MANUAL TECNICO

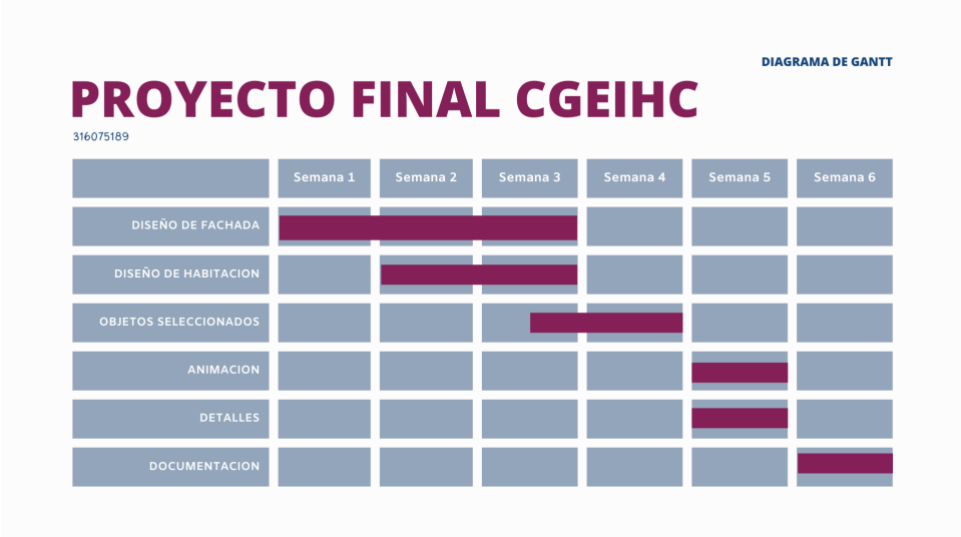
INTRODUCCION

Este manual técnico está diseñado con el propósito de guiar al usuario para visualizar este proyecto de acuerdo con las condiciones iniciales. Este proyecto fue construido de tal manera que visualmente puede ser un juego en juegos 3D. Con su diseño modular, muchos de sus componentes también se pueden usar en otras facetas de su proceso de diseño de juegos. El objetivo de este documento es ayudarlo a usar esta plantilla al máximo al brindarle información sobre cómo funciona el proyecto y cómo puede modificarse y ajustarse a su gusto.

OBJETIVO

El alumno deberá aplicar y demostrar los conocimientos adquiridos durante todo el curso.

Diagrama de Gantt



Alcance del proyecto

Alcance del proyecto de este proyecto implica determinar y documentar una lista de objetivos, entregables, tareas, costos y cronogramas específicos del proyecto.

Consideramos que el proyecto debera complir con los siguientes puntos:

- cámara sintética
- 4 animaciones.
- Documentación del proyecto
- Analisis de costos del proyecto

Limitantes

Las herramientas proporcionadas en curso nos permiten hacer varios tipos de animaciones, sin embargo, estas son demasiado basica por lo que con respecto a

eso, es un desarrollo limitado. Por otro lado en temas de textura y modelado podemos tener excelentes resultados.

