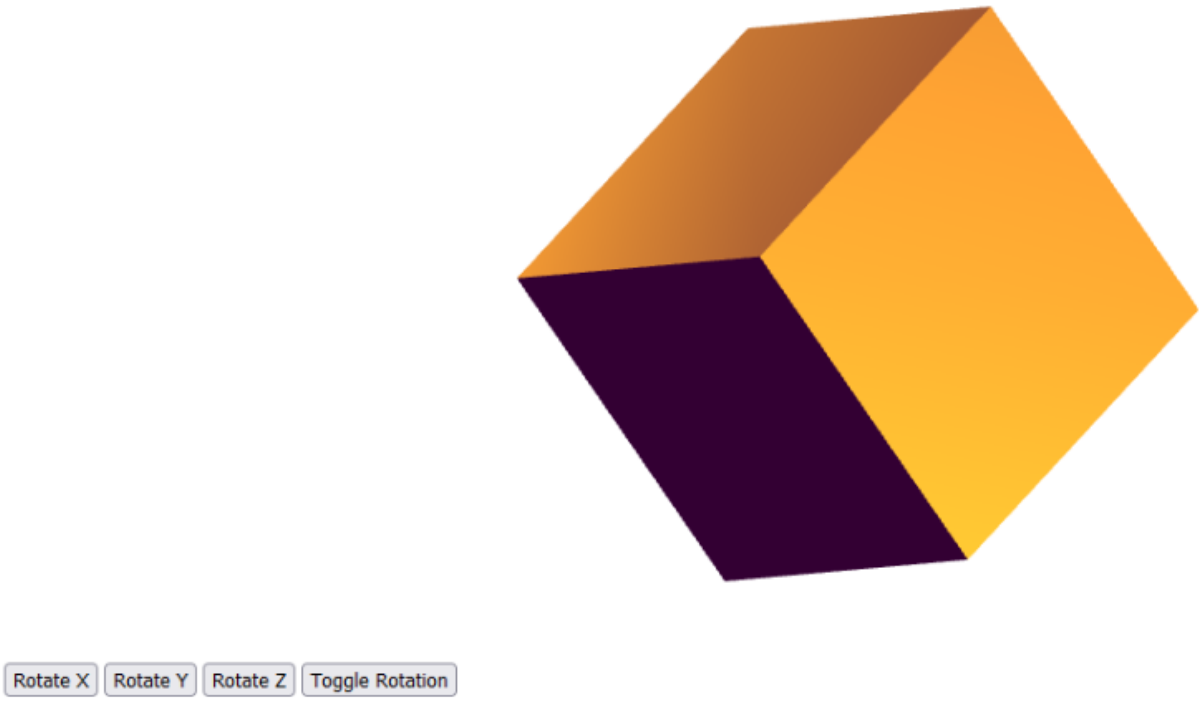

Figure 1: Base project

BBM 414 - Computer Graphics Laboratory

HACETTEPE UNIVERSITY
Department of Computer Engineering

Programming Assignment 5
Fall 2023-2024
Assoc. Prof. Dr. Ufuk Çelikcan

Due Date: 23:59 pm on Friday, January 5th, 2024

WebGL2 Texture and Lighting

In this experiment, you are expected to learn creating textured objects and use per-shader based lighting. Also, you are expected to create controllable camera from the previous experiment.

Part 1

In this part, you are expected to download the Experiment5_Part1_base.zip (see Figure 1) and snowflake.png from the resources in Piazza. Then, you will cover the cube with texture. You will use buttons to change light's position as in Figure 2.

Part 2

In this part, you are expected to create 625 cubes on a square plane. After that, you will cover texture sky using skybox images, and cover the plane with sea image, and cover the cubes with seagull images from Piazza resources.

1. Create a scene composed of textured cubes as shown in Figure 3.
   (a) You should create 625 cubes placed as 25 by 25 grid on a square ground plane.
      i. Make sure that your cubes do not touch each other.
   (b) You should use two separate textures; one for the cubes and one for the ground.
   (c) You can use image files of these textures that can be downloaded from Resources section of BBM 414's Piazza site.

Figure 2: Textured and lightened

(d) Place your camera in the scene so that it sees the scene with a similar angle and distance as depicted in the Figure 3.

2. Your scene should also include the controllable camera similar to Part 2 of Experiment 4.

   (a) You will use mouse movements like first person shooter concept.

3. Implement lighting to illuminate your scene.

   (a) Attach a head light to the camera in your scene.

      i. The head light must be implemented as a spot light.

      ii. The head light must be located at the same position with the camera.

      iii. The head light must be directed to the same direction with the look direction of the camera.

      iv. Make sure that position and direction of the head light changes accordingly as the camera moves or rotates.

   (b) Pressing 'O' (not zero) button on keyboard should switch on/off the head light.

   (c) Pressing 'P' button on keyboard should switch between per-vertex and per-pixel shading.

The Implementation Details

1. Implement your homework using **WebGL2**. All programming assignments must use the shader-based functionality of **WebGL2**: at least one vertex shader and one fragment shader.

