Two thousand and twenty leagues under the sea

Graphical Processing Systems

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Contents

1. Subject Specification

The purpose of this project was to create a photorealistic scene with 3D objects using the OpenGL library.

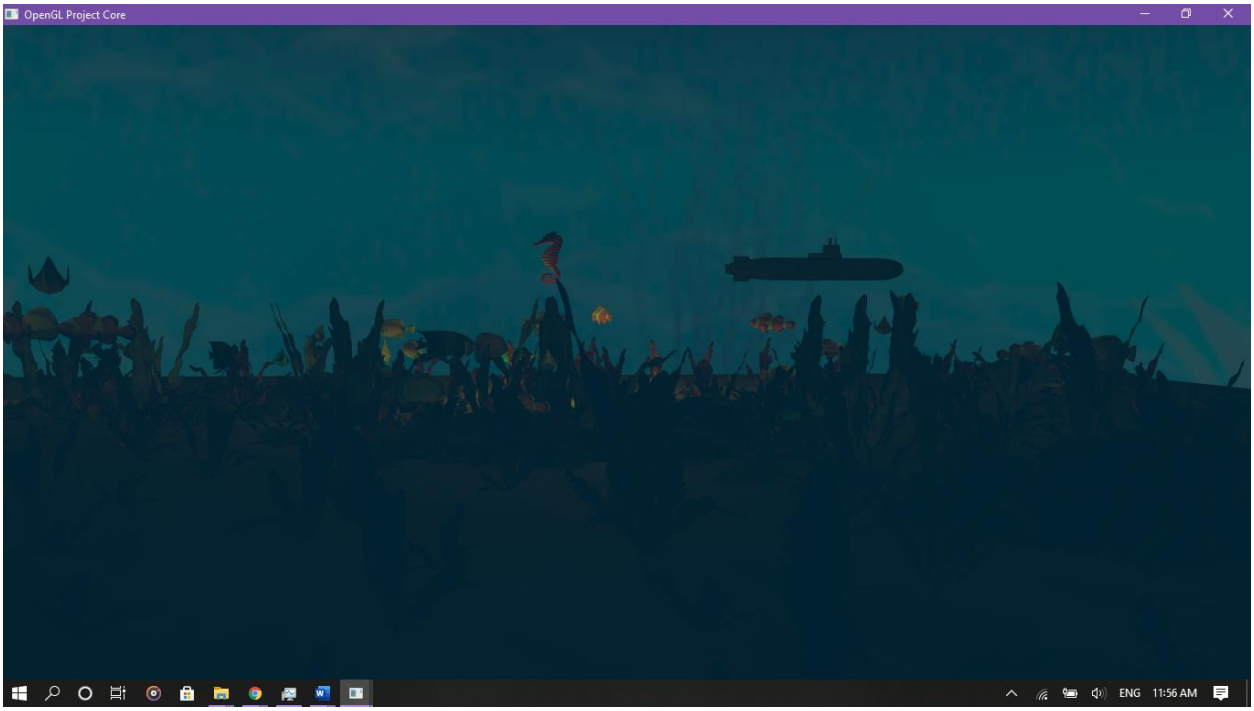
The user can navigate through the scene by using the keyboard and the mouse. By using the keyboard the user can also change the aspect of the scene, like rotating the light source, viewing the objects in wireframe mode etc. The project includes multiple light sources as well as shadows for one of them, implemented with Shadow Mapping technique. Scaling, translation and rotation were performed on the objects as well animations on some of them.

2. Scenario

The project consists of an underwater scene, named “Two thousand and twenty leagues under the sea”, with which the user can interact by using the keyboard and the mouse.

2.1 Scene and objects description

The scene consists of multiple objects and a skybox that can be better visualized if we move the camera around the scene. I named the scene like this because of clown fish, that most of us know as Nemo, and the moving submarine which reminded me of Jules Verne’s novel “Twenty Thousand Leagues Under the Sea” where the captain of the submarine Nautilus is named Nemo. I tried to make the scene as realistic as possible so I used different types of fish, 6 to be more exact,as well as other sea-life creatures such as turtle and seahorse. For the flora part of the project unfortunately I found only one object, a type of seaweed, which in order make the scene more realistic I’ve duplicated it and mapped another texture. The scene also has some rocks and for the ground I used the one from laboratories on which I mapped a sand texture that matches the skybox. For the skybox I used the same one twice as in, for the night part of the scene I’ve decreased the luminosity of the pictures manually and mapped those.



2.2 Functionalities

- Control the camera with the mouse.
- Control the camera with the keyboard by moving forward (W), backward (S), right (D) and left (A).
- Rotate the light source by pressing L and J.
- Change from day to night and back with N
- View the scene in:
    - Object mode by pressing O
    - Wireframe mode by pressing P
    - Point frame mode by pressing I

3. Implementation details

3.1 Animation of the objects

All animated objects have a linear movement, some are animated regardless whether is “day” or “night” in the scene, the turtle and the submarine, while the seahorse is animated only during the night time. For the animation I used two functions that either increase or decrease a distance based on the elapsed time from one rendering of the scene to another.

3.2 Day versus Night

For the day part of the scene I changed the directional light, the one provided in the template, to a point one in order to give more depth to the scene, and used another one at its center of different colour to increase the realism. For the underwater feeling I used two types of fogs of different colours.

For the night part I used a very, very dark shade of blue and a yellow point light where the diving helmet is placed in order to give a spooky vibe to the scene. When the night scene is rendered the skybox also changes to a darker version of the original one.

4. Conclusion and further development

The scene is still a basic one so it can be developed in many ways, from the way the objects are placed to more complex animations and different ways through which the user can interact with it.
To sum it up, working on this project was actually quite fun as I got to experiment with different topics presented during the laboratories and I wish I had more time in order to create more complex animations and make the scene more interactive. Overall through this project I was able further understand the information presented at the laboratories.

5. Bibliography

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