Documentación del código

```
#include <iostream>
#include <cmath>

// GLEW
#include <GL/glew.h>

// GLFW
#include <GLFW/glfw3.h>

// Other Libs
#include "stb_image.h"

// GLM Mathematics
#include <glm/glm.hpp>
#include <glm/gtc/matrix_transform.hpp>
#include <glm/gtc/type_ptr.hpp>

//Load Models
#include "SOIL2/SOIL2.h"


// Other includes
#include "Shader.h"
#include "Camera.h"
#include "Model.h"

// Function prototypes
void KeyCallback(GLFWwindow* window, int key, int scancode, int action, int
 mode);
void MouseCallback(GLFWwindow* window, double xPos, double yPos);
void DoMovement();

// Window dimensions
const GLuint WIDTH = 800, HEIGHT = 600;
int SCREEN_WIDTH, SCREEN_HEIGHT;

// Camera
Camera  camera(glm::vec3(0.0f, 5.0f, 20.0f));
GLfloat lastX = WIDTH / 2.0;
GLfloat lastY = HEIGHT / 2.0;
bool keys[1024];
bool firstMouse = true;
// Light attributes

float rot = 90.0f;
float rot2 = 0.0f;
bool mov1 = false;
bool mov2 = false;
glm::vec3 lightPos(0.0f, 0.0f, 0.0f);
bool active;
float tiempo;
```

```
glm::vec3 PosIni(-95.0f, 0.0f, -45.0f);

float posX;     //Variable para PosicionX
float posY;     //Variable para PosicionY
float posZ;     //Variable para PosicionZ
//AnimaciÛn del coche
float movKitX = 0.0;
float movKitZ = 0.0;
float rotKit = 0.0;

bool circuito = false;
bool recorrido1 = true;
bool recorrido2 = false;
bool recorrido3 = false;
bool recorrido4 = false;
bool recorrido5 = false;


// Positions of the point lights
glm::vec3 pointLightPositions[] = {
    glm::vec3(0.7f,  0.2f,  2.0f),
    glm::vec3(2.3f, -3.3f, -4.0f),
    glm::vec3(-4.0f,  2.0f, -12.0f),
    glm::vec3(0.0f,  0.0f, -3.0f)
};
glm::vec3 LightP1;

float vertices[] = {
     -0.5f, -0.5f, -0.5f,  0.0f,  0.0f, -1.0f,
        0.5f, -0.5f, -0.5f,  0.0f,  0.0f, -1.0f,
        0.5f,  0.5f, -0.5f,  0.0f,  0.0f, -1.0f,
        0.5f,  0.5f, -0.5f,  0.0f,  0.0f, -1.0f,
       -0.5f,  0.5f, -0.5f,  0.0f,  0.0f, -1.0f,
       -0.5f, -0.5f, -0.5f,  0.0f,  0.0f, -1.0f,

       -0.5f, -0.5f,  0.5f,  0.0f,  0.0f,  1.0f,
        0.5f, -0.5f,  0.5f,  0.0f,  0.0f,  1.0f,
        0.5f,  0.5f,  0.5f,  0.0f,  0.0f,  1.0f,
        0.5f,  0.5f,  0.5f,  0.0f,  0.0f,  1.0f,
       -0.5f,  0.5f,  0.5f,  0.0f,  0.0f,  1.0f,
       -0.5f, -0.5f,  0.5f,  0.0f,  0.0f,  1.0f,

       -0.5f,  0.5f,  0.5f, -1.0f,  0.0f,  0.0f,
       -0.5f,  0.5f, -0.5f, -1.0f,  0.0f,  0.0f,
       -0.5f, -0.5f, -0.5f, -1.0f,  0.0f,  0.0f,
       -0.5f, -0.5f, -0.5f, -1.0f,  0.0f,  0.0f,
       -0.5f, -0.5f,  0.5f, -1.0f,  0.0f,  0.0f,
       -0.5f,  0.5f,  0.5f, -1.0f,  0.0f,  0.0f,

        0.5f,  0.5f,  0.5f,  1.0f,  0.0f,  0.0f,
        0.5f,  0.5f, -0.5f,  1.0f,  0.0f,  0.0f,
```

```
         0.5f, -0.5f, -0.5f,  1.0f,  0.0f,  0.0f,
         0.5f, -0.5f, -0.5f,  1.0f,  0.0f,  0.0f,
         0.5f, -0.5f,  0.5f,  1.0f,  0.0f,  0.0f,
         0.5f,  0.5f,  0.5f,  1.0f,  0.0f,  0.0f,

        -0.5f, -0.5f, -0.5f,  0.0f, -1.0f,  0.0f,
         0.5f, -0.5f, -0.5f,  0.0f, -1.0f,  0.0f,
         0.5f, -0.5f,  0.5f,  0.0f, -1.0f,  0.0f,
         0.5f, -0.5f,  0.5f,  0.0f, -1.0f,  0.0f,
        -0.5f, -0.5f,  0.5f,  0.0f, -1.0f,  0.0f,
        -0.5f, -0.5f, -0.5f,  0.0f, -1.0f,  0.0f,

        -0.5f,  0.5f, -0.5f,  0.0f,  1.0f,  0.0f,
         0.5f,  0.5f, -0.5f,  0.0f,  1.0f,  0.0f,
         0.5f,  0.5f,  0.5f,  0.0f,  1.0f,  0.0f,
         0.5f,  0.5f,  0.5f,  0.0f,  1.0f,  0.0f,
        -0.5f,  0.5f,  0.5f,  0.0f,  1.0f,  0.0f,
        -0.5f,  0.5f, -0.5f,  0.0f,  1.0f,  0.0f
};



glm::vec3 Light1 = glm::vec3(0);


// Deltatime
GLfloat deltaTime = 0.0f;   // Time between current frame and last frame
GLfloat lastFrame = 0.0f;   // Time of last frame

int main()
{
    // Init GLFW
    glfwInit();
    // Set all the required options for GLFW
    glfwWindowHint(GLFW_CONTEXT_VERSION_MAJOR, 3);
    glfwWindowHint(GLFW_CONTEXT_VERSION_MINOR, 3);
    glfwWindowHint(GLFW_OPENGL_PROFILE, GLFW_OPENGL_CORE_PROFILE);
    glfwWindowHint(GLFW_OPENGL_FORWARD_COMPAT, GL_TRUE);
    glfwWindowHint(GLFW_RESIZABLE, GL_FALSE);

    // Create a GLFWwindow object that we can use for GLFW's functions
    GLFWwindow* window = glfwCreateWindow(WIDTH, HEIGHT,
     "316075189_PROYECTOFINAL_GPO09", nullptr, nullptr);

    if (nullptr == window)
    {
        std::cout << "Failed to create GLFW window" << std::endl;
        glfwTerminate();

        return EXIT_FAILURE;
    }
```

```
glfwMakeContextCurrent(window);

glfwGetFramebufferSize(window, &SCREEN_WIDTH, &SCREEN_HEIGHT);

// Set the required callback functions
glfwSetKeyCallback(window, KeyCallback);
