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Simulating the Human Iris Response to Amounts of Light

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INTRODUCTION

Lighting within games design is a key feature that helps make the games form into what they are. The current lighting design techniques within games, along with effects, are not being utilised to the maximum potential. Yet, the human eye is at the very centre of this gaming experience. The use of human visual perception plays a huge part in objects observed through its sensitivity to light.

The very purpose of this study is to investigate the gap within effect designs. And moreover, simulate life like responses to light (from the iris) inside a virtual reality scene.

AIMS & OBJECTIVES

Aims

- Simulate The Human Eye Adapting to Light/Dark Environments.

Objectives

- Gather Large Amounts of Qualitative Research on How Eye Adaptation Works.
- Develop A Realistic Visual Effect Capable of Simulation Human Eye Adaptation.

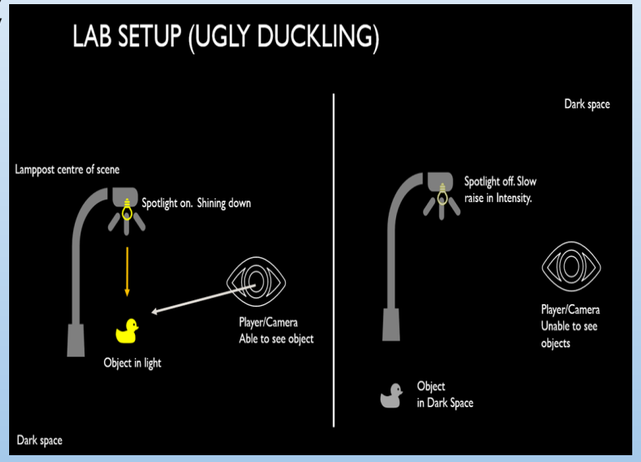
METHODS

A chosen means of gathering information is that via questionnaires and interviews. Both are effective and flexible ways to collect a variety of self entered data. As well as, from a diverse amount of subjects. This means of data collection is cheap and can get the information you require really quickly, due to how fast surveys take to complete. There are also free online platforms for surveys .

Another method is that of secondary sources. This is good as it's an often tried and tested method for tackling a problems.

LAB EXPERIMENT SETUP

Below shows the original set up of the lab scene, on with the left a spotlight is central to the scene and the duck is visible under its light source. After a short duration of five seconds the light goes off and the player is then situated within darkness. During this time the duck relocates position and the iris effect begins taking place. As time progresses the player/user should be able to locate the duck in the dark space as the eyes, or the camera within the experiment adapts to the new environment of light.



DESIGN & IMPLEMENTATION

The required software & hardware:

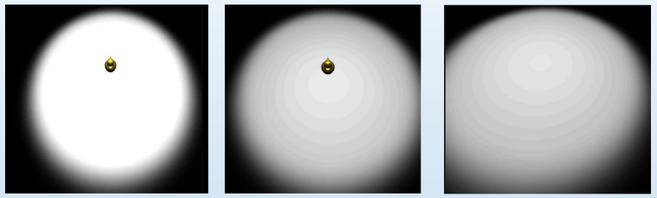
Unity3D, Oculus Integration, Visual Studio 2019, Oculus Rift VR headset and a GTX 1060 6GB GPU.

When conducting the lab experiment, three different methods were thought of to achieve the effect:

- Render Texture
- Ray Casting
- Tone Mapping

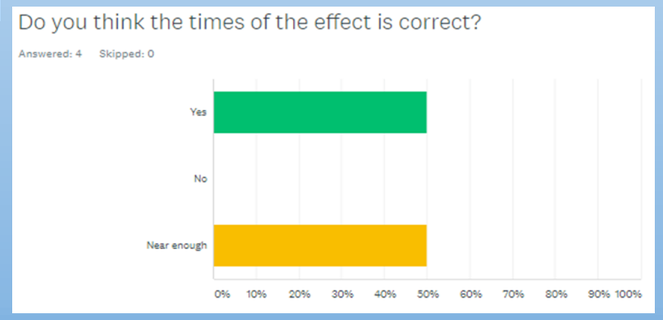
The best solution and the most known means for achieving a visual effect is Tone Mapping through the use of shaders.

These images show the Tone Mapping shader transition within five seconds of the spotlight adjusting from a high intensity to a more subtle pool of light. There are visible bands of light shown throughout the time frame. For testing purposes the ugly duck experiment was a simple scene to demonstrate both the pool of light and an object within it.



LAB RESULTS

The main topic for this study was; "Simulating the Human Iris Response to Amounts of Light". This was kept in mind when traversing over the data gathered from sources, surveys and input. With the respondents giving a plethora of good answers.
First question asked: "Did you Notice the Effect when first Entering the Scene?" All three said they had noticed the effect upon starting the experiment. This indicates that the effect is instantiated from the beginning of the test.



Question three "Do you Think the Times of the Effect is Correct? A 50/50 split between the players was discovered. Half of the respondents voted "Yes", and the other half voted "Near Enough".
From this, it's clear that the reduction of time carried from real life eye adaption had been effectively reduced. With 50% responding "Near Enough" it suggests that there is still room for improvement to gauge the perfect times.

Within Question five of the survey, it asks the player "How Realistic of an Effect Was it?" With a scale rating between 1-5.
One respondent rated the effect a three out of five. Which suggests the effect was average and realistic to an extent. Were as two participants voted it a four out of five meaning it was a "Cool, [and] It has correlation to eye adaptation." This indicated even though the effect is at the testing stage it's still an effective simulation.

CONCLUTION

Conclusions drawn from this data indicates that visual effects are a pleasing way to implement real life effects inside of a virtual world.
This data shows that although its an interesting visual effect the use of it is very limited to the situation or preference of the player and has to be used correctly.

Research from both surveys before and after the lab experiment goes to show that the question within the lit review here proven correct.

The pre-lab participants who said no to eye adaption learned quickly about what it meant along with the players who tested in the experiment got a good representation of how the human visual system works.

REFLECTION

Having had first-hand experience conducting a shader effect for the 3rd year of my degree. In this experience learned, the most significant aspect was the research and taking in of information. There was a lot of key information that previously, I thought was eye adaptation but it didn't hit all the desired requests. So learning different approaches was an important part of the process. For the most part of this study, the results would be egregious, after finding respondents enjoyed the idea of having such an effect in a game environment it encouraged me to bring great interest to the effect. It enabled personal goals to be achieved as well as potentially matachin a target audiences requests.