

ReSTIR with DirectX Ray Tracer

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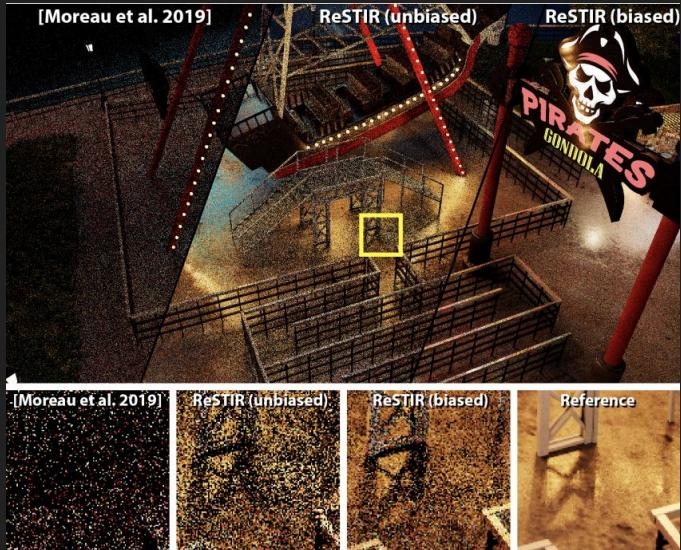
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ReSTIR Overview

For each pixel:

1. Select 1 light from 32 randomly chosen lights.
2. Shoot a shadow ray from the light to pixel. If it is obscured, discard selection.
3. Compare light used in the last frame to the light from step 2. Choose one. (Temporal Reuse)
4. Compare the lights from random adjacent pixels to light from step 3. Choose one. (Spatial Reuse)
5. Shoot a shadow ray to light from step 4 and shade pixel.

Use a combination of Weighted Reservoir Sampling (WRS) and Resampled Importance Sampling (RIS) to select and compare lights.



Final Renders

Final Renders

Lumberyard Bistro Scene by Amazon



Final Renders



Forest Scene After 14 Iterations

Random Light



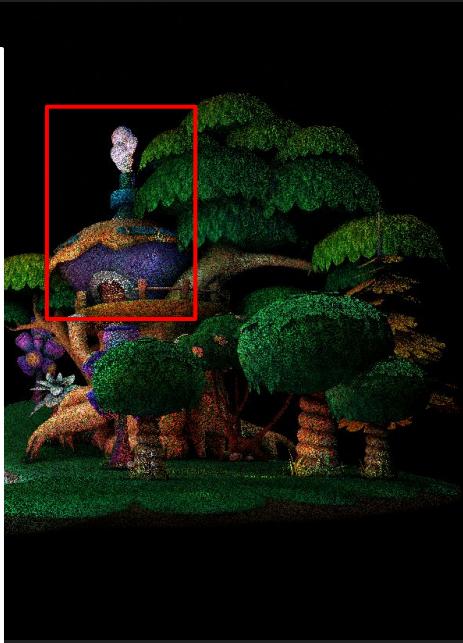
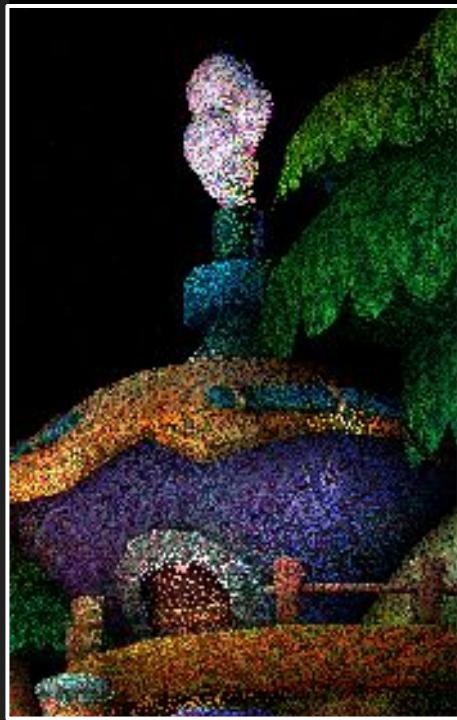
ReSTIR



