DH2323 Project Specification

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1 Summary

I will implement the Metropolis Light Transport algorithm and use it to render a small scene, showcasing accurate rendering of some advanced lightning phenomena such as reflections and caustics.

I am aiming for grade A.

2 Background

Metropolis Light Transport (MLT) [1] is a Monte Carlo method for solving the light transport problem, relying on repeated random sampling of possible light paths. It is an unbiased path tracer which exploits knowledge of previously important light paths in order to converge on difficult scenes faster than naive path tracing. An "important light path" is simply a path which contributes more to the final image - for instance, paths which end up in a dark part of the scene will not contribute as much as ones which directly hit a light source and are thus wasteful.

3 Implementation

In order to be able to direct my focus entirely on the accurate implementation of MLT I choose to only support one hard-coded 3D-scene. A possible extension would be to allow loading of general scenes imported from 3D modelling software.

The finished program should:

- Display a simple 3D-scene, such as the Cornell box, with a mix of specular, transparent, and diffuse surfaces.

- Be interactive, with camera movement and visualised progress of the path tracing. When the camera moves or rotates, the canvas is cleared. In case MLT is too slow to be able position the camera interactively, I will add a feature of toggling wire-frame graphics.

The final functionality I am going for is something like this: `https://www.youtube.com/watch?v=70uNjjplYzA`

References

[1] Eric Veach and Leonidas J Guibas. "Metropolis light transport". In: *Proceedings of the 24th annual conference on Computer graphics and interactive techniques*. ACM Press/Addison-Wesley Publishing Co. 1997, pp. 65–76.