Remote Rendering for XR

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Overview

Problem statement

XR platforms such as smartphones and Hololens lack the processing capability to render high poly meshes and effects. An external GPU is required for processing the frames and rendering them on the XR platform.

Solution

For this project, we will recreate the latest cloud service provided by Microsoft Azure (only for Hololens 2, as of now) to be available for other XR platforms such as VR headsets and smartphones. The project will also include real-time raytracing for the mentioned platforms.

This project will include a desktop app that will work as a control panel and an XR app that will be deployed on the target platforms.

Overview

Features

1. Remote rendering
    a.   Realtime raytracing
    b.   Mesh decimation
2. Render to video (Hybrid Rendering)
    a.   Rendered Scene
    b.   UI (As part of hybrid rendering)
    c.   Hand interaction + Collision detection
3. Late Stage Reprojection (Optional)
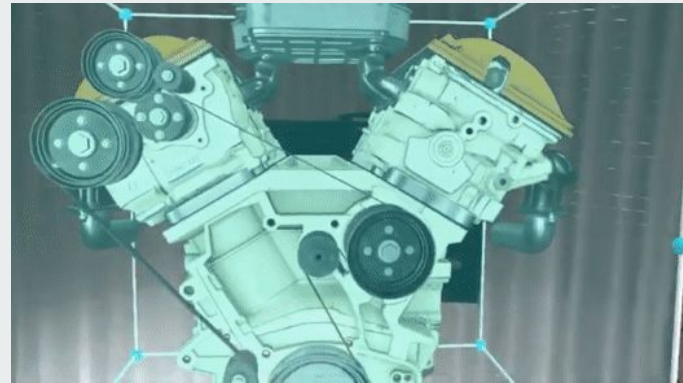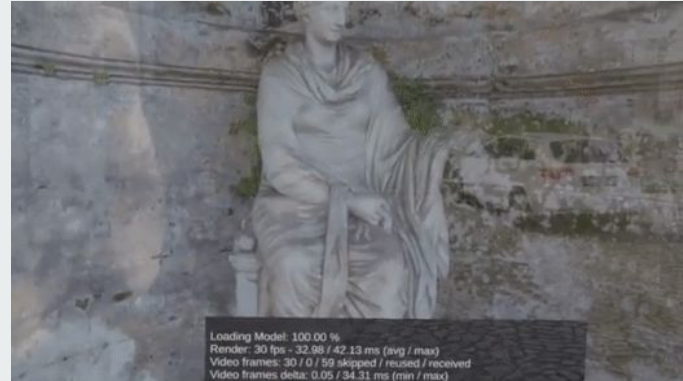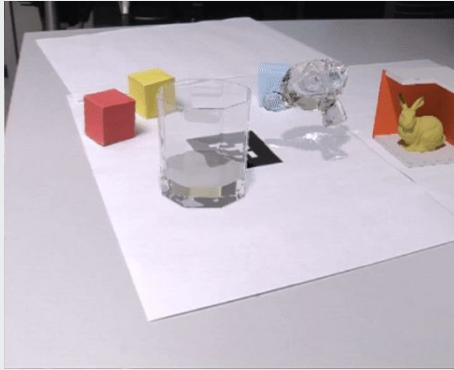
Schedule

Milestone 1 – Nov 18<u>th</u>:

- Basic Desktop app (Control Panel) + Hololens app

Milestone 2 – Nov 30<u>th</u>:

- Mesh decimation + Frame generation
- Hybrid Rendering
- Real time ray tracing with only virtual light

Milestone 3 – Dec 7<u>th</u>:

- Late Stage Reprojection for Hololens
- Global illumination in augmented reality

Final – Dec 13<u>th</u>:

- Bug fixings and optimizations
- Performance analysis

References

1. About Azure Remote Rendering
   https://docs.microsoft.com/en-us/azure/remote-rendering/overview/about

2. CPU-GPU Algorithms for Triangular Surface Mesh Simplification
   https://imr.sandia.gov/papers/imr21/Shontz.pdf

3. A Positional Timewarp Accelerator for Mobile Virtual Reality Devices
   https://escholarship.org/content/qt96r870gs/qt96r870gs_noSplash_4abbeba6bd4266514b1d56cbdd9dc5d7.pdf

4. Differential Irradiance Caching for Fast High-Quality Light Transport Between Virtual and Real Worlds
   https://publik.tuwien.ac.at/files/PubDat_220665.pdf