ITAI-1370
Spenser Van Horne & Richard Rodriguez Team: Automation Learners

Assignment 04: Ray Tracing: A Simple Guide

What is Ray Tracing?

Ray tracing is used in computer graphics to create realistic images by mimicking how light interacts with objects. It tracks the path of light as it moves through a scene, considering how it bounces off surfaces, passes through objects, and creates shadows. This helps make images look more natural and lifelike.

How Does Ray Tracing Work?

Ray tracing works by sending light rays from the camera into the scene. When a ray hits an object, the computer calculates how the light should behave whether it reflects like a mirror, bends through glass, or creates shadows. This process allows for realistic lighting, reflections, and shadows in an image.

Where is Ray Tracing Used?

Ray tracing is used in several areas to make visuals look better and more realistic:

1. **Video Games** – Many modern games use ray tracing to create more realistic lighting and reflections. Examples include *Cyberpunk 2077* and *Minecraft RTX*.
2. **Movies and Animation** – Filmmakers use ray tracing to create special effects and animated scenes. Studios like Pixar and Marvel use it in movies like *Toy Story* and *Avengers: Endgame*.
3. **Architecture** – Architects use ray tracing to make lifelike 3D models of buildings, helping clients see how their designs will look with real lighting.
4. **Medical Imaging** – In medical scans like CT scans, ray tracing helps create clear 3D images of the inside of the human body.

5. **Science and Engineering** – Scientists use ray tracing to study how light behaves in different materials and environments.

Examples of Ray Tracing in Action

- **NVIDIA RTX Graphics Cards** – Help bring real-time ray tracing to video games.
- **Unreal Engine & Unity** – Game engines that use ray tracing for better graphics.
- **Rendering Software like V-Ray & Arnold** – Used in movie production and architectural design.

Conclusion:

Ray tracing is an exciting technology that makes images and animations look more realistic. While it was once used only in high-end movie production, new advancements in hardware now allow real-time ray tracing in video games and other applications. As technology improves, we can expect even more lifelike graphics.

References:

1. https://en.wikipedia.org/wiki/Ray_tracing_%28graphics%29?form=MG0AV3\

2. https://historyofcomputers.eu/hardware/ray-tracing-through-the-ages-from-cgi-movies-to-real-time-gaming/?form=MG0AV3