EE/CprE/SE 4920 SPRINT REPORT 5

3/28/25 - 4/11/25

Group number: 40

Project title: Hybrid Relightable 3D Gaussian Rendering

Client: Jackson Vanderheyden & Brian Xicon

Advisor: Simanta Mitra

Sprint Summary:

	Sprint Tasks	**Accomplished Tasks**	**Tasks for Next Sprint**
Ethan	-ML: Assist in and review the Gaussian optimizer as needed. -ML: Test and refine the PythonScriptRunner.cs script on remaining python files.	-ML: Assist in and review the Gaussian optimizer as needed. -ML: Tested and refined the PythonScriptRunner.cs script on remaining python files, and made them run sequentially	-ML: Fix bug of feature_matcher not processing all blocks. -ML: Assist in integrating the Gaussian optimizer code into unity with the other scripts. -Misc: Assist in Revising the Design document, Poster, website and Presentation
Kyle	-Put the pieces together . -Have the python runner running in Unity. -Have the optimizer running on in Unity. -Work or Read me	-Met with Brian and Ethan to assemble all the pieces of our project and put them together in Unity. -The AI section is almost completely integrated with Unity	-Work or Read me -Maybe start writing Test code

Jackson	-GP: Code review for Luke's BVH Merge Request -GP: multiple-intersection hybrid rendering -GP: polish up by completing lower priority tasks + regroup with ML to get an MVP working	-GP: Code review for Luke's BVH Merge Request -GP: multiple-intersection hybrid rendering	-GP: polish up by completing lower priority tasks + regroup with ML to get an MVP working
Luke	- GP: Implement BVH generation for Gaussians - GP: Change intersections to account for Gaussian BVHs - GP: Make code review changes and merge BVH - GP: Simplify Gaussian representation	- GP: Implement BVH generation for Gaussians - GP: Change intersections to account for Gaussian BVHs - GP: Make code review changes and merge BVH - GP: Simplify Gaussian representation	- GP: Refine and optimize Gaussian BVH intersections - GP: match Gaussian representation to ML output
Brian	-ML: Optimize camera angles for training ML models off our premade images. -ML: Create ML model and optimize it to work with different values of Gaussians like color, texture, etc.	-ML: Finished the retrieval and processing of our image data, images of point cloud are now optimized to match the truth images -ML: Create a working renderer to use for data processing.	-ML: Work on the first prototype of the Gaussian Point Optimizer model

<u>Ongoing Tasks:</u>

Graphics Programming (GP) Team:

- ☑ ~~Merge BVHs into the main branch **[High Priority]**~~
- ☑ ~~Write ray-gaussian intersection code **[High Priority]**~~
- ☑ ~~Gaussian BVH **[High Priority]**~~
- ☑ ~~Update necessary buffers on scene update **[Medium Priority]**~~
- ☑ ~~Remove bounce from Path struct and add pathBounce counter buffer **[Medium Priority]**~~
- ☐ Gaussian parser **[High Priority]**
- ☐ Gaussian spherical harmonics support **[High Priority] (due Apr 27)**
- ☑ ~~Handle multiple paths per pixel **[Low Priority] (due Apr 20)**~~
- ☑ ~~Anti-aliasing in primary path generation **[Low Priority] (due Apr 20)**~~
- ☐ PBR materials **[Low Priority] (due Apr 27)**

- [ ] Improve workgroup count **[Low Priority] (due Apr 27)**
- [ ] Support Unity lights **[Low Priority]**

Machine Learning (ML) Team:

- [x] ~~Prep point cloud data by removing noise and outliers **[Medium Priority]**~~
- [x] ~~Create a ML model to convert a point cloud into a Gaussian point cloud.**[High Priority]**~~
- [x] ~~Test accuracy of Gaussian point cloud generation **[Low Priority]**~~
- [x] ~~Modify SfM script to accept user selected paths **[Low Priority]**~~
- [ ] Fix bug within SfM script with user selected paths having format issues**[HIGH Priority]**
- [x] ~~Video to images support for preprocessing **[Low Priority]**~~
- [ ] Extract original lighting from models **[Low Priority]**
- [x] ~~Create .cs script to run python scripts within Unity scenes **[Medium Priority]**~~
- [ ] Test .cs script on all python scripts within Unity scenes **[Medium Priority]**
- [x] ~~Explore techniques on running python scripts within the unity environment**[Medium Priority]**~~

General Features:

- [ ] Have test code for all parts
- [ ] Have complete Read Me