80 lights

Forest Scene After 14 Iterations

Random Light



80 lig

ReSTIR

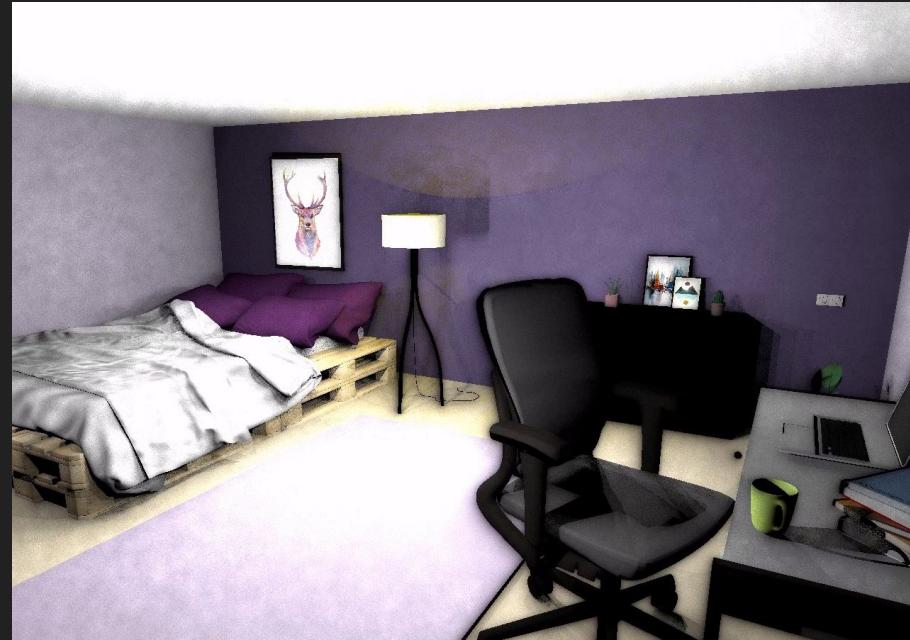


Purple Room Scene After 44 Iterations

Random Light



ReSTIR



15 lights

Purple Room Scene After 44 Iterations

Random Light



ReSTIR



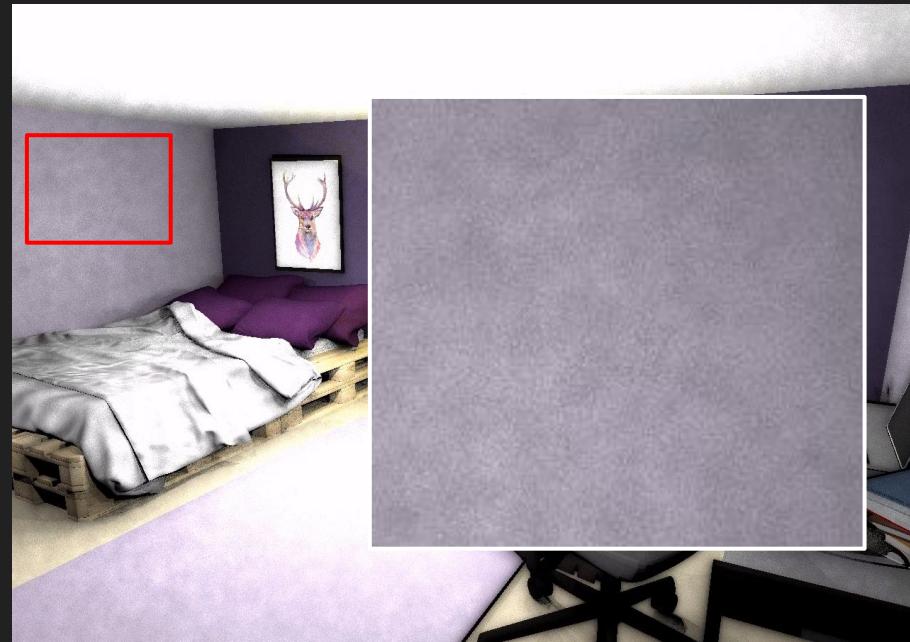
15 lights

Purple Room Scene After 44 Iterations

Random Light



ReSTIR



15 lights

Pink Room Scene 1 Iteration

Base



RIS



RIS + Temporal Reuse



