BEST PRACTICE FOR ACHIEVING REAL-TIME VIRTUAL REALITY ARCHITECTURAL VISUALIZATION

Achieving Virtual Reality Presentation Performance Efficiency

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Abstract. Real-time rendering is the most fundamental aspect of the virtual reality technology, which is always, a balance between hardware advancement and efficient software algorithm upgrades on the one hand and the demands of the quality output on the other. As architects who utilize this technology, what we can do as users is to optimize the parameters we can control in the files we input to run the simulation. Thus the identification of the few variables we can control to prevent a lagging performance or ghosting which is no longer real-time. The frame rate above all is the measurement to determine whether a simulation is real-time or not. The research aim is to identify the biggest contributing factors among the few identified. The intention is to save time and effort by optimizing the selected factors in projects so that we do not have to optimize all of them. The workflow will also be a lot faster and projects can be done efficiently. The final part is to run satisfaction tests among users to evaluate those biggest contributing factors and the qualities acceptable by users. This is to eliminate the added processing power needed to run bigger files if they do not contribute much to improved quality.

1. Introduction

From literature reviews, it is very clear that 4 variables are used by computer graphic scientists to optimize the algorithms for real-time rendering software creation. These variables are:
-vertex count, triangle count, geometry count and texture count

From the virtual reality projects that we had created, I propose another few more which are crucial to be used in the simulation depending on the requirements of projects. They are light count (up to 8), texture resolution (up to 4096), advanced shader (Cg or HLSL or GLSL) and particle system.

2. The Problem and Methodology

The research looks into these variables and try to identify the biggest contributing factors in slowing down the frame rate (6 and below), especially in huge projects. Knowing the major contributing factors can avoid the time and effort wasted for repeated model editing to make real-time work. The elimination of trial and error as well as the blind method of optimizing everything which may not improve performance by much will help increase the speed of workflow. This will greatly contribute to an efficient virtual reality architectural visualization project construction.

The research also took into account the finding of the relationship of triangles count with real life project scale. This is because a guideline is expected at the end of the day to inform users of the amount of triangles will generally mean a project with a certain floor area. The samples I use for this research is from 3D models of past years' architecture student (year 2 to year 5 as well as from research projects). Since every year's design criteria is calculated by the amount of floor area designed, I can categorize the ranges later in the end.

Correlation and multiple regression statistical methods are used to find the biggest contributing factors among the variables. Design of experiment may be done as well to find optimization. The biggest factors will be selected to test satisfaction evaluation in users survey. The intention is to eliminate the use of elements that do not improve quality and are too resource intensive to render. For example if a texture resolution of 512 pixels is good enough, there is no need to use a 4096 pixels texture.

3. Expected Contributions and Current Status

In summary, the research aims to find the guidelines for architects who want to use virtual reality technology for architectural buildings and urban sites visualization. Later, it tries to find the factors that affect performance of achieving real-time. It also will determine the acceptable quality of the identified factors through users evaluation. This is in the hope to efficiently create a workflow effective for architects who wish to use virtual reality technology for presentation and visualization of spaces. The research progress to date is at the stage of collection of all the 3D models in preparation for experiment testing.

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