Realtime Ray Tracing and Global Illumination

# Project Scope

This project will implement rendering techniques that can realistically simulate the lighting of a scene and its objects by computing and rendering physically accurate reflections, refractions, shadows, and indirect lighting (global illumination). The end product will be a framework which will allow developers to implement various algorithms with an easy-to-understand abstraction. This work will explore ray tracing in various domains including 2D images and movie renders, however the primary focus will be virtual 3D scenes. The tool will come with additional support of GPU acceleration to parallelize the calculations, which will provide faster results and will enable real-time interaction with the scene.

The project will explore various existing techniques with a potential of designing a new and more optimized version of existing algorithms that can result in better, faster and more photorealistic renders.

# Technologies

* C++, Premake
* CUDA
* Vulkan / DirectX

# Project Plan

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| **Functionality** | **Time Period** | **Signature** |
| Application framework | Week 1  (08-08-2023) |  |
| Ray tracing pipeline | Week 2  (15-08-2023) |  |
| Brute force approach | Week 3  (22-08-2023) |  |
| Bounding volume hierarchies | Week 4  (29-08-2023) |  |
| Polygons and textures | Week 5  (05-09-2023) |  |
| *Mid Semester Examination Week*  *(11-09-2023 to 15-09-2023)* | | |
| Monte Carlo rendering, bidirectional methods | Week 6  (26-09-2023) |  |
| Metropolis methods, photon mapping | Week 7  (03-10-2023) |  |
| GPU acceleration | Week 8  (10-10-2023) |  |
| GPU acceleration | Week 9  (24-10-2023) |  |
| Research for new algorithm | Week 10  (31-10-2023) |  |
| Research for new algorithm | Week 11  (07-11-2023) |  |
| Documentation | Week 12  (14-11-2023) |  |