

Design Document – Real Time Rendering

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1 SCENE

The camera follows a small ship around a harbor scene in the evening/night. It will eventually set sail into the sea and leave the harbor.

1.1 Elements

Ship — sailing along a harbor. The camera will follow it for the beginning.

Water — base for the scene.

Harbor — static scene element. Will consist of wooden docks and piers mainly.

Rain — to showcase the particles.

Floating Light — to showcase point light shadows.

Skybox — to set the scene.

2 EFFECTS

2.1 Complex Effects

- (1) **GPU particle system** — to simulate rain.
- (2) **Omnidirectional Shadow Mapping** — to create nice effects with the light source.
- (3) **Normal Mapping with manually computed normals** — to create a dynamic water texture. Will be based on a combination of sine waves and computed in the shader.

2.2 Low Complexity

- (1) **Static Environment Mapping** — utilized for the water in combination with the skybox. This mainly aids the dynamically computed normals.
- (2) **Bloom effect** — already in the framework, reused for the point light source as well as the rain.

2.3 Framework

The framework already contained an implementation of the Bloom effect, as well as Vertex Skinning (not utilized in this version). Additionally, Shadow-Mapping with PCF for directional light was in there, but has been replaced by the omnidirectional Shadow-Map.

3 IMPLEMENTATION

The demo was implemented using C++ and OpenGL.

3.1 Framework

As framework, the SS22 Computergraphics UE project *Morgan Maze* was utilized. This framework was programmed by me and my colleague Christina Tüchler.

3.2 Libraries

The libraries already in the framework will be partly utilized again. Those being: glm, GLFW, GLAD and AssImp.

3.3 Sources

The omnidirectional Shadow Map followed tutorials on learnopengl.com and ogldev.org.

The GPU particle system followed the tutorial on learnopengl.com.

The manually computed normals are based off the tutorial on jayconrod.com/posts/34/water-simulation-in-glsl.

The models are from turbosquid.com (Harbor) and cgtrader.com (Boat).

The skybox is from cleanpng.com.