glfwSetCursorPosCallback(window, MouseCallback);

// GLFW Options
//glfwSetInputMode(window, GLFW_CURSOR, GLFW_CURSOR_DISABLED);

// Set this to true so GLEW knows to use a modern approach to retrieving
 function pointers and extensions
glewExperimental = GL_TRUE;
// Initialize GLEW to setup the OpenGL Function pointers
if (GLEW_OK != glewInit())
{
    std::cout << "Failed to initialize GLEW" << std::endl;
    return EXIT_FAILURE;
}

// Define the viewport dimensions
glViewport(0, 0, SCREEN_WIDTH, SCREEN_HEIGHT);



Shader lightingShader("Shaders/lighting.vs", "Shaders/lighting.frag");
//Shader lampShader("Shaders/lamp.vs", "Shaders/lamp.frag");
Shader lampShader("Shaders/lamp2.vs", "Shaders/lamp2.frag");
Shader Anim("Shaders/anim.vs", "Shaders/anim.frag");
Shader Anim2("Shaders/anim2.vs", "Shaders/anim2.frag");
//Cuarto 1
Model Cuarto((char*)"Models/Cuarto/Cuarto.obj");
Model Puerta((char*)"Models/Cuarto/Puerta.obj");
Model Ducha((char*)"Models/Cuarto/Ducha.obj");
Model BarraL((char*)"Models/Cuarto/barraLateral.obj");
Model BarraT((char*)"Models/Cuarto/barraTrabajo.obj");
Model Carrito((char*)"Models/Cuarto/carrito.obj");
Model EstanSup((char*)"Models/Cuarto/estanteSuperior.obj");
Model MeCentral((char*)"Models/Cuarto/mesaCentral.obj");
Model Pizarron((char*)"Models/Cuarto/Pizarron.obj");
Model Vidrio((char*)"Models/Cuarto/Vidrio.obj");
Model Vidrio2((char*)"Models/Cuarto/Vidrio2.obj");
Model Pecera1((char*)"Models/Cuarto/Pecera1.obj");
Model Pecera2((char*)"Models/Cuarto/Pecera2.obj");
Model Ciencia((char*)"Models/Cuarto/Ciencia.obj");

//CUARTO 2
Model Cuarto2((char*)"Models/Cuarto2/Cuarto.obj");
Model Puerta2((char*)"Models/Cuarto2/Puerta.obj");
```

```
Model arbol_cuarto((char*)"Models/Cuarto2/arbol_cuarto.obj");
Model alfombra((char*)"Models/Cuarto2/alfombra.obj");
Model pasto((char*)"Models/Cuarto2/Pasto.obj");
Model Cama((char*)"Models/Cuarto2/Cama.obj");
Model Espejo((char*)"Models/Cuarto2/Espejo.obj");
Model Mesita((char*)"Models/Cuarto2/Mesita.obj");
Model Ventilador((char*)"Models/Cuarto2/ventilador.obj");
Model Foto((char*)"Models/Cuarto2/Foto.obj");


//OBJETOS
Model Micro((char*)"Models/Micro/11642_Microwave_v1_L3.obj");
Model craneo((char*)"Models/skull/skull.obj");
Model Planta((char*)"Models/Planta/indoor plant_02.obj");
Model Material((char*)"Models/Cuarto/material.obj");
Model Libros((char*)"Models/Cuarto/Libros.obj");
Model Porta((char*)"Models/Cuarto/Porta.obj");
Model Tetera((char*)"Models/Cuarto/Tetera.obj");
Model Locker((char*)"Models/Cuarto/Locker.obj");

//FACHADA

Model Punta((char*)"Models/Castillo/Punta.obj");
Model Nubes((char*)"Models/Castillo/Nubes.obj");
Model Torres((char*)"Models/Castillo/Torres.obj");
Model Arboles((char*)"Models/Castillo/Arbol_paleta.obj");
Model Barda((char*)"Models/Castillo/Barda.obj");
Model Entrada((char*)"Models/Castillo/Entrada.obj");
Model Piso((char*)"Models/Castillo/Piso.obj");
Model Rio((char*)"Models/Castillo/Rio.obj");
Model Castillo((char*)"Models/Castillo/Castillo.obj");
Model Vent_der((char*)"Models/Castillo/Ventanas_der.obj");
Model Vent_izq((char*)"Models/Castillo/Ventanas_izq.obj");
Model Porton_D((char*)"Models/Castillo/Porton_der.obj");
Model Porton_I((char*)"Models/Castillo/Porton_izq.obj");
Model BardaPa((char*)"Models/Castillo/BardaPa.obj");
Model Arcoiris((char*)"Models/Castillo/Arcoiris.obj");
Model Escaleras((char*)"Models/Castillo/Escaleras.obj");




// First, set the container's VAO (and VBO)
GLuint VBO, VAO;
glGenVertexArrays(1, &VAO);
glGenBuffers(1, &VBO);
glBindVertexArray(VAO);
glBindBuffer(GL_ARRAY_BUFFER, VBO);
glBufferData(GL_ARRAY_BUFFER, sizeof(vertices), vertices, GL_STATIC_DRAW);
// Position attribute
```

```
glVertexAttribPointer(0, 3, GL_FLOAT, GL_FALSE, 6 * sizeof(GLfloat),
 (GLvoid*)0);
glEnableVertexAttribArray(0);
// normal attribute
glVertexAttribPointer(1, 3, GL_FLOAT, GL_FALSE, 6 * sizeof(float),
 (void*)(3 * sizeof(float)));
glEnableVertexAttribArray(1);

// Set texture units
lightingShader.Use();
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "material.diffuse"), 0);
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "material.specular"), 1);

glm::mat4 projection = glm::perspective(camera.GetZoom(),
 (GLfloat)SCREEN_WIDTH / (GLfloat)SCREEN_HEIGHT, 0.1f, 100.0f);

// Game loop
while (!glfwWindowShouldClose(window))
{

    // Calculate deltatime of current frame
    GLfloat currentFrame = glfwGetTime();
    deltaTime = currentFrame - lastFrame;
    lastFrame = currentFrame;

    // Check if any events have been activiated (key pressed, mouse moved
