Preliminary Implementation Plan

Cloud VR. Secure, Fast and Distributed Virtual Reality Solutions.

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1 Introduction

Recent developments in the field of Virtual Reality (VR) offer all kinds of opportunities in the field of training and entertainment. For training purposes, the audiovisual entry into a virtual world is where the biggest value is. The capabilities of artificial environments allow users to manage scenarios and experiences that cannot be simulated in the real world. VR also allows users to access the virtual training at any time and less physical facilities are required for exercises. Examples VR experiences include training maintenance at high altitudes (such as windmills), working under heavy loads and weather conditions in construction (Strukton) or maintenance on naval ships (Thales). These companies (and more) form the Industrial Reality Hub, which is one of the stakeholders of this project.

2 Reason for Assignment

2.1 Graduation Assignment

The assignment for this graduation is to analyse the current state of cloud VR streaming. This includes existing commercial services, open source libraries/frameworks, relevant research papers and experimental technologies. The 4 research directions for this project are system architecture for a cloud VR system, Latency, Multi-User Experiences and GPU Scaling. This paper will focus on researching the system architecture and latency improvements. These findings will be presented in the form of a theoretical framework and a literature review.

Armed with the information from the initial part of the research, the student and the stakeholders will agree on a suitable research focus for the reminder of the project.

2.2 Client outline

The stakeholders in this project are the student (Leon Koster), Saxion's XR Lab (Matthijs van Veen, Yiwei Jiang) and the Industrial Reality Hub (Thales & more).

3 Objectives of the client

Together with the companies from the Industrial Reality Hub mentioned in the Client outline, Saxion wants to investigate how virtual reality can be rendered in the cloud in a safe and efficient manner. This involves looking at state-of-the art technology in the field of virtual reality, cloud computing, rendering and machine learning for one complete CloudVR pipeline.

In the bigger picture this project is a multi phase project, with this project being the initial phase. It aims to give an overview of the current situation

regarding cloud VR streaming and focus on system architecture and latency optimization. These informations will subsequently be utilized in the later stages of the over arching research project.

4   Preliminary Problem Statement

One of the essentials for a good Virtual Reality (VR) experience is a powerful computer system to render semi-realistic worlds. However, there are two problems here. First, this type of system is not available in every location. Certainly if realistic images have to be rendered in the simulation, it requires specialized and expensive machines that are difficult to move.

The second problem is that for rendering the VR training scenario, all kinds of data about the scenarios need to be available on the system. This can pose a problem when it concerns sensitive information, for example about all kinds of information defense systems or business sensitive information.

Focusing on these problems will lay the foundation for future research, to make CloudVR streaming a mature technology.

The aim of this project is to investigate the feasability of a streaming based VR approach with current cutting edge technology. Qualitative research methods will be used to gain in-depth insights about existing solutions and the current state of research into this topic. The data will be contextualized via a literature review of recent research papers and an analysis of the capabilites of existing solutions when applied to the research problem.

5   Time Planning

I was asked to give an overview of the time line for this project. These times are from the graduation manual, translated to the time frame of my graduation project.

Start of Project   The project started on the 4th May 2020.

Preliminary Implementation Plan   To be handed in at the end of week 2: 17th May 2020 23:59

Final Implementation Plan   To be handed in at the end of week 4: ~31st May 2020 23:59

Graduation Report Draft   To be handed in at the end of week 10: ~12th July 2020 23:59

Final Graduation Report   To be handed in at the end of week 16: ~23rd August 2020 23:59