

# ReSTIR with DirectX Ray Tracer

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# Goal for this milestone

- Complete spatial reuse
- Temporal reuse (using previous frames in an animation)
- Incorporate global illumination

# Results

# Pink Room Scene 1 Iteration

Base



RIS



RIS + Temporal Reuse



RIS + Spatial Reuse



RIS + Spatiotemporal



RIS + Spatiotemporal +  
Global Illumination



# Pink Room Scene Converged

Base



RIS



RIS + Temporal Reuse



RIS + Spatial Reuse



RIS + Spatiotemporal

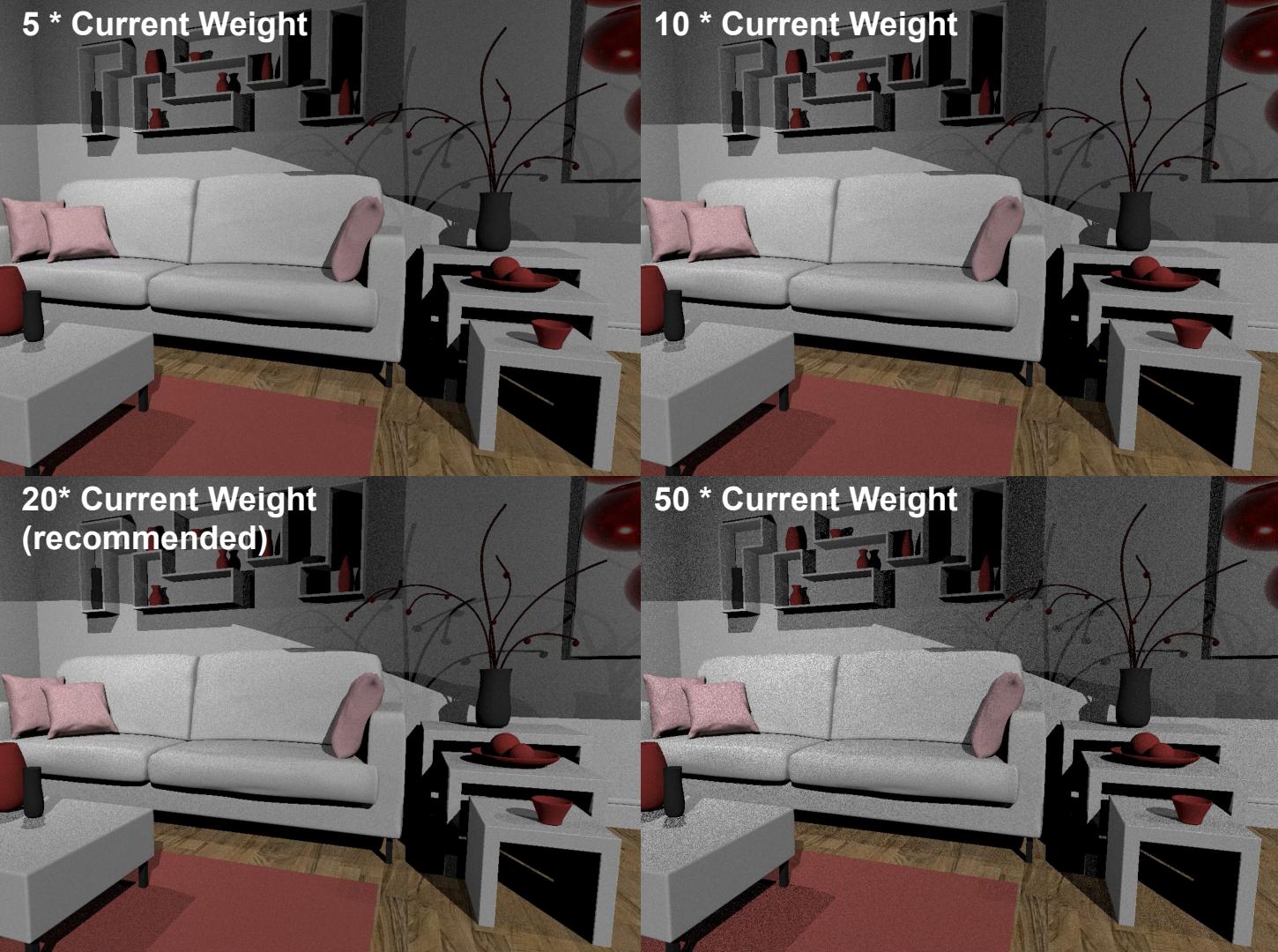


RIS + Spatiotemporal +  
Global Illumination



# Temporal Reuse

Difference in convergence & brightness based on max weighting of previous frames



# Spatial Reuse

Difference in number of neighbors  
(radius 5x5)



Difference in radius of sampling  
(20 neighbor samples)