RIS + Spatial Reuse



RIS + Spatiotemporal



RIS + Spatiotemporal +
Global Illumination

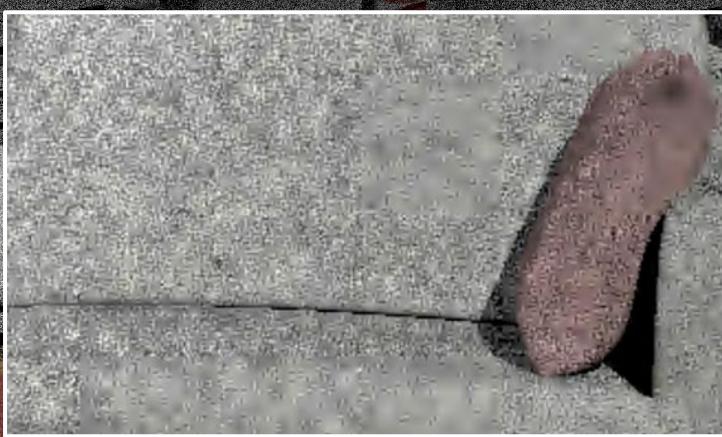


Pink Room Scene 1 Iteration

Base



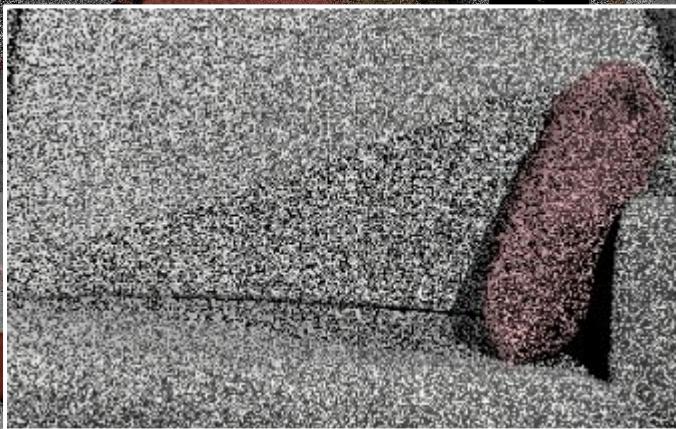
RIS



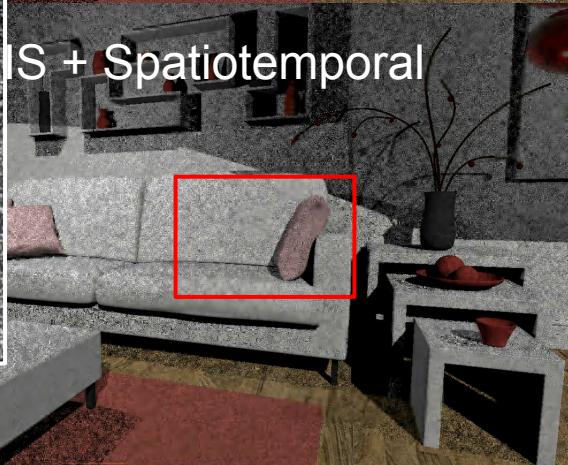
Global Reuse



RIS + Spatiotemporal



RIS + Spatiotemporal +
Global Illumination



Pink Room Scene Converged

Base



RIS



RIS + Temporal Reuse



RIS + Spatial Reuse



RIS + Spatiotemporal



