

CS680: Advanced Computer Graphics (Fall 2008)  
– Scalable Global Illumination Algorithms

Instructor: [Sung-eui Yoon](#)

**KAIST**

This book contains a list of papers on recent development to the global illumination algorithms. Papers shown in below are included. Also, papers will appear in the order of papers listed here.

#### **A. LOD Technique 1, focus on global illumination**

1. Homan Igehy, Tracing Ray Differentials, SIGGRAPH '99
2. Eric Tabellion, Arnauld Lamorlette, An Approximate Global Illumination System for Computer-Generated Films, SIG 04
3. Sung-Eui Yoon, Christian Lauterbach, and Dinesh Manocha, R-LODs: Fast LOD-based Ray Tracing of Massive Models , Visual Computer (Pacific Graphics), 2006
4. Per H. Christensen, Julian Fong, David M. Laur and Dana Batali, Ray Tracing for the Movie 'Cars' , RT 06
5. Robert L. Cook, John Halstead, Maxwell Planck, David Ryu, Stochastic Simplification of Aggregate Detail, SIG07

#### **B. Many light problems**

6. Bruce Walter, Sebastian Fernandez, Adam Arbree, Kavita Bala, Mike Donikian and Donald Greenberg, Lightcuts: A Scalable Approach to Illumination, SIGGRAPH 2005
7. Bruce Walter, Adam Arbree, Kavita Bala, Donald Greenberg, Multidimensional lightcuts, SIGGRAPH 2006
8. Milos Hasan, Fabio Pellacini, Kavita Bala, Matrix Row-Column Sampling for the Many-Light Problem, SIG 07,
9. tensor clustering for rendering many-light animations, EGSR 08
10. Adam Arbree, Bruce Walter, Kavita Bala, Single-pass Scalable Subsurface Rendering with Lightcuts, Eurographics '08

#### **C. Coherent Ray Tracing**

11. Matt Pharr, Craig Kolb, Reid Gershbein, and Pat Hanrahan, Rendering Complex Scenes with Memory-Coherent Ray Tracing, SIGGRAPH '97
12. Ingo Wald and Carsten Benthin and Markus Wagner and Philipp Slusallek, Interactive Rendering with Coherent Ray Tracing, Eurographics 01
13. Alexander Reshetov, Alexei Soupikov, Jim Hurley, Multi-Level Ray Tracing Algorithm, SIG 05
14. Sung-Eui Yoon and Peter Lindstrom, Mesh Layouts for Block-Based Caches, IEEE Tran. on Vis. and Computer Graphics (TVCG) and IEEE Visualization, 2006
15. Paul Arthur Navrátil, Donald S. Fussell, Calvin Lin and William R. Mark, Dynamic Ray Scheduling to Improve Ray Coherence and Bandwidth Utilization, IEEE / EG Symposium on Interactive Ray Tracing 2007
16. Erik Månsson, Jacob Munkberg, Tomas Akenine-Möller, Deep Coherent Ray Tracing, Symposium on Interactive Ray Tracing 2007
17. Adaptive Ray Packet Reordering, Solomon Boulos, Ingo Wald and Carsten Benthin, Proceedings of IEEE Symposium on Interactive Ray Tracing 2008

18. Getting Rid of Packets: Efficient SIMD Single-Ray Traversal using Multi-branching BVHs, Ingo Wald, Carsten Benthin and Solomon Boulos, Proceedings of IEEE Symposium on Interactive Ray Tracing 2008

#### **D. Shadow maps**

19. Cyril Soler, *François X. Sillion*, Fast calculation of soft shadow textures using convolution, SIG 98
20. Marc Stamminger, George Drettakis, Perspective Shadow Maps, SIG 02
21. Samuli Laine, Timo Aila, Ulf Assarsson, Jaakko Lehtinen and Tomas Akenine-Möller, Soft Shadow Volumes for Ray Tracing, ACM Transactions on Graphics 24(3) (SIGGRAPH 2005).
22. Erik Sintorn, Elmar Eisemann, Ulf Assarsson, Sample Based Visibility for Soft Shadows using Alias-free Shadow Maps, EGSR 08
23. Thomas Annen, Zhao Dong, Tom Mertens, Philippe Bekaert, Hans-Peter Seidel, Jan Kautz, Real-time, All-frequency Shadows in Dynamic Scenes, SIG 08

