ReSTIR - Vulkan

CIS 565 Final Project Milestone 1

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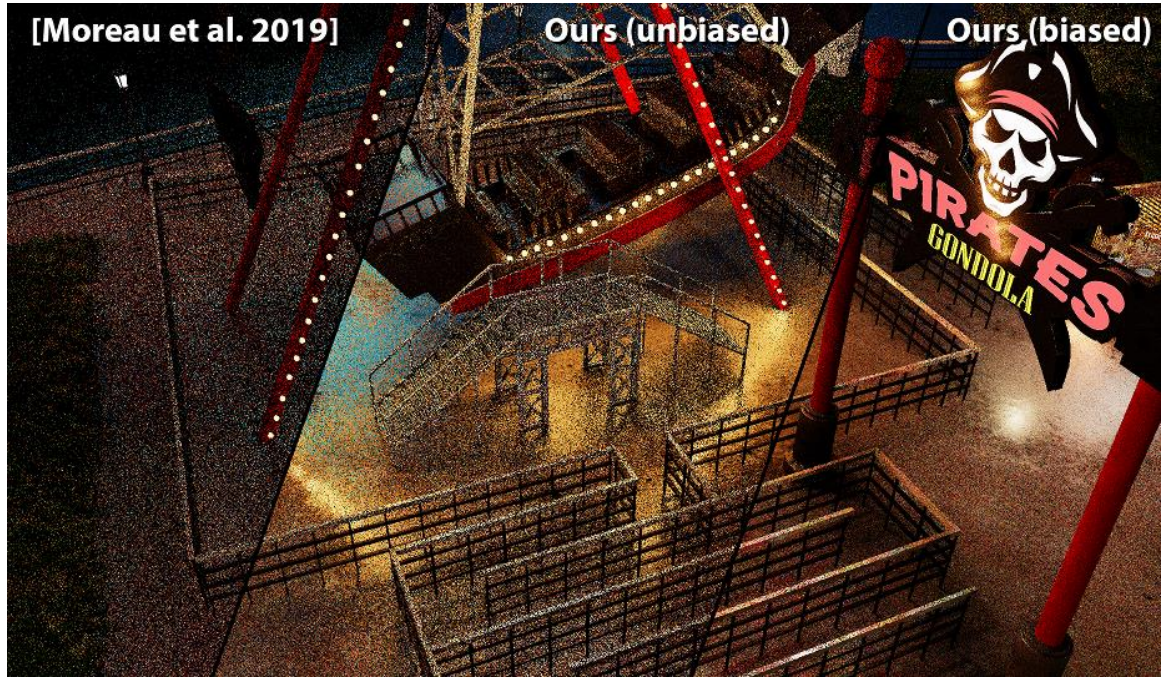
Overview

- Our project will try to implement ReSTIR in Vulkan
- For the first pass of ReSTIR, we will leverage GBuffer and rasterization pipeline. The second pass of the ReSTIR, which is the shadow ray pass, we will use ray tracing techniques.
- As for ray tracing, we will implement two kinds of raytracing techniques in Vulkan. The first one is the raytracing using Compute Shader and the second one is the raytracing using Vulkan raytracing pipeline.



MS1 Progress

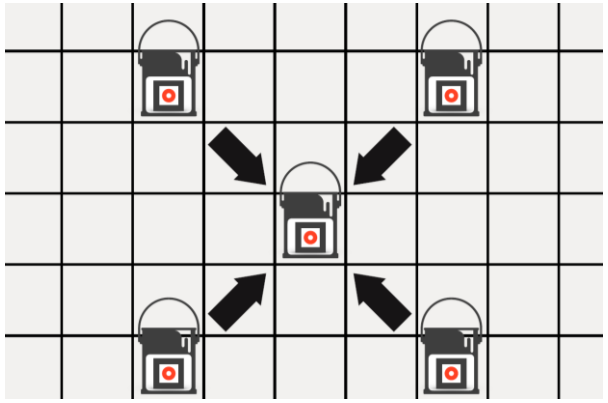
- **Milestone 1 (Pitch)**
  - Basic hardware and software Vulkan path tracer
  - Basic diffusive and specular material.
  - GLTF scene loader.

