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3D Project Part 1 Report

Introduction

A simple 3D application that showcases several features of 3D Graphics with OpenGL has been developed. There are 6 scenes in total. For the first four scene, four same meshes are rendered. The first shape on the top left is a sphere with 16 vertical segment and 16 rotational segments. The second shape is a torus which is located at the right top of the scene. It has the same number of vertical and rotational segments. The third shape which is on bottom left is an interesting shape that looks like a flower. I am inspired by the shape which is created by our TA Berk and I have changed some of the features of the shape to create a smoother flower looking shape. 128 vertical and 128 rotational segments are used for flower shape. The fourth shape which is on the left bottom is different kind of a sphere which looks like it is created by adding different size of disks. The formula used to render that shape is cos(t) - sin(a*t) / a, sin(t) + cos(a*t) / a) / 1.2 when an equal to 18. That parametric shape is rotated along the y axis to create a 3D object.

Part 1

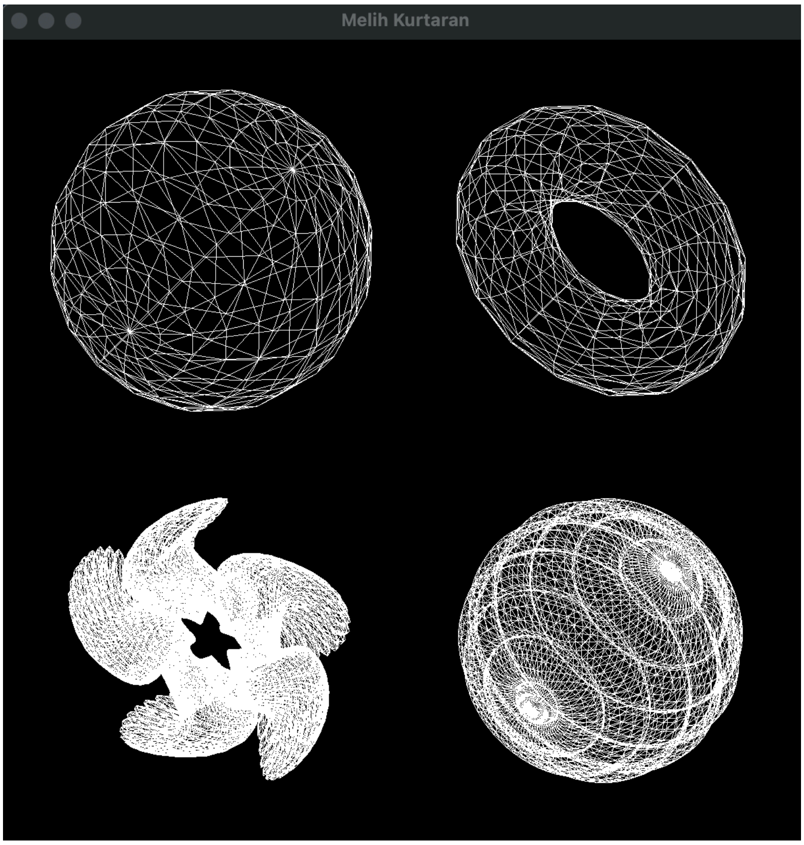


Figure I: Scene 1

The screenshot of the first scene is given in figure I. The below function is used to create the lines.

glPolygonMode(GL_FRONT_AND_BACK, GL_LINE);

All shapes also rotate along to (1,1,0) vector. To see the scene, the letter Q needs to be pressed. Also, all the shapes scaled down to 0.4 to fit into the screen.