     etc.) and call corresponding response functions
    glfwPollEvents();
    DoMovement();

    // Clear the colorbuffer
    glClearColor(0.1f, 0.1f, 0.1f, 1.0f);
    glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);

    // OpenGL options
    glEnable(GL_DEPTH_TEST);



    //Load Model


    // Use cooresponding shader when setting uniforms/drawing objects
    lightingShader.Use();
    GLint viewPosLoc = glGetUniformLocation(lightingShader.Program,
     "viewPos");
    glUniform3f(viewPosLoc, camera.GetPosition().x,
     camera.GetPosition().y, camera.GetPosition().z);
```

```
// Directional light
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "dirLight.direction"), -0.2f, -1.0f, -0.3f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "dirLight.ambient"), 0.5f, 0.5f, 0.5f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "dirLight.diffuse"), 0.5f, 0.5f, 0.5f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "dirLight.specular"), 0.00f, 0.00f, 0.0f);


// Point light 1
glm::vec3 lightColor;
lightColor.x = abs(sin(glfwGetTime() * Light1.x));
lightColor.y = abs(sin(glfwGetTime() * Light1.y));
lightColor.z = sin(glfwGetTime() * Light1.z);


glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].position"), pointLightPositions[0].x,
 pointLightPositions[0].y, pointLightPositions[0].z);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].ambient"), lightColor.x, lightColor.y, lightColor.z);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].diffuse"), lightColor.x, lightColor.y, lightColor.z);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].specular"), 0.0f, 0.0f, 0.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].constant"), 1.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].linear"), 0.8f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[0].quadratic"), 1.8f);



// Point light 2
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].position"), pointLightPositions[1].x,
 pointLightPositions[1].y, pointLightPositions[1].z);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].ambient"), 0.05f, 0.05f, 0.05f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].diffuse"), 0.0f, 0.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].specular"), 0.0f, 0.0f, 0.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].constant"), 1.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].linear"), 0.0f);
```

```
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[1].quadratic"), 0.0f);

// Point light 3
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].position"), pointLightPositions[2].x,
 pointLightPositions[2].y, pointLightPositions[2].z);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].ambient"), 0.0f, 0.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].diffuse"), 0.0f, 0.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].specular"), 0.0f, 0.0f, 0.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].constant"), 1.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].linear"), 0.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[2].quadratic"), 0.0f);

// Point light 4
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].position"), pointLightPositions[3].x,
 pointLightPositions[3].y, pointLightPositions[3].z);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].ambient"), 0.0f, 0.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].diffuse"), 0.0f, 0.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].specular"), 0.0f, 0.0f, 0.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].constant"), 1.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].linear"), 0.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "pointLights[3].quadratic"), 0.0f);

// SpotLight
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "spotLight.position"), 0.0f, 10.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "spotLight.direction"), 0.0f, 10.0f, 0.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "spotLight.ambient"), 1.0f, 1.0f, 1.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "spotLight.diffuse"), 1.0f, 1.0f, 1.0f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "spotLight.specular"), 0.5f, 0.5f, 0.5f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "spotLight.constant"), 1.0f);
```

```
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "spotLight.linear"), 0.07f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "spotLight.quadratic"), 0.17f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "spotLight.cutOff"), glm::cos(glm::radians(12.5f)));
