Project Title: **OpenGL-based real-time ray tracing**

Team - 18

Harshal

1. INTRODUCTION

In 3D computer graphics, ray tracing is a technique for modelling light transport for use in a wide variety of rendering algorithms for generating digital images. Ray tracing is capable of simulating a variety of optical effects such as reflection, refraction, soft shadows, scattering, depth of field, motion blur, caustics, ambient occlusion and dispersion phenomena.

On a spectrum of computational cost and visual fidelity, ray tracing-based rendering techniques are generally slower and have higher fidelity than scanline rendering methods.
Thus, ray tracing was first deployed in applications where taking a relatively long time to render could be tolerated, such as in still computer-generated images and film and television visual effects (VFX), but was less suited to real-time applications such as video games, where speed is critical in rendering each frame.
Since 2018, however, hardware acceleration for real-time ray tracing has become standard on new commercial graphics cards, and graphics APIs have followed suit, allowing developers to use hybrid ray tracing and rasterization-based rendering in games and other real-time applications with lesser hit-to-frame render times.

This project is focused on developing a real-time ray tracing program to get photo-realistic output like in real-time applications or games.

2. LITERATURE REVIEW

Ray Tracing is when a ray continues past its original point in a recursive manner. The word tends to be used to describe everything here, recursive ray casts, cook-style ray tracing, path tracing, etc.
This is useful for calculating information based on an object's neighbours, such as Reflections, Global Illumination or Ambient Occlusion.

The ray-tracing algorithm works by casting a ray from an imaginary eye, commonly called as a camera or a viewport, through each pixel in a virtual screen and calculating the colour and its intensity. When a ray intersects with an object, the material property of the object is identified and gives the final colour of the pixel. In the case of an opaque object, the object can only cast a

shadow ray. In the case of transparent and translucent objects, they can cast shadow ray, reflected ray and refracted ray.

The main advantage of ray-tracing render is that it can produce photorealistic images with a wide variety of optical effects that can be seen in real life. And in this project, we have to make a ray tracing program which can produce optical effects in real-time.

3. MILESTONES

S.No	Milestone	Member	Status
1	Setting up basic code files (skeletal code, classes, objects) for project	Harshal	DONE
2	Add different shapes/objects in the window and add different textures in them	Harshal	DONE
3	Make some objects movable	Harshal	DONE
4	Make shader files (vshader, fshader)	Harshal	DONE
5	Implementing lighting and shading	Harshal	DONE
6	Implement raytracing to simulate different optical effects and get a photo-realistic output in real-time	Harshal	DONE

REFERENCES

- Wikipedia, “Ray tracing (graphics)”.
- Alain Galvan, “Real Time Ray Tracing”, https://alain.xyz/blog/real-time-ray-tracing
- Benjamin Douglas J, “Analysis of Ray Tracing Methodology and Techniques and its Distinction from other Render Models”,

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