

CITS 3003 – Graphics and Animation

Part A – Camera Rotation

This task has been successfully completed. The display function was modified to allow the camera to rotate around the centre point. The camera rotates around sideways first, then it rotates up and over and finally translates away from the centre point.

Part B – Object Rotation

This task has been successfully completed. The drawMesh function was modified to allow the object to rotate using its angles. The object rotates around the X-axis, then the Y-axis, and finally the Z-axis. The fragment shader was also modified to allow texture scaling using the middle mouse button by multiplying the texture coordinates by the texture scale.

Part C - Materials

This task has been successfully completed. Two functions were created to adjust the ambient, diffuse, specular and shine. The materialMenu and makeMenu were modified to allow adjustments.

Part D - Closeup

This task has been successfully completed. The nearDist variable was scaled down from 0.2 to 0.002 to prevent clipping when performing a closeup view of an object.

Part E - Reshape

This task has been successfully completed. The reshape function was modified to scale the viewport horizontally or vertically when reshaping the window. The top and bottom were multiplied by the height/width ratio if the width is shorter than the height. If the width is longer than the height, then the left and right were multiplied by the width/height ratio.

Part F – Light Reduction

This task has been successfully completed. The vertex shader was modified so that the object would get darker as the distance between the object and the light source increased. The light attenuation formula was used to calculate the light reduction. The distance of light coverage is 20 so the constant is 1.0, linear is 0.22 and quadratic is 0.20.

Part G – Light per Fragment

This task has been successfully completed. Most of the code in the vertex shader was transferred to the fragment shader. The light that was cast onto the plane using the fragment shader had a circular shape compared to the vertex shader one which had a hexagonal shape.

Part H - Shine

This task has been successfully completed. The fragment shader was modified by moving the specular variable from color.rgb to gl_FragColor.

Part I – Light 2

This task has been successfully completed. The second light object was added in the init function, its attributes were passed to the fragment shaders in the display function and new menus were created for it in the lightMenu function. The fragment shader was modified to include the light 2 attributes into the fragment calculation.

Part J – Object deletion/duplication

This task has been successfully completed. Two functions were created to delete or duplicate the most recent object by manipulating the sceneObjs array. After the object is deleted, the second recent object will be selected and if there are none then the camera will be selected. After the object is duplicated, the newly added object will be selected. The plane and the 3 lights are protected against deletion and duplication. New menus were created for deletion and duplication.

Part J – Spotlight

This task has been successfully completed. The third light object was added in the init function, and its attributes and the light cut off angle were passed to the fragment shaders in the display function. Two functions were created to adjust the position and rotation of the spotlight and new menus were created for it in the spotlightMenu function. The fragment shader was modified to include the spotlight attributes into the fragment calculation. The theta which is the dot product of the light direction vector and the spotlight direction vector was used to make the spotlight and the value is a cosine value and not an angle so the cut off angle is converted to a cosine value to avoid expensive operation like inversing the cosine value. If the theta is larger than the light cut off cosine value then do normal light calculation else set the ambient, diffuse, and specular vectors to zero. The values comparison is reversed as we are not comparing angles but cosine values. $\cos(60)$ is bigger than $\cos(90)$.