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "spotLight.outerCutOff"), glm::cos(glm::radians(15.0f)));

// Set material properties
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "material.shininess"), 16.0f);

// Create camera transformations
glm::mat4 view;
view = camera.GetViewMatrix();

// Get the uniform locations
GLint modelLoc = glGetUniformLocation(lightingShader.Program, "model");
GLint viewLoc = glGetUniformLocation(lightingShader.Program, "view");
GLint projLoc = glGetUniformLocation(lightingShader.Program,
 "projection");

// Pass the matrices to the shader
glUniformMatrix4fv(viewLoc, 1, GL_FALSE, glm::value_ptr(view));
glUniformMatrix4fv(projLoc, 1, GL_FALSE, glm::value_ptr(projection));


glm::mat4 model(1);

//Carga de modelo
view = camera.GetViewMatrix();
model = glm::mat4(1);
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
Piso.Draw(lightingShader);

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);



//CUARTO
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Cuarto.Draw(lightingShader);
```

```
//DUcha
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Ducha.Draw(lightingShader);

///Vidrio
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal
 alfa
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
model = glm::mat4(1);

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 0.3f);
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
Vidrio.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 1.0f);



///Vidrio 2
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal
 alfa
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
model = glm::mat4(1);

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 0.3f);
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
model = glm::translate(model, glm::vec3(-0.60f, 1.82f, -0.43f));
model = glm::rotate(model, glm::radians(rot2), glm::vec3(0.0f, 1.0f,
 0.0));
```

```
//CIENCIA


view = camera.GetViewMatrix();
model = glm::mat4(1);
//model = glm::translate(model, PosIni + glm::vec3(movKitX, 0,
 movKitZ));
model = glm::translate(model, glm::vec3(posX, posY, posZ));
model = glm::translate(model, glm::vec3(-0.36f, 1.96f, 0.570f));
model = glm::scale(model, glm::vec3(0.008f, 0.008f, 0.008f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 0.0f,
 1.0));
//model = glm::translate(model, PosIni + glm::vec3(movKitX, 0,
 movKitZ));

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));

Ciencia.Draw(lightingShader);
///////////////////////////////////////////////////////TRASLADADOS
        //PORAT
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.850f, 1.94f, 0.300f));
model = glm::scale(model, glm::vec3(0.008f, 0.008f, 0.008f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Porta.Draw(lightingShader);

//Material
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal
 alfa
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
model = glm::mat4(1);

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 0.7f);
model = glm::translate(model, glm::vec3(-0.850f, 1.94f, 0.300f));
model = glm::scale(model, glm::vec3(0.008f, 0.008f, 0.008f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
```

```
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));

Vidrio2.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 1.0f);


//Puerta
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.60f, 1.82f, -0.43f));
model = glm::rotate(model, glm::radians(rot2), glm::vec3(0.0f, 1.0
 0.0));

glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Puerta.Draw(lightingShader);

glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Puerta.Draw(lightingShader);
//Barra  Trabajo
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
BarraT.Draw(lightingShader);

//Barra Lareral
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
BarraL.Draw(lightingShader);

//Mesa
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
MeCentral.Draw(lightingShader);

//Pizarron
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Pizarron.Draw(lightingShader);

//Estante Sup
model = glm::mat4(1);
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
EstanSup.Draw(lightingShader);
```

```
Material.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 1.0f);



//Libros
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.60f, 1.94f, 0.600f));
model = glm::scale(model, glm::vec3(0.08f, 0.08f, 0.08f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Libros.Draw(lightingShader);

//PECERA2
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.413f, 1.94f, 0.600f));
model = glm::scale(model, glm::vec3(0.05f, 0.05f, 0.05f));
