COMP4900L - Project Proposal

S1. Group Members

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S2. Main Idea

The main goal of this project is to create a real-time simulation of a tsunami. We want to portray the wave crashing into a coastline and some building/terrain style geometry after traveling over the ocean.

This project also has a solid amount of room for improvement over the base version if the time permits, we could potentially add in destructible environments, particle effects to the water such as sea foam, and also potentially write a custom shader for the water surface.

This project will be a great showcase for water physics as it combines animation and rendering to create a dynamic visual scene.

S3. Graphic Focus

This idea will focus:

Animation: Based on calculating the water's movement using 2D height maps and cell's values to emulate gravity

Rendering: Using 2D height map we'll use the ofMesh library from openframeworks to render in a 3D version of the tsunami

S4. Resource And Precedent

- Article about fluid simulation
  - Neural Implicit Reduced Fluid Simulation | SIGGRAPH Asia 2024 Conference Papers
- Video Demo of fluid particles
  - Coding Adventure: Rendering Fluids

- Openframeworks documentation on 2D fluids
    - https://vimeo.com/92334462
- Example projects of openframeworks
    - https://ofxaddons.com/categories/3-physics
- ofMesh
    - https://openframeworks.cc/documentation/3d/ofMesh/
- Fast water simulation
    - https://media.gdcvault.com/gdc08/slides/S6509i1.pdf
- Shallow Water Equations
    - https://en.wikipedia.org/wiki/Shallow_water_equations

S5. Breakdown of Objectives

Main Objectives:

- Initially start by making basic logic and data structures for a 2D heightmap grid.
- Add simple CPU based wave simulation and water physics.
- Use ofMesh to convert the 2D heightmap array to render it as a 3D surface.
- Polish wave simulation logic.
- Add coastline, buildings, terrain.
- Add a UI to add manual control of wave variables.

S6. Midterm Goals

By the middle of the term we should have implemented the following:

- The functional 2D based water simulator.
- The wave logic.
- Rendering the wave in 3D.

S7. Tools and Software

- For the framework we will be using openFramworks with C++.
- For the IDE we will be using Visual Studio 22.

S8. Stretch Goals

If Time permits, we will try to add the following features to our project:

- Real time destruction of geometry.
- Proper shaders for the water body.
- Sea foam and other particle effects.