Final Project Pitch

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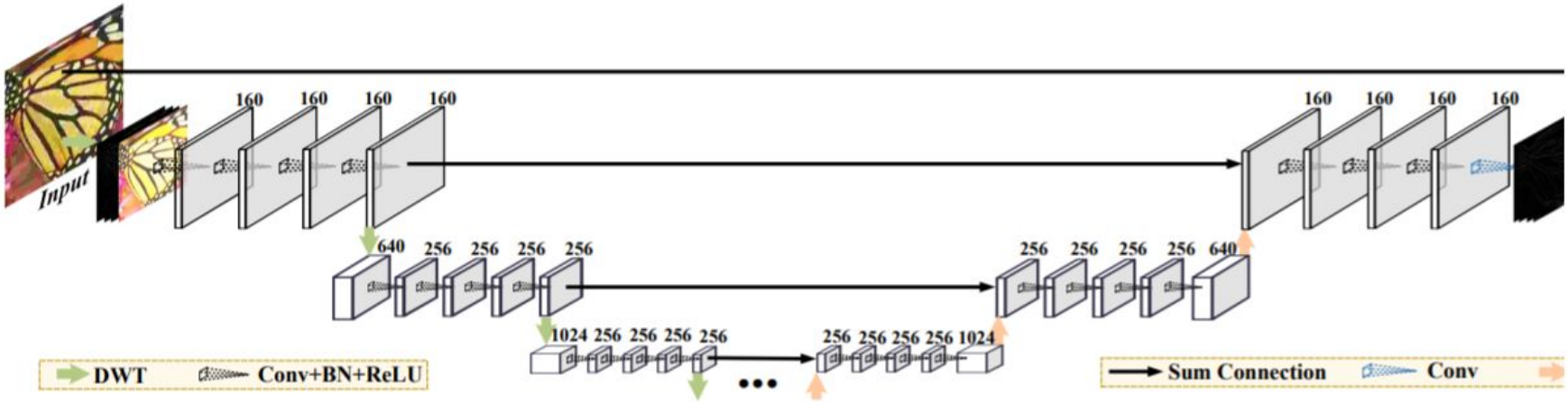
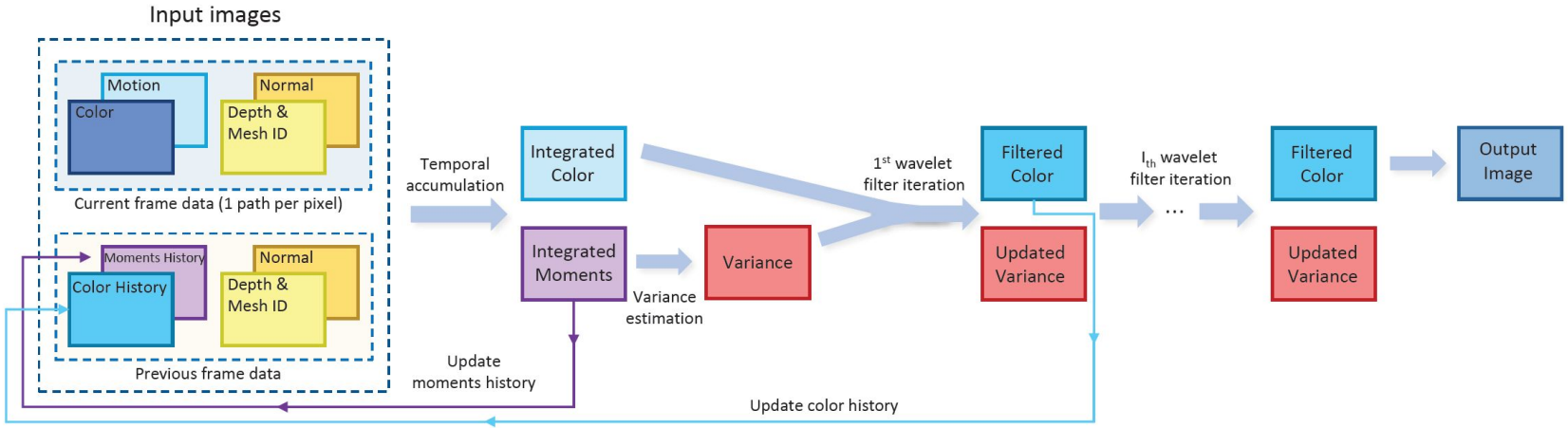
Background

- Path tracing can produce photo-realistic global illuminated images. However, current ray tracing performance is limited by hardware. Therefore, denoising, which reconstructs the rendering output only with few samples, becomes a popular topic in both industry and academia.
- Two major research areas for denoising are
  - Machine Learning
  - Hybrid Rendering
- Our project will try to implement denoising methods in both categories and compare the results.