Part 2

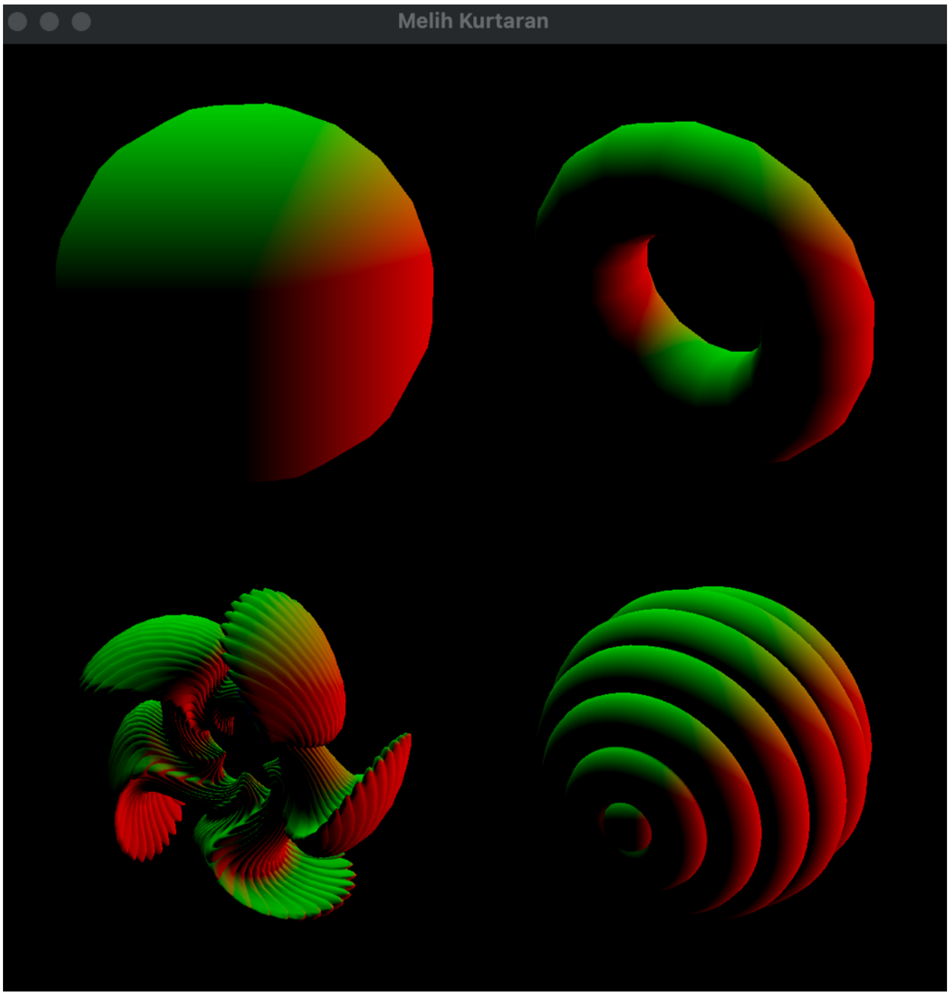


Figure II: Scene 2

The screenshot of the second scene is given in figure II. The shaders are created and colored according to the normal vector of the surfaces. The normal vectors are calculated by using the epsilon value that equals to 1 over number of vertical segments and 1 over number of rotational segments. Also, all the shapes are rotating along (1,1,0) vector. The letter "W" is needed to be pressed to open the scene 2.