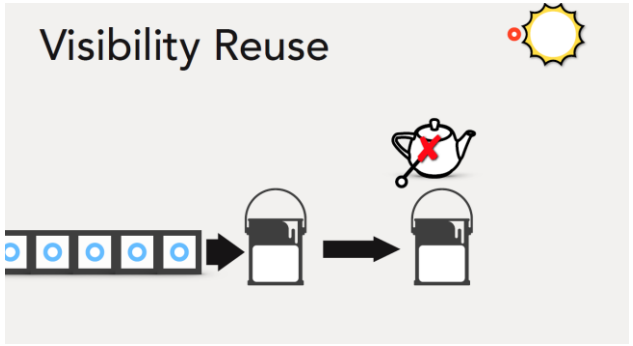
- **Milestone 1 (Done)**
  - GBuffer/Rasterization renderer
  - Software Raytracing (Compute Shader)
  - Hardware Raytracing (RT Pipeline)
  - GLTF scene loader
  - Read ReSTIR paper and discuss algorithm

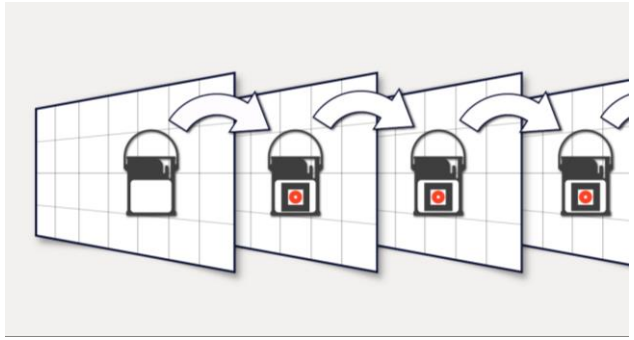
- **Milestone 1 (Not Finished)**
  - Basic diffusive and specular material

ReSTIR

- It is a sampling technique that combines RIS (Resampled important sampling) and WIS (Weighted reservoir sampling) techniques and create a new way to reuse reservoirs. In this way, it can efficiently render direct lighting from millions of dynamic light sources using Monte Carlo integration.

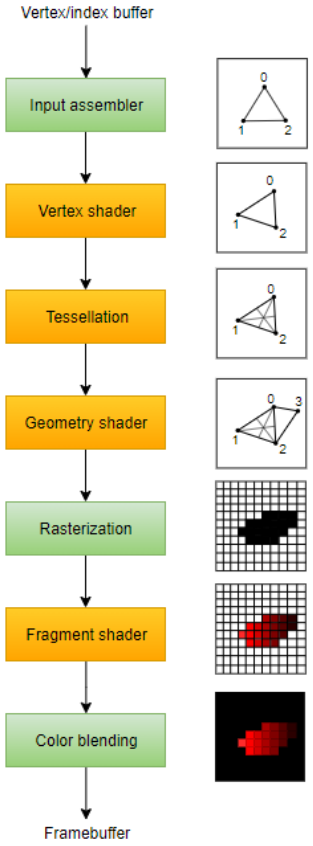






Vulkan

- In Vulkan, we will use two pipelines. The left one is the traditional rasterizing pipeline and the right one is the Vulkan Ray Tracing pipeline.



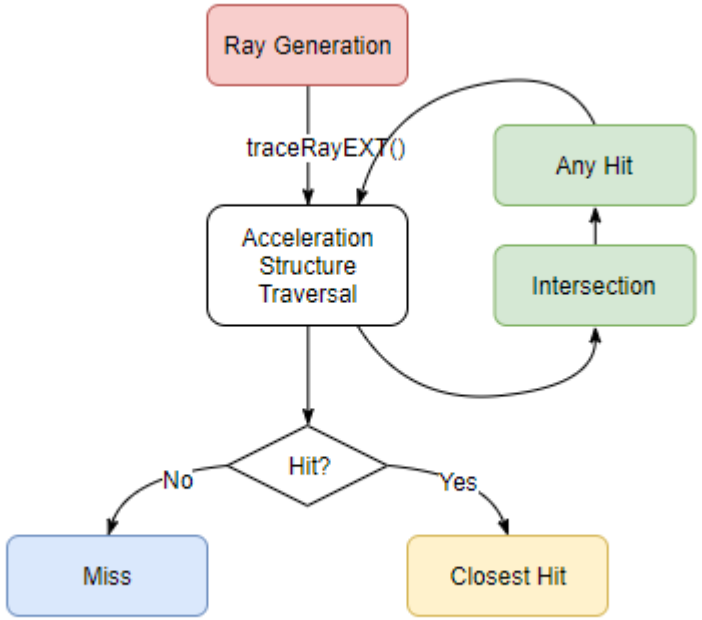
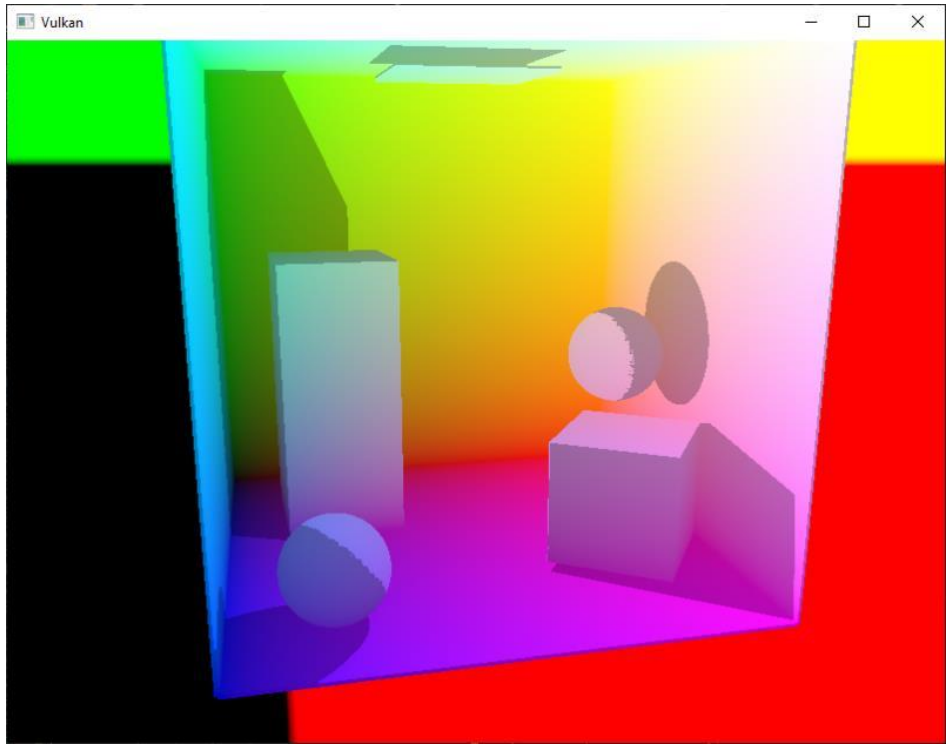