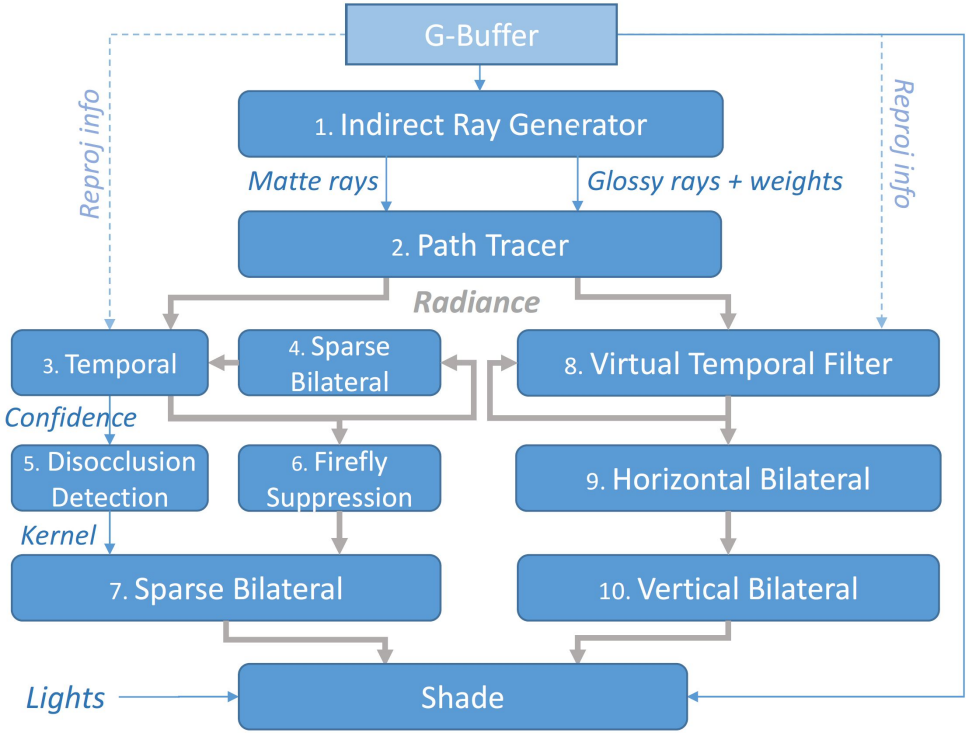
Sample Denoising Network Architecture



Sample Spatiotemporal Filtering Pipeline

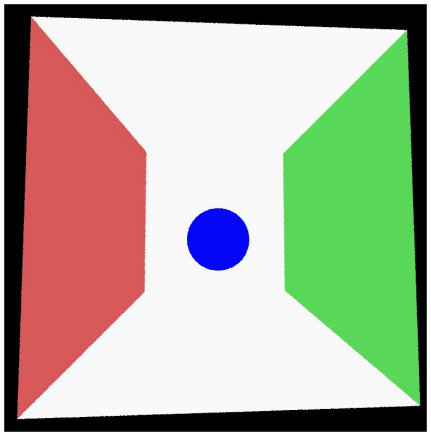


- Scheid et al. Spatiotemporal Variance-Guided Filtering

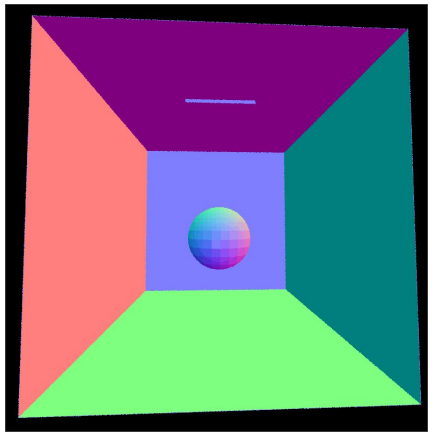


- Mara et al. An efficient denoising algorithm for global illumination

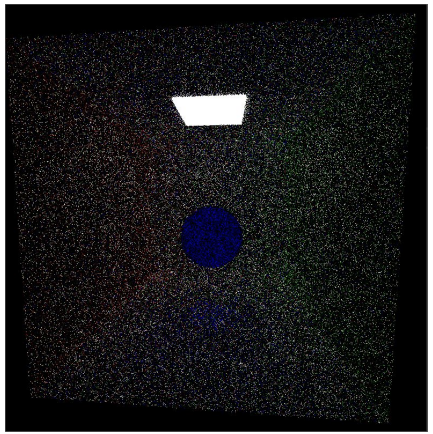
Denoising the Cornell Box



Albedo



Normal



1spp Path Traced Image

Proposed Timeline

- Milestone 1
  - Write framework code
  - Attempt offline denoising methods
  - Adapt existing denoiser (Intel Open Image Denoise) to the projects
- Milestone 2
  - Generate image data from path tracer
  - Build and train denoising neural network
- Milestone 3
  - Achieve real-time denoising for static scenes
- Final Presentation
  - Different environment
  - Optimization

Reference

- Alain Galvan's Blog: https://alain.xyz/blog/raytracing-denoising
- Spatiotemporal Variance Guided Filtering: https://research.nvidia.com/sites/default/files/pubs/2017-07_Spatiotemporal-Variance-Guided-Filtering%3A//svgf_preprint.pdf