Part 3

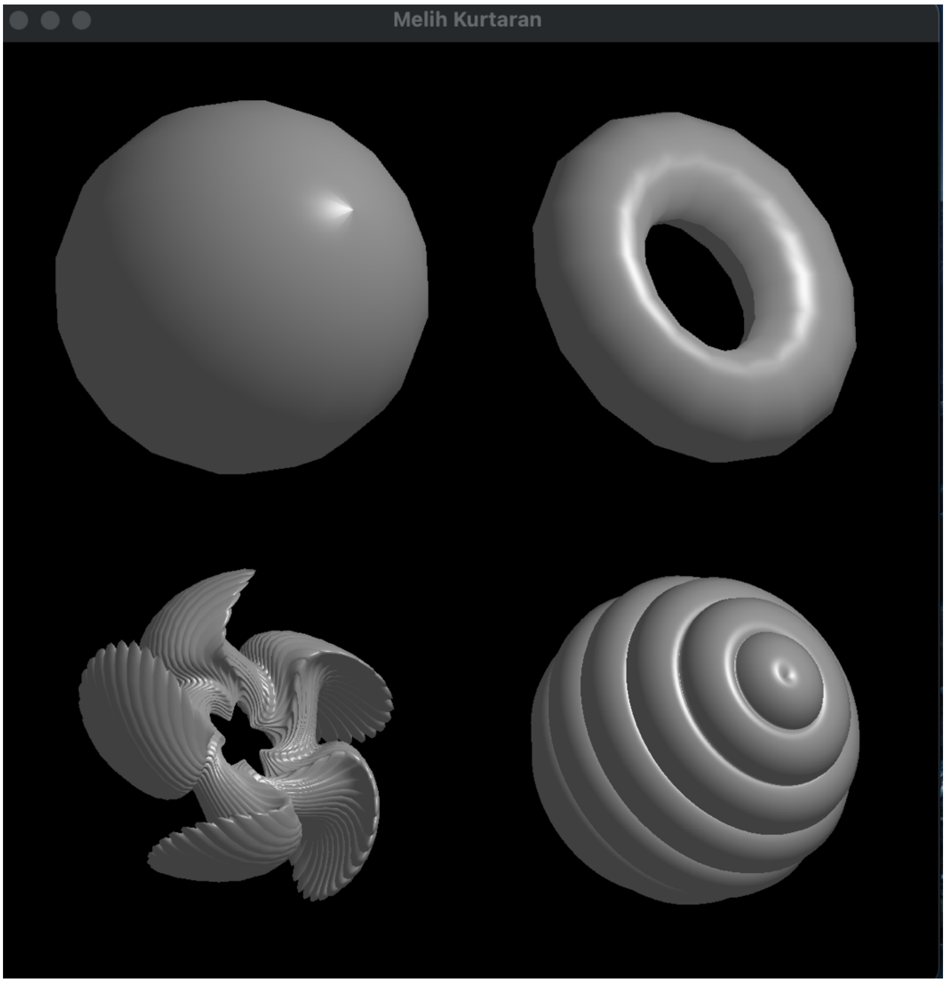


Figure III: Scene 3

Blinn-Phong reflection is used to shade the meshes for the scene 3. The screenshot of the scene is given in figure III. All meshes have a gray surface color with a shininess value of 64. There is one single light source and its direction is (-1,-1,1), and its color is (0.4, 0.4, 0.4). There is also an ambient light with the color (0.5, 0.5, 0.5). The letter “E” needed to be pressed to see the scene.