RIS + Spatiotemporal +
Global Illumination



Global Illumination + ReSTIR

Using Indirect illumination along with SpatioTemporal Reuse from ReSTIR



Bistro Scene With and Without Global Illumination

With Global Illumination



Without Global Illumination

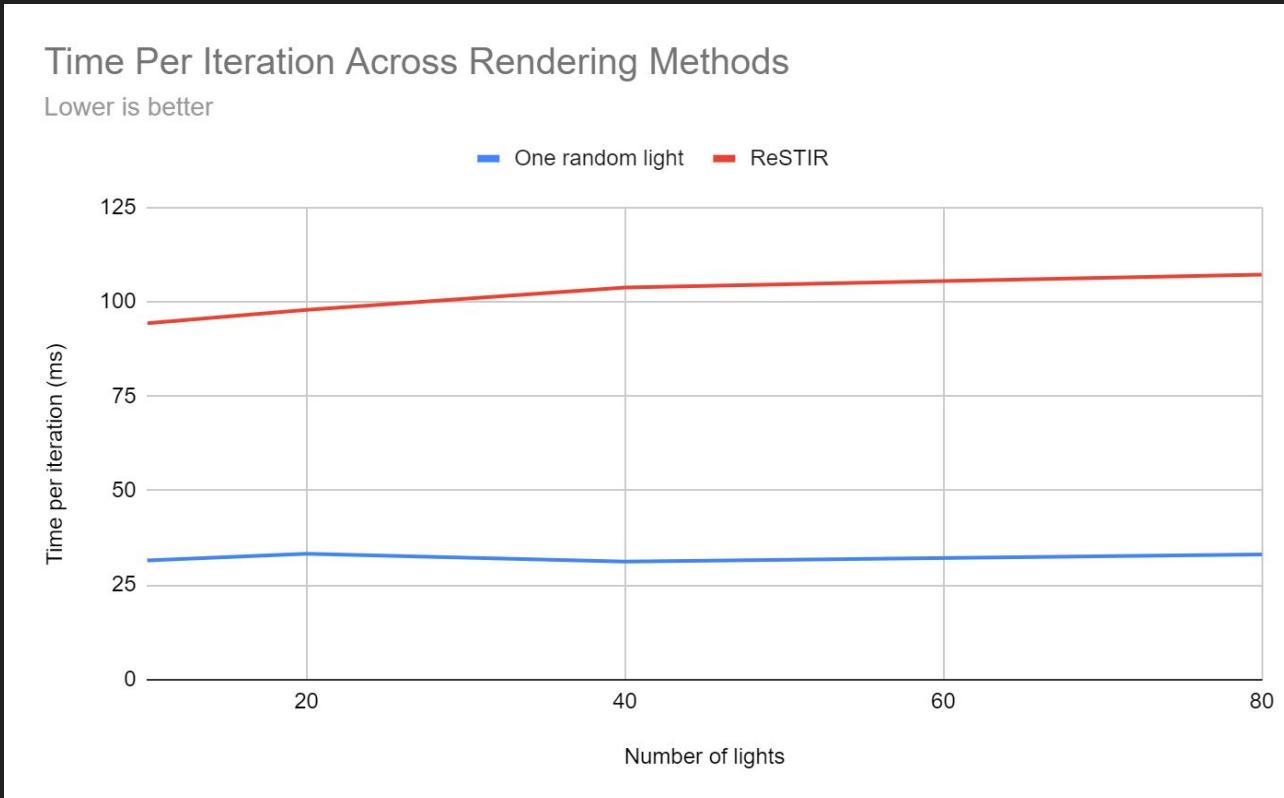


Converged ~500 Iterations

Performance Analysis

Performance Analysis

Tested on our forest scene (Windows 10, i7-8750H @ 2.20GHz 22GB, GTX 1070)



