



## Introduction

Many human-computer interaction techniques using input devices like keyboard and mouse have been developed and matured over time. For example, software tools use well-known methods for scrolling, zooming, panning, and selecting with a mouse in 2D environments in identical ways. In comparison, the input devices in Virtual Reality (VR) environments are new.



Figure 1: HTC Vive.



Figure 2: HTC Vive interaction.

Tracking the head and two hand-held controllers, each with six degrees of freedom provides a considerable input space. Creative interaction techniques should be devised, tested, and improved iteratively

to exploit the potential of the input devices in VR.

Real-time ray tracing rendering is becoming the standard for graphics today, so implementing a VR ray tracing-based renderer for 3D scenes is an opportunity to learn and program a path tracer algorithm while interacting with a VR device.

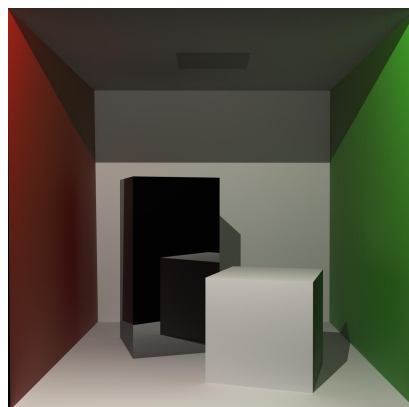


Figure 3: CornellBox path tracer.

## Assignment

Develop a VR path tracer viewer for 3D scenes and implement interactive walk-through navigation with VR input devices in this environment. This project will be running on HTC Vive and Nvidia RTX GPU. Some of the small tasks needed to complete this project include loading a scene into the viewer, implementing an OptiX-based path tracer, rendering to the VR device, and handling the interaction between the VR device and the scene.

## Requirements

Interest and willingness to learn about computer graphics and human-computer interaction. This project requires C++ programming experience, and prior knowledge of OpenGL is recommended.

## Work Load

- 30% Theory
- 50% Implementation
- 20% Test

## Project Type

This project can be defined for the requirements of a Bachelor's Thesis or Master's project. The goals and tasks will be adjusted accordingly.

## Supervision

- Prof. Dr. Renato Pajarola
- Luciano A. Romero Calla (assistant)

## Contact

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## References

- [1] Tomas Akenine-Möller, Eric Haines, and Naty Hoffman. *Real-Time Rendering, Fourth Edition*. A. K. Peters, Ltd., USA, 4th edition, 2018.
- [2] Adam Marrs, Peter Shirley, and Ingo Wald, editors. *Ray Tracing Gems II*. Apress, 2021.