Part 4

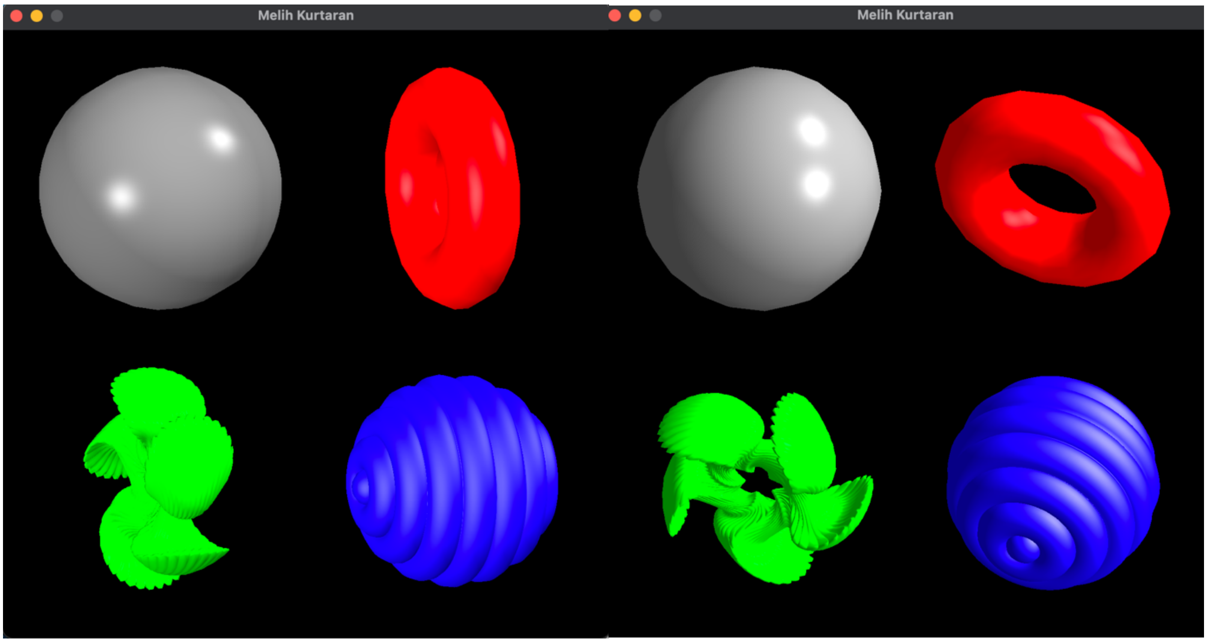
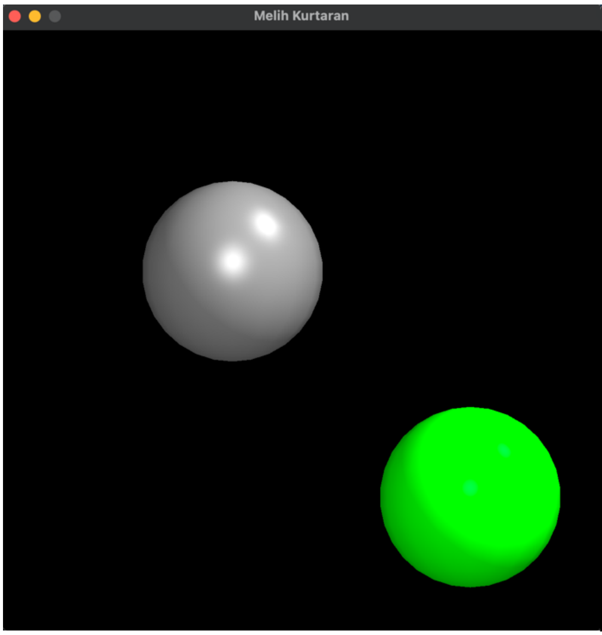


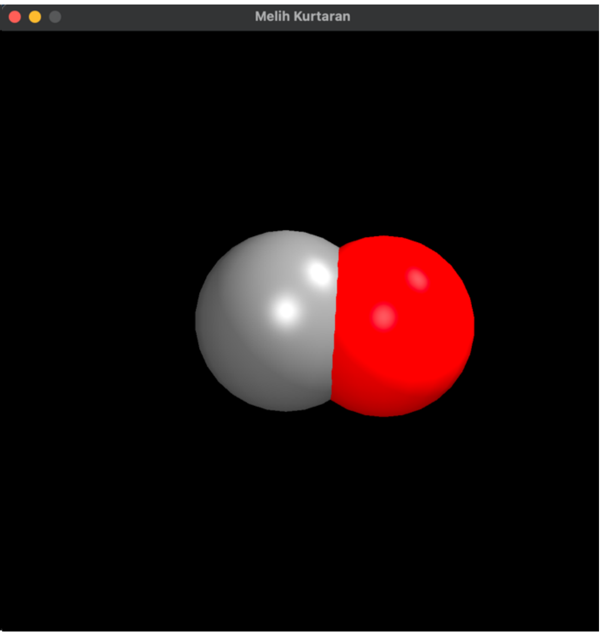
Figure IV: Scene 4

Two screenshots of the scene 4 are given in figure IV. This time all four meshes have different surface colors. The first shape has gray color (0.5, 0.5, 0.5), the second one has red color (1, 0, 0), the third shape has green color (0, 1, 0) and the last shape has blue color (0,0,1). Again Blinn-Phong reflection is used but now with two light sources, one of them is the same with the scene 3. The other light source is mouse controlled, the position of the light changes real time with the mouse movements. Moreover, different shininess values are used for different meshes. Their shininess values are 128, 32, 256 and 8 respectively. To see this screen, the letter “R” should be pressed. Two uniform values are used to determine the individual color and shininess values.