//model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Pecera2.Draw(lightingShader);

//PECERA1
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal
 alfa
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
model = glm::mat4(1);

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 0.7f);
//model = glm::translate(model, glm::vec3(0.0f, 0.0f, 5.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
Pecera1.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 1.0f);
```

```
//Microandas
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.860f, 1.97f, -0.0800f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
model = glm::scale(model, glm::vec3(0.020f, 0.02f, 0.02f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Micro.Draw(lightingShader);


  //Creaneo

glUniform3f(glGetUniformLocation(lightingShader.Program,
 "material.ambient"), 0.25f, 0.20725f, 0.20715f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "material.diffuse"), 1.0f, 0.8290f, 0.8290f);
glUniform3f(glGetUniformLocation(lightingShader.Program,
 "material.specular"), 0.2966480f, 0.2966480f, 0.296648f);
glUniform1f(glGetUniformLocation(lightingShader.Program,
 "material.shininess"), 0.008f);
model = glm::mat4(1);
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.860f, 1.938f, 0.050f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
model = glm::scale(model, glm::vec3(0.010f, 0.01f, 0.01f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
craneo.Draw(lightingShader);

//TETERA
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.860f, 1.933f, 0.175f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
model = glm::scale(model, glm::vec3(0.0150f, 0.015f, 0.015f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Tetera.Draw(lightingShader);


 //Planta
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.860f, 1.82f, -0.3f));
model = glm::rotate(model, glm::radians(rot), glm::vec3(0.0f, 1.0f,
 0.0));
model = glm::scale(model, glm::vec3(0.030f, 0.03f, 0.03f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Planta.Draw(lightingShader);
```

```
//Locker
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.820f, 1.82f, -0.4f));
model = glm::scale(model, glm::vec3(0.030f, 0.03f, 0.03f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Locker.Draw(lightingShader);

///////////////////////////////////////////////////////////////////////7 //FACHADA


 //castillo
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.50f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Castillo.Draw(lightingShader);

///Ventanas der
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal
 alfa
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
model = glm::mat4(1);

glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 0.5f);
//model = glm::translate(model, glm::vec3(0.0f, 0.0f, 5.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
Vent_der.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 1.0f);


///Ventanas izq
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal
 alfa
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA);
model = glm::mat4(1);
```

```
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 0.5f);
//model = glm::translate(model, glm::vec3(0.0f, 0.0f, 5.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
glUniform1i(glGetUniformLocation(lightingShader.Program,
 "activaTransparencia"), 0);
Vent_izq.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa
glUniform4f(glGetUniformLocation(lightingShader.Program,
 "colorAlpha"), 1.0f, 1.0f, 1.0f, 1.0f);

//PUNTA
model = glm::mat4(1);
// model = glm::scale(model, glm::vec3(0.5f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Punta.Draw(lightingShader);

//NUBES
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Nubes.Draw(lightingShader);



model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Arcoiris.Draw(lightingShader);


//TORRES

model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Torres.Draw(lightingShader);


//Arbol
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
```

```
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Arboles.Draw(lightingShader);
//Barda
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Barda.Draw(lightingShader);


//Barda Paletas
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
BardaPa.Draw(lightingShader);

//PORTON DER
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(0.4120f, 0.05f, 2.250f));
model = glm::rotate(model, glm::radians(-rot2), glm::vec3(0.0f, 1.0f,
 0.0));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Porton_D.Draw(lightingShader);


//PORTON IZQ