# Global Illumination

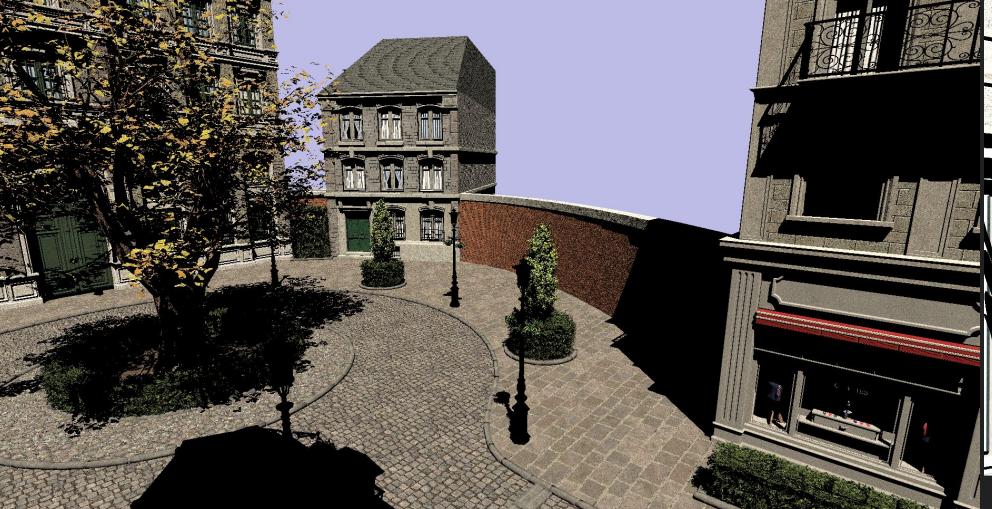
# Global Illumination - Incorporating with ReSTIR

- Accumulate \*indirect\* lighting
- Bounce rays to hit another surface.
- We only shoot ONE shadow ray from each hit.
- Add the global illumination output to the spatiotemporal output



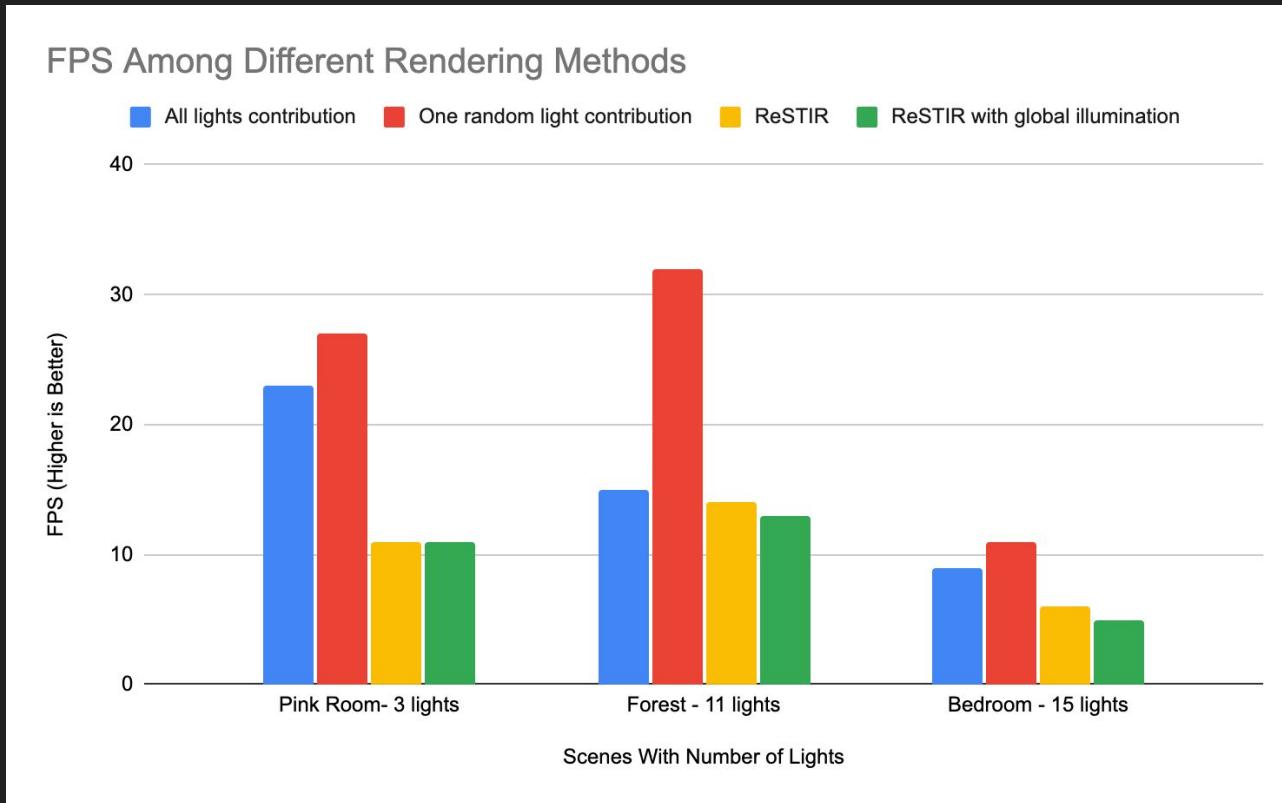


# New Scenes





# Time analysis for new scene



# Challenges

# Temporal Reuse

## Problem

- Scene does not converge because the sum of all candidates seen per pixel become extremely huge as accumulation through frames

## Solution

- Clamp the number of light candidates seen in the previous reservoir

# Spatial Reuse

## Problem

- Race condition due to reading from and writing into reservoirs (neighbor sampling and reservoir updating)

## Solution

- More than one buffer for reservoirs
- Separate pass for spatial reuse
- Separate pass to shade & put the updated the original reservoir buffer

# Global Illumination



# Goals Checklist

## ReSTIR

- ✓ Light candidates generation
- ✓ Spatial reuse
- ✓ Temporal reuse for non-moving frames

Temporal reuse for moving frames

## Additional features

- ✓ Custom scenes
- Global illumination (fix bug)

# Demo