

Algorithms for Monte Carlo denoising

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Motivation

The current state of the art for graphics hardware only supports a small number of rays per pixel in the time period of a single frame. This gives an incomplete image and the cost to fully converge cannot be done in the time constraints of real time rendering. In the course lectures we discussed some interesting and flexible algorithm for denoising and deconvolution. I am interested in evaluating those algorithms on images with Monte Carlo noise.

Related work

ADMM algorithm : https://stanford.edu/~boyd/papers/pdf/admm_distr_stats.pdf

Richardson Lucy Algorithm : <http://adsabs.harvard.edu/full/1974AJ.....79..745L>

<https://www.osapublishing.org/josa/abstract.cfm?uri=josa-62-1-55>

Project overview

I plan to evaluate accuracy and performance of the denoising/deconvolution algorithm discussed in lectures for Monte Carlo denoising. I will be using ADMM and Richard-Lucy algorithms to denoise a ray trace image with low rays/pixel. Those 2 algorithms can be applied with different priors (anisotropic, isotropic and others).

I plan on using pbrt (<https://github.com/mmp/pbrt-v3>) to generate the noisy (1-4 rays per pixel) and the ground truth (100+ rays per pixel) images.

Milestone, timeline and goals

2/15 – Acquire PBRT images (noisy and ground truth)

2/19 – ADMM with anisotropic prior

2/22 – Richardson Lucy with anisotropic prior

2/29 – ADMM with isotropic prior

3/3 – Richardson-Lucy with isotropic prior

3/7 – Try other priors if time permits

3/11 – Project poster due