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-0.4120f, 0.05f, 2.250f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Porton_I.Draw(lightingShader);

//ENTRADA
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Entrada.Draw(lightingShader);

//ESCALERA
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Escaleras.Draw(lightingShader);

//PISO
model = glm::mat4(1);
```

```
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Piso.Draw(lightingShader);
///////////////////////////////////////CUARTO 2////////////////////////////////
//ALFOMBRA
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
alfombra.Draw(lightingShader);


//ARBOLES
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
arbol_cuarto.Draw(lightingShader);

//CAMA
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Cama.Draw(lightingShader);

//CUARTO
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Cuarto2.Draw(lightingShader);

//PASTO
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
pasto.Draw(lightingShader);

//PUERTA
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Puerta2.Draw(lightingShader);


//ESPEJO
model = glm::mat4(1);
```

```
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Espejo.Draw(lightingShader);
//MESITA
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Mesita.Draw(lightingShader);


//VENTILADOR
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Ventilador.Draw(lightingShader);

//Marco
model = glm::mat4(1);
//model = glm::scale(model, glm::vec3(0.05f, 0.5f, 0.5f));
glUniformMatrix4fv(glGetUniformLocation(lightingShader.Program,
 "model"), 1, GL_FALSE, glm::value_ptr(model));
Foto.Draw(lightingShader);



glBindVertexArray(0);


// Also draw the lamp object, again binding the appropriate shader
lampShader.Use();
// Get location objects for the matrices on the lamp shader (these
 could be different on a different shader)
modelLoc = glGetUniformLocation(lampShader.Program, "model");
viewLoc = glGetUniformLocation(lampShader.Program, "view");
projLoc = glGetUniformLocation(lampShader.Program, "projection");

// Set matrices
glUniformMatrix4fv(viewLoc, 1, GL_FALSE, glm::value_ptr(view));
glUniformMatrix4fv(projLoc, 1, GL_FALSE, glm::value_ptr(projection));
model = glm::mat4(1);
model = glm::translate(model, lightPos);
model = glm::scale(model, glm::vec3(0.2f)); // Make it a smaller cube
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
// Draw the light object (using light's vertex attributes)

Anim.Use();
tiempo = glfwGetTime();
modelLoc = glGetUniformLocation(Anim.Program, "model");
```

```
    viewLoc = glGetUniformLocation(Anim.Program, "view");
    projLoc = glGetUniformLocation(Anim.Program, "projection");

    // Set matrices
    glUniformMatrix4fv(viewLoc, 1, GL_FALSE, glm::value_ptr(view));
    glUniformMatrix4fv(projLoc, 1, GL_FALSE, glm::value_ptr(projection));
    glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
    glUniform1f(glGetUniformLocation(Anim.Program, "time"), tiempo);
    model = glm::mat4(1);
    glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
    Rio.Draw(Anim);



    Anim2.Use();
    tiempo = glfwGetTime();
    modelLoc = glGetUniformLocation(Anim2.Program, "model");
    viewLoc = glGetUniformLocation(Anim2.Program, "view");
    projLoc = glGetUniformLocation(Anim2.Program, "projection");
    glUniformMatrix4fv(viewLoc, 1, GL_FALSE, glm::value_ptr(view));
    glUniformMatrix4fv(projLoc, 1, GL_FALSE, glm::value_ptr(projection));
    glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
    model = glm::mat4(1);
    glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
    glUniform1f(glGetUniformLocation(Anim.Program, "time"), tiempo);
    Carrito.Draw(Anim2);


    for (GLuint i = 0; i < 4; i++)
    {
        model = glm::mat4(1);
        model = glm::translate(model, pointLightPositions[i]);
        model = glm::scale(model, glm::vec3(0.2f)); // Make it a smaller
         cube
        glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
        glBindVertexArray(VAO);
        glDrawArrays(GL_TRIANGLES, 0, 36);
    }
    glBindVertexArray(0);



    // Swap the screen buffers
    glfwSwapBuffers(window);
}


// Terminate GLFW, clearing any resources allocated by GLFW.
glfwTerminate();
```

```
    return 0;
}

// Moves/alters the camera positions based on user input
void DoMovement()
{

    // Camera controls
    if (keys[GLFW_KEY_W] || keys[GLFW_KEY_UP])
    {
        camera.ProcessKeyboard(FORWARD, deltaTime);

    }

    if (keys[GLFW_KEY_S] || keys[GLFW_KEY_DOWN])
    {
