A5 Revised Project Proposal
Title: Shark Hunt - An OpenGL Interactive Experience
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Final Project:

Purpose :

To implement various graphics objectives that end up creating an OpenGL game that showcases my understanding and work in graphics this term.

Statement :

This project will be an OpenGL game. The main idea of the game is there will be a big body of water encompassed by a **Skybox**. Underneath the water will be a **Model of a Shark** which will be **Animated to be swimming around** trying to kill you. As the player, you have to shoot it down with enough exploding cannonballs to beat the game before you die.

In terms of how this project will map to my objectives, the shark approaching the player and the cannonball hit will be calculated by **3D Collision Detection**. The models (such as the cannonball) will have **Texture Mapping** to colour them more realistically. **Bump Mapping** will be used to create ripple effects whenever a cannonball misses and shoots into the water. To simulate the cannonball explosions upon colliding with the shark, a **Particle System** will be used. Finally, the water will be **reflective and refractive** to look closer to a real body of water. This should include reflection of the skybox as well as any projectiles flying over the water, and projectiles / the shark that are underwater.

I think this is interesting because it encompasses many of the concepts talked about this term and applying it to making an interactive game, which turns the theoretical knowledge accumulated through the course into something that's playable.

I think one of the most difficult things to do will be how light works with the large body of water where the game will take place. By not using ray tracing, a lot of the reflection and refraction literature I've read up on does not apply. Figuring out how to make the water look more realistic will be the hardest part to this, as well as doing it in an optimized way that doesn't slow down my game beyond playability.

Technical Outline :

I will be looking to research papers to learn how to implement many of these objectives, along with the course notes. Many of these are straight forward based on course learnings (like Texture and Bump mapping).

For 3D Collision, I will be using the axis-aligned bounding boxes concept and look for when the bounding boxes of two models intersect each other. Namely, this will be around the shark, the player and the weapons.

For water to look accurate, it must support reflection and refraction. One real property of how water interacts with light is that depending on the viewing angle, water will appear either more reflective or more refractive. To simulate this, I will use Fresnel equations. As extra objectives I will try to get the Fresnel effect working, as well as depth. In water, underwater light absorption creates the phenomena that scatters some light back out of the water, and absorbs the rest. This changes with the depth of water.

Bibliography :

Many details of extensions have been looked at in the course notes.

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Xu, X., & Zou, K. (2012). Simulation of Realistic Water on 3D Game Scene. *Procedia Engineering*, 29, 1819–1823. doi: 10.1016/j.proeng.2012.01.219

Objectives:

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___ 1: Implement a skybox that positions itself around the camera and moves with it.

___ 2: Create a model of a shark that will be used as the main enemy in the game.

___ 3: Texture Mapping

___ 4: Bump Mapping

___ 5: Particle System

___ 6: 3D Collision Detection

___ 7: Animate the shark swimming underneath water.

___ 8: Implement the reflection of light on top of the water.

___ 9: Implement refraction of light for underwater objects.

___ 10: Final Modelled Scene of the Game