Figure 2: *The Ray Tracing Pipeline*

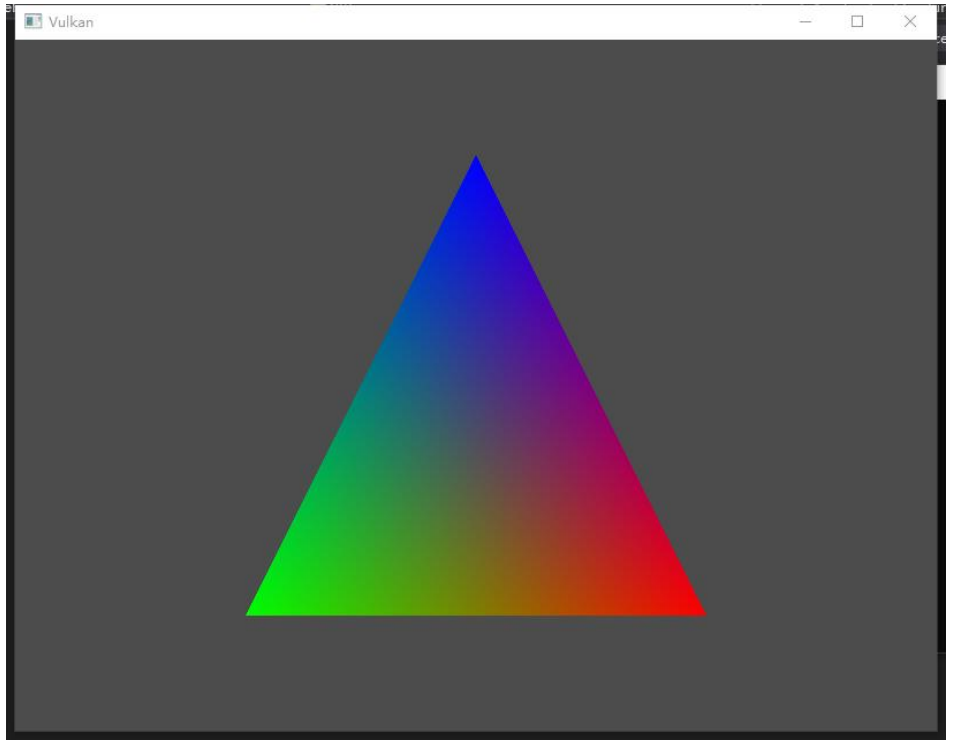
MS1 Demo

GBuffer information (normal).
The shadow comes from compute shader.



Rasterizing Pipeline

For the demo below, it transfers the barycentric value to color.



Ray Trace Pipeline Triangle

Proposed Timeline

- **Milestone 1**
  - Basic hardware and software Vulkan path tracer
  - GLTF scene loader.
- **Milestone 2**
  - Well-functioned hardware and software Vulkan path tracer
  - GLTF PBR support for rasterization rendering and two kinds of ray tracing
- **Milestone 3**
  - Biased ReSTIR
- **Final Presentation**
  - Unbiased ReSTIR algorithm

Thank you for listening!

Q&A