2. The assignment must be original work. Turning in someone else's work, in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else. **Detection of such plagiarism in a submission will automatically void the submission and establish grounds to trigger an official disciplinary investigation.** General discussion of the assignment among peers is allowed, but do not share answers, algorithms or source codes. **Also using other resources (example source code, book, webpage etc.) as a code and javascript libraries (except jquery, Angel's book) are not allowed.**

3. Do not write the scripts into the html file. Reference your scripts in html.

4. You should use Netbeans or Webstorm as IDE for your projects.

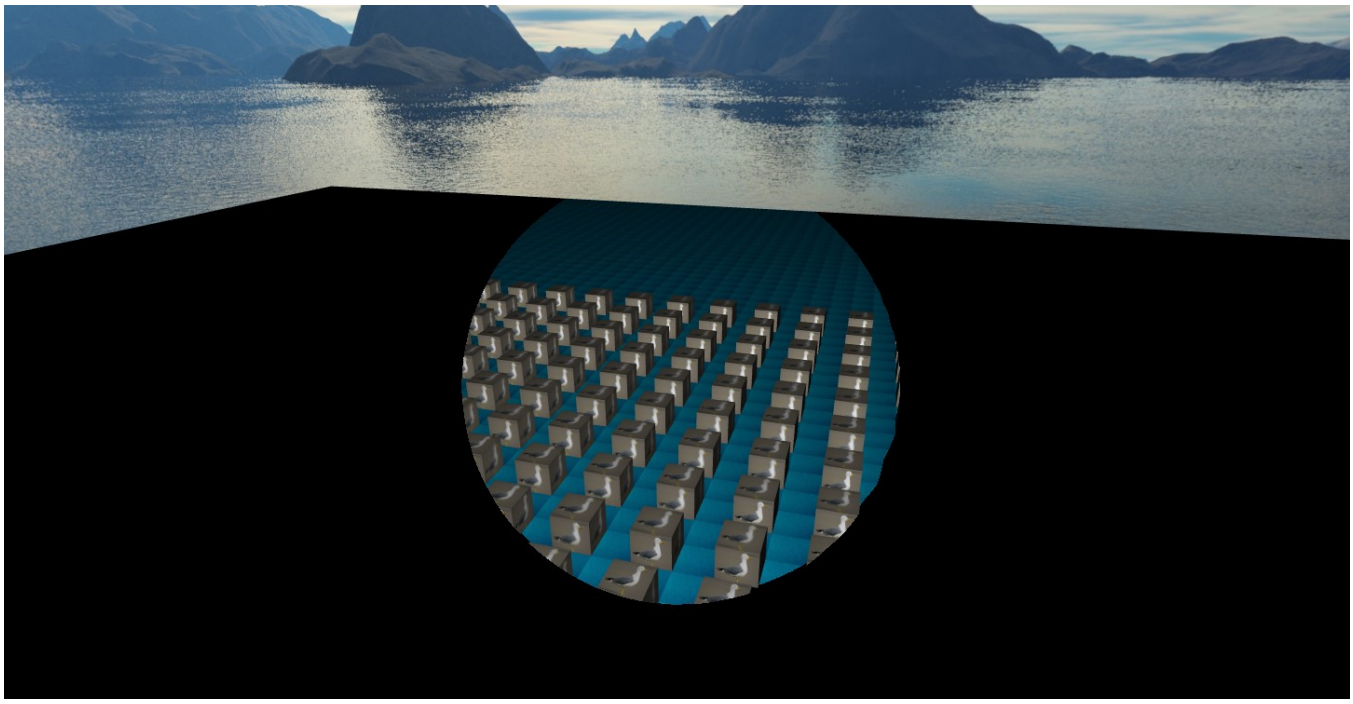

Figure 3: Scene image

The Report

You will write a report on latex for this assignment. You will explain the code parts and algorithm for part 1 and part 2.

What to Hand In

You should submit entire Netbeans or Webstorm project directory including javascript files and html file in a zip file extracted from IDE. Submission file structure is as given in below:

- b<studentNumber>.zip

  |–Experiment3_2023
  |——Part 1**(The whole Netbeans or Webstorm project)**
  |——Part 2**(The whole Netbeans or Webstorm project)**
  |–report.pdf

Archieve this folder as **b<studentNumber>.zip** and send via Piazza Private Post.

Grading

The assignment will be graded out of 100:

- PART 1 - CODE:0 (no implementation)
  20 (correct solution).
- PART 2 - CODE: 0 (no implementation)
  15 (skybox)
  15 (cubes and plane)
  15 (lighting)
  15 (camera)
- REPORT: 20

Academic Integrity

All work on assignments must be done individually unless stated otherwise. You are encouraged to discuss with your classmates about the given assignments, but these discussions should be carried out in an abstract way. That

is, discussions related to a particular solution to a specific problem (either in actual code or in the pseudocode) will not be tolerated. In short, turning in someone else's work, in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else.

References

[1]