Part 5

A mini game is created for the scene 5. There are two spheres in the scene. One sphere is controlled by a mouse and the other one is chasing it. Blinn-Phong reflection is used while rendering the scene and the same light sources are used with the previous scene. Both spheres are scaled by 0.3. The chasing position is calculated by glm::mix(mouse_pos, chasing_pos, 0.99) function. The chasing sphere has gray color (0.5,0.5,0.5) and the other sphere has green color (0,1,0). If their distance between origins get smaller or equal to 0.6 then the color of the sphere changes to red (1,0,0).





Part 6

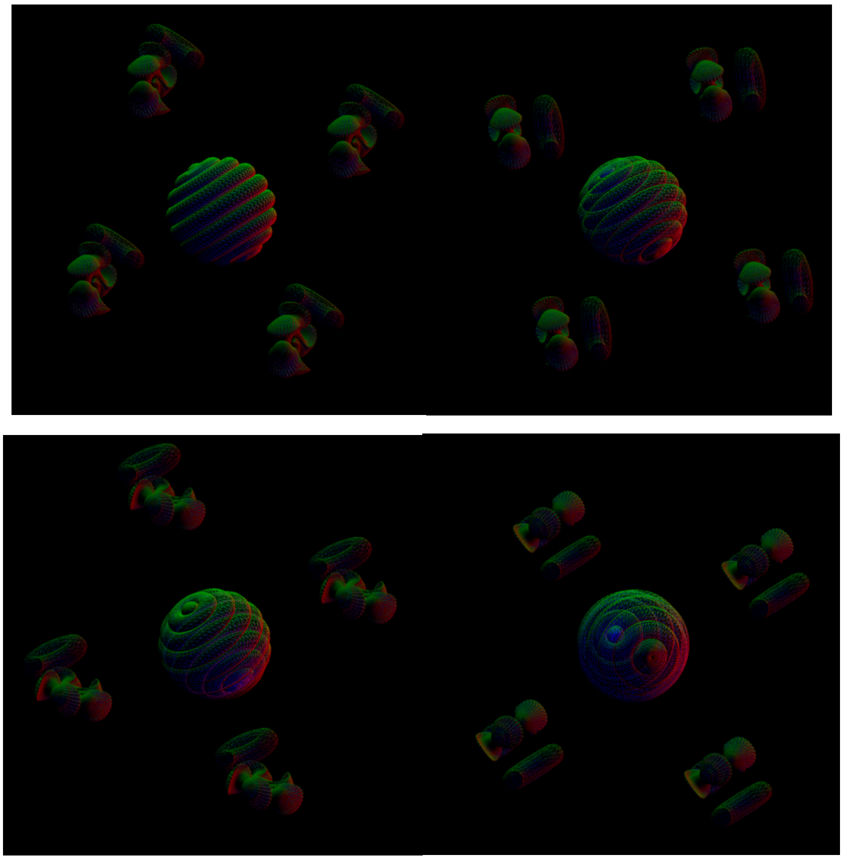


Figure VI: Scene 6

Clicking “Y” or any other key rather than “Q,W,E,R,T” shows this scene. The four screenshots of the scene are given in Figure VI. Three types of meshes are used in the scene the sphrere looking shape is at the center and rotates along the (0.7,0.2,0) vector. There are four flower shape at exactly four side of the sphere. The flower looking shapes rotates around (0.4,1,0) vector and they have their torus shape satellites which rotates around the flower shape which looks like a moon of a planet. For glPolygonMode, GL_LINE is used like in scene 1 to draw the lines only. On the other hand, The shapes are colored according to their normal vectors like in the case in scene 2. They rotate faster than the other scenes to see their movements easily.