        camera.ProcessKeyboard(BACKWARD, deltaTime);


    }

    if (keys[GLFW_KEY_A] || keys[GLFW_KEY_LEFT])
    {
        camera.ProcessKeyboard(LEFT, deltaTime);


    }

    if (keys[GLFW_KEY_D] || keys[GLFW_KEY_RIGHT])
    {
        camera.ProcessKeyboard(RIGHT, deltaTime);


    }

    if (keys[GLFW_KEY_T])
    {
        pointLightPositions[0].x += 0.01f;
    }
    if (keys[GLFW_KEY_G])
    {
        pointLightPositions[0].x -= 0.01f;
    }
    if (keys[GLFW_KEY_O])
    {
        if (rot2< 45.0f)
            rot2 += 0.5f;
        mov1 = true;
    }
    if (mov1)
```

```
{
    if (rot2 < 90.0f)
        rot2 += 0.05f;
    else {
        mov1 = false;
        mov2 = true;
    }
}
if (mov2)
{
    if (rot2 > 0.0f)
        rot2 -= 0.05f;
    else {
        mov2 = false;
        mov1 = true;
    }

}
if (keys[GLFW_KEY_1])
{

    rot += 1;

}
//Mov Personaje
if (keys[GLFW_KEY_2])
{
    posZ += 1;
}

if (keys[GLFW_KEY_3])
{
    posZ -= 1;
}

if (keys[GLFW_KEY_4])
{
    posX -= 1;
}

if (keys[GLFW_KEY_5])
{
    posX += 1;
}
if (keys[GLFW_KEY_Y])
{
    pointLightPositions[0].y += 0.01f;
}

if (keys[GLFW_KEY_H])
{
```

```
        pointLightPositions[0].y -= 0.01f;
    }
    if (keys[GLFW_KEY_U])
    {
        pointLightPositions[0].z -= 0.1f;
    }
    if (keys[GLFW_KEY_J])
    {
        pointLightPositions[0].z += 0.01f;
    }
    if (keys[GLFW_KEY_N])
    {
        pointLightPositions[3].x += 0.1f;
        pointLightPositions[3].y += 0.1f;
        pointLightPositions[3].z += 0.1f;
        circuito = true;
    }

    if (keys[GLFW_KEY_M])
    {
        circuito = false;
    }
}

void animacion()
{

    if (circuito)
    {
        if (recorrido1) //Recorrido inicial del carrito
        {
            rotKit = 90;
            movKitX += 0.1f;//Z
            if (movKitX > 90.0f)//>90 sentido del recorrido Z
            {
                recorrido1 = false;
                recorrido2 = true;
            }
        }
        if (recorrido2)
        {
            rotKit = -45;//90 sentido del carro
            movKitZ += 0.1f;// X (+ adelante - atras)
            movKitX -= 0.1f;
            if (movKitZ > 90 && movKitX < 30)//>90 X sentido del recorrido
             (sentidos iguales >)  && movKitZ < 30
            {
                recorrido2 = false;
                recorrido3 = true;

            }
```

```
        }

        if (recorrido3)
        {
            rotKit = 270;//180 sentido del carro Z
            movKitX -= 0.1f;
            if (movKitX < 0)//<0 Z sentido del recorrido
            {
                recorrido3 = false;
                recorrido4 = true;
            }
        }

        if (recorrido4)
        {
            rotKit = 180;//270sentido del carro X
            movKitZ -= 0.1f;
            if (movKitZ < 0)//<0 X sentido del recorrido
            {
                recorrido4 = false;
                recorrido5 = true;
            }
        }

        if (recorrido5)
        {
            rotKit = 0; //sentido del carro Z
            movKitZ += 0.1f;
            if (movKitZ > 0)//>0 Z sentido del recorrido
            {
                recorrido5 = false;
                recorrido1 = true;
            }
        }

    }
}


// Is called whenever a key is pressed/released via GLFW
void KeyCallback(GLFWwindow* window, int key, int scancode, int action, int
 mode)
{
    if (GLFW_KEY_ESCAPE == key && GLFW_PRESS == action)
    {
        glfwSetWindowShouldClose(window, GL_TRUE);
    }

    if (key >= 0 && key < 1024)
    {
        if (action == GLFW_PRESS)
```

```
        {
            keys[key] = true;
        }
        else if (action == GLFW_RELEASE)
        {
            keys[key] = false;
        }
    }

    if (keys[GLFW_KEY_SPACE])
    {
        active = !active;
        if (active)
        {
            Light1 = glm::vec3(1.0f, 1.0f, 0.0f);
        }
        else
        {
            Light1 = glm::vec3(0);//Cuado es solo un valor en los 3 vectores
             pueden dejar solo una componente
        }
    }
}

void MouseCallback(GLFWwindow* window, double xPos, double yPos)
{
    if (firstMouse)
    {
        lastX = xPos;
        lastY = yPos;
        firstMouse = false;
    }

    GLfloat xOffset = xPos - lastX;
    GLfloat yOffset = lastY - yPos;  // Reversed since y-coordinates go from
     bottom to left

    lastX = xPos;
    lastY = yPos;

    camera.ProcessMouseMovement(xOffset, yOffset);
}
```

REQUERIMIENTOS DE FUNCIONAMIENTO

Para que la ejecución del proyecto pueda ser posible, es necesario que en una encuente con el siguiente material:

- Visual Studio 2