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CIS 565
Final Project Pitch

Introduction

Our team is interested in rendering while at the same time exploring an API commonly used for this graphics area. Inspired by the talk Rendering Games With Millions of Ray-Traced Lights by Chris Wyman and Elexey Panteleeve in NVIDA GTC 2020, we want to implement the Reservoir Spatio-Temporal Importance Resampling (ReSTIR) algorithm presented in the talk, with DirectX as our chosen API. We hope to showcase how this algorithm helps to speed up rendering with only few samples per pixel, and create much less noisy renders for scenes with many lights and reflections.

Milestones

Milestone 1: Basic DirectX works and understand ReSTIR
> By Milestone 1 we want to set up the DirectX raytracing base code and understand how to do basic operations such as creating different passes, setting up shaders and linking variables from CPU to GPU. We need to make sure this code will work on all of our devices and is compatible with the ReSTIR algorithm. In addition, we will spend time understanding the ReSTIR paper in depth enough to implement it.

Milestone 2: Implement the beginning ReSTIR
> By Milestone 2 we will have the beginning of the ReSTIR algorithm implemented. This involved understanding how to store, populate, and update the reservoirs. In addition, we will implement the visibility test for the reservoirs.

Milestone 3: Work on Spatial and Temporal Reuse
> By Milestone 3 we will implement Spatial reuse, which will require setting up multiple buffers in order to ping pong the data. In addition, we will implement temporal reuse for non-moving frames. We are also going to begin creating different scenes for our final renders.

Final Presentation: Moving Temporal Reuse, Final Renders, and Performance Analysis
> For the Final Presentation we will improve temporal analysis to work for scenes with moving frames. In addition, we will work to add more lights into our custom scenes and create final renders of them. Finally, we will also perform performance analysis with our algorithm and compare it to the base code and ground truth images.

APIs & Platforms

The project will be implemented in Visual Studio using the new DXR API.

Third party code

We will be using the below samples as reference to get started with ray tracing using DXR.

1. http://cwyman.org/code/dxrTutors/dxr_tutors.md.html

References

1. ReSTIR GTC talk and slides
2. Original ReSTIR paper and SIGGRAPH talk 2020