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assignments

final project: PBRT+

Assigned: 2016/12/22
Due: 2107/1/17 11:59pm

Project description

In this project, you are free to implement existing or novel algorithms. You can either use them to extend pbrt to produce a realistic image or implement it as a standalone system. Of course, you are welcome to work on real-time rendering systems as well. For inspiration, you can either look at the results of Stanford's rendering competition, internet ray tracing competition or recent SIGGRAPH papers. I list some papers as options if you do not have a clear idea in your mind.

- implement Ray Specialized Contraction on Bounding Volume Hiererchies
- implement Adaptive Rendering with Linear Prediction
- implement A Machine Learning Approach for Filtering Monte Carlo Noise
- implement SURE-based Optimization for Adaptive Sampling and Reconstruction
- implement Gradient-Domain Path Tracing
- implement Adaptive Rendering with Non-Local Means Filtering
- implement Temporal Light Field Reconstruction for Rendering Distribution Effects
- implement Progressive Photon Mapping
- implement A Spatial Data Structure for Fast Poisson-Disk Sample Generation or Recursive Wang iles for Real-Time Blue Noise
- implement Structured Importance Sampling of Environment Maps
- implement Fast Hierarchical Importance Sampling with Blue Noise Properties
- implement Efficient BRDF Importance Sampling Using A Factored Representation
- implement Wavelet Importance Sampling: Efficiently Evaluating Products of Complex Functions
- implement Metropolis Light Transport algorithm
- speed up the final gathering of photon mapping by Christensen's method
- implement Fast and Detailed Approximate Global Illumination by Irradiance Decomposition
- implement Photon mapping approach for the volume integrator
- extend pbrt to handle L-system, refer to papers from Dr. P's lab.
- extend pbrt to handle hairy objects. Refer to the following papers: Rendering Fur with Three Dimensional Textures, Fake Fur Rendering and Light Scattering from Human Hair Fibers.
- Write a progrm and make an animation to illustrate a concept which will be otherwise very difficult to understand.
- extend pbrt so that it can handle large complex scene efficiently, for example you can use GPU to accelerate it or consider cache coherence. You can refer to Ray Engine, Ray Tracing on Programmable Graphics Hardare and Rendering Complex Scenes with Memory-Coherent Ray Tracing.

Please notice that the ultimate goal is to synthesize a realistic image. Hence, even if you choose to implement a paper or two, please create a scene to demonstrate your result clearly.

Submission

You have to turn in every source file you have modified or created and a html report. The report could describe how you create your scene and image. It is fine to import other's objects, such as those available online, in your scene. For the format of the report, please refer to the reports of Stanford's rendering competition for examples. Please send your project directly to me by the deadline.