#### **E. Dynamic models**

24. Karol Myszkowski, Takehiro Tawara, Hiroyuki Akamine, Hans-Peter Seidel, Perception-Guided Global Illumination Solution for Animation Rendering, SIG 01
25. P. Tole, F. Pellacini, B. Walter, D. Greenberg, Interactive Global Illumination in Dynamic Scenes, SIGGRAPH 2002, in ACM Transactions on Graphics, 2002.
26. Mark Meyer, John Anderson, Statistical Acceleration for Animated Global Illumination, SIG 06
27. Sung-Eui Yoon, Sean Curtis, Dinesh Manocha, Ray Tracing Dynamic Scenes using Selective Restructuring, EGSR 07
28. Zhong Ren, Rui Wang, John Snyder, Kun Zhou, Xinguo Liu, Bo Sun, Peter-Pike Sloan, Hujun Bao, Qunsheng Peng, Baining Guo, Real-time Soft Shadows in Dynamic Scenes using Spherical Harmonic Exponentiation, ACM TOG (SIGGRAPH 2006)

#### **F. PRT**

29. Ravi Ramamoorthi, Pat Hanrahan, An Efficient Representation for Irradiance Environment Maps, SIG 01
30. Peter-Pike Sloan, Jan Kautz, and John Snyder, Precomputed Radiance Transfer for Real-Time Rendering in Dynamic, Low-Frequency Lighting Environments, SIGGRAPH 2002, July, 2002
31. Ren Ng, Ravi Ramamoorthi Pat Hanrahan, All-Frequency Shadows Using Non-linear Wavelet Lighting Approximation, SIG 03
32. Ren Ng, Ravi Ramamoorthi, Pat Hanrahan, Triple Product Wavelet Integrals for All-Frequency Relighting, SIG 04
33. Peter-Pike Sloan, Ben Luna, John Snyder, Local, Deformable Precomputed Radiance Transfer, SIG 05
34. A Meshless Hierarchical Representation for Light Transport, SIG 08

#### **G. Real-time lighting & rendering**

35. Anders Wang, Kristensen, Tomas Akenine-Moller, Henrik Wann Jensen, Precomputed Local Radiance Transfer for Real-Time Lighting Design, SIG05
36. Direct-to-Indirect Transfer for Cinematic Relighting, M. Hasan, F. Pellacini, K. Bala. SIGGRAPH 2006, in ACM Transactions on Graphics, 2006.
37. Xin Sun, Kun Zhou, Yanyun Chen, Stephen Lin, Jiaoying Shi, Baining Guo , Interactive Relighting with Dynamic BRDFs, ACM TOG (SIGGRAPH 2007)
38. Xin Sun, Kun Zhou, Eric Stollnitz, Jiaoying Shi, Baining Guo, Interactive Relighting of Dynamic Refractive Objects, ACM TOG (SIGGRAPH 2008)
39. Carsten Dachsbacher, Marc Stamminger, George Drettakis, Frédo Durand, Implicit Visibility and Antiradiance for Interactive Global Illumination, ACM Transactions on Graphics (SIGGRAPH 07)
40. Kun Zhou, Zhong Ren, Stephen Lin, Hujun Bao, Baining Guo, Heung-Yeung Shum, Real-Time Smoke Rendering Using Compensated Ray Marching, ACM TOG (SIGGRAPH 2008)

#### H. Irradiance caching

41. A ray tracing solution for diffuse interreflection, SIG 88
42. Irradiance gradient, EGSR 92
43. Irradiance Gradients in the Presence of Participating Media and Occlusions, EGSR 08
44. Wojciech Jarosz, Craig Donner, Matthias Zwicker, and Henrik Wann Jensen, "Radiance Caching for Participating Media", ACM Transactions on Graphics, 2008

#### I. Sampling and reconstruction

45. Victor Ostromoukhov, Charles Donohue, Pierre-Marc Jodoin, Fast Hierarchical Importance Sampling With Blue Noise Properties, SIG 04
46. Jason Lawrence, Szymon Rusinkiewicz, Ravi Ramamoorthi, Efficient BRDF Importance Sampling Using A Factored Representation, SIG 04
47. Petrik Clarberg, Wojciech Jarosz, Tomas Akenine-Möller, Henrik Wann Jensen, Wavelet Importance Sampling: Efficiently Evaluating Products of Complex Functions, ACM SIGGRAPH 2005
48. T. Hachisuka, W. Jarosz, R. Weistroffer, K. Dale, G. Humphreys, M. Zwicker, and H. Wann Jensen, Multidimensional Adaptive Sampling and Reconstruction for Ray Tracing, SIG08

#### J. Radiosity

49. Pat Hanrahan, David Salzman, Larry Aupperle, A Rapid Hierarchical Radiosity Algorithm, SIG91
50. A. Keller, Instant Radiosity, SIGGRAPH 97
51. Samuli Laine, Hannu Saransaari, Janne Kontkanen, Jaakko Lehtinen, and Timo Aila, Incremental Instant Radiosity for Real-Time Indirect Illumination.. Eurographics Symposium on Rendering 2007

## **K. LOD 2, focus on rasterization**

52. *Surface Simplification Using Quadric Error Metrics*, Michael Garland and Paul Heckbert, SIGGRAPH 97
53. Quick-VDR: Interactive View-Dependent Rendering of Massive Models, Sung-Eui Yoon, Brian Salomon, Russell Gayle and Dinesh Manocha, IEEE Visualization 04
54. Adaptive tetrapuzzles: efficient out-of-core construction and visualization of gigantic multiresolution polygonal models , Gobbetti et al., SIG 04
55. Doug L. James and Christopher D. Twigg, *Skinning Mesh Animations*, ACM SIGGRAPH 2005
56. Burley, B., and Lacewell, D., *Ptex: Per-Face Texture Mapping for Production Rendering*, Eurographics Symposium on Rendering, 2008

## **L. Parallel computation**

57. Chromium: A Stream Processing Framework for Interactive Rendering on Clusters, Greg Humphreys et al. SIG 02
58. J. Günther, I. Wald, P. Slusallek, *Realtime Caustics using Distributed Photon Mapping*, Eurographics Symposium on Rendering, 2004
59. Kurt Debattista, Luis Paulo Santos, Alan Chalmers, *Accelerating the Irradiance Cache through Parallel Component-Based Rendering*. EGPGV2006 - 6th Eurographics Symposium on Parallel Graphics Visualization. 2006
60. Li-Yi Wei, *Parallel Poisson Disk Sampling*, SIG 08
61. *A Spatial Data Structure for Fast Poisson-Disk Sample Generation*, Daniel Dunbar, Greg Humphreys, Proceedings of SIGGRAPH 2006

## **M. Data compression**

62. Peter-Pike Sloan, Jesse Hall, John Hart, and John Snyder, *Clustered Principal Components for Precomputed Radiance Transfer*, SIGGRAPH 2003, July, 2003
63. Perfect spatial hashing, S. Lefebvre, H. Hoppe, SIGGRAPH 2006, 579-588.
64. Sung-Eui Yoon and Peter Lindstrom, *Random-Accessible Compressed Triangle Meshes* , IEEE TVCG and Visualization 07

## **N. Realistic rendering**

65. Henrik Wann, Jensen, Steve Marschner, Marc Levoy, Pat Hanrahan, *A Practical Model for Subsurface Light Transport*, SIG 01
66. Craig Donner and Henrik Wann Jensen , *Light Diffusion in Multi-Layered Translucent Materials*, SIGGRAPH'2005
67. Rui Wang, John Tran, David Luebke, *All-Frequency Interactive Relighting of Translucent Objects with Single and Multiple Scattering*, SIG 05
68. Angeles, August 2005 Jeppe Revall Frisvad, Niels Jørgen Christensen, Henrik Wann Jensen, *Computing the Scattering Properties of Participating Media using Lorenz-Mie Theory*, SIG 07

69. I. Ihrke, G. Ziegler, A. Tevs, C. Theobalt, M. Magnor, H.-P. Seidel, "Eikonal Rendering: Efficient Light Transport in Refractive Objects" , ACM Trans. on Graphics (Siggraph'07)
70. Jonathan T. Moon and Stephen R. Marschner , Simulating Multiple Scattering in Hair Using a Photon Mapping Approach, SIGGRAPH 2006
71. Jonathan T. Moon, Bruce Walter, and Stephen R. Marschner, Efficient Multiple Scattering in Hair Using Spherical Harmonics, SIGGRAPH 2008

#### **O. Hardware for GI**

72. Ray Tracing on Programmable Graphics Hardware Timothy J. Purcell, Ian Buck, William R. Mark, and Pat Hanrahan, SIGGRAPH 02
73. Photon Mapping on Programmable Graphics Hardware, Timothy J. Purcell, Craig Donner, Mike Cammarano, Henrik Wann Jensen, and Pat Hanrahan, Graphics Hardware, 2003
74. GPU Algorithms for Radiosity and Subsurface Scattering, Nathan A. Carr, Jesse D. Hall, John C. Hart Proc. Graphics Hardware, July 2003
75. RPU: a programmable ray processing unit for realtime ray tracing, Sven Woop, Jörg Schmittler , Philipp Slusallek , SIG 05
76. Interactive k-D Tree GPU Raytracing, Daniel Horn, Jeremy Sugerman, Mike Houston, and Pat Hanrahan, Proc. 2007 Symposium on Interactive 3D Graphics

#### **P. Other applications**

77. Christian Lauterbach, Anish Chandak, and Dinesh Manocha, Interactive Sound Propagation in Dynamic Scenes Using Frustum Tracing, IEEE TVCG (Proc. IEEE Visualization 2007)
78. Oliver Cossairt, Shree Nayar, Ravi Ramamoorthi, Light Field Transfer: Global Illumination Between Real and Synthetic Objects, SIGGRAPH ( ACM Transactions on Graphics), 2008.