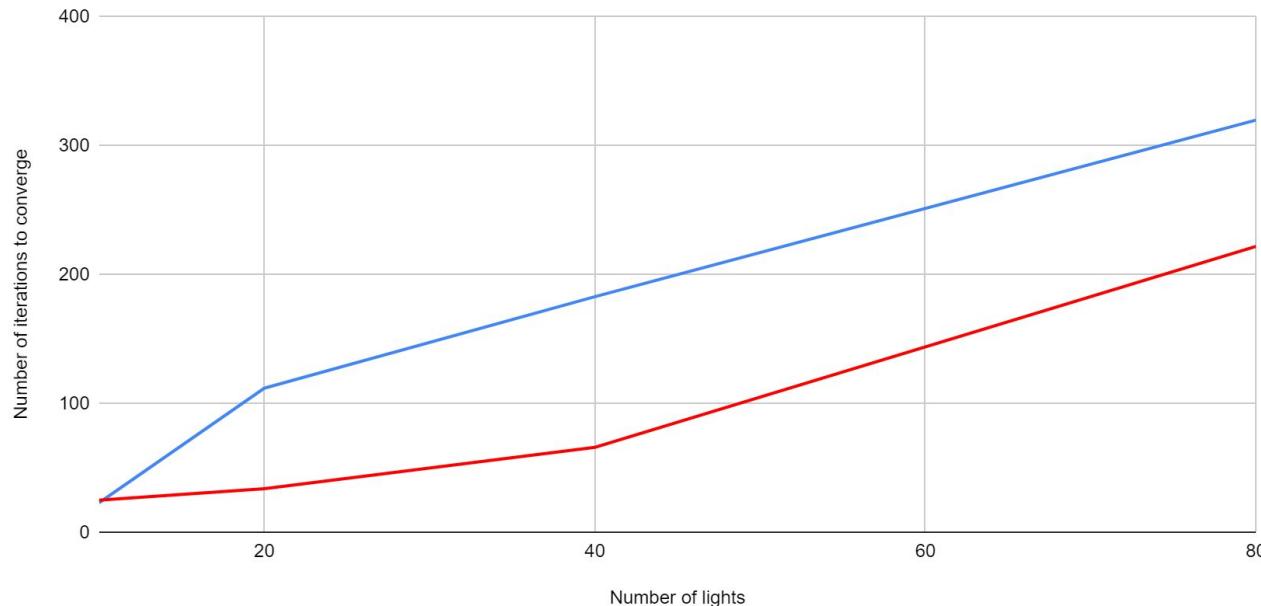
Performance Analysis

Tested on our forest scene (Windows 10, i7-8750H @ 2.20GHz 22GB, GTX 1070)

Number of Iterations to Converge Across Rendering Methods

Lower is better

— One random light — ReSTIR



Credits

GTC A21210 Rendering Games With Millions of Ray-Traced Lights: Chris Wyman and Alexey Panteleev

ReSTIR Paper: Benedikt Bitterli, Chris Wyman, Matt Pharr, Peter Shirley, Aaron Lefohn, Wojciech Jarosz. Spatiotemporal reservoir resampling for real-time ray tracing with dynamic direct lighting. *ACM Transactions on Graphics (Proceedings of SIGGRAPH)*, 39(4), July 2020.

DirectX Ray Tracing Base Code: Chris Wyman, Shawn Hargreaves, Peter Shirley, and Colin Barré-Brisebois. 2018. Introduction to DirectX raytracing. In ACM SIGGRAPH 2018 Courses (SIGGRAPH '18). Association for Computing Machinery, New York, NY, USA, Article 9, 1.
DOI:<https://doi.org/10.1145/3214834.3231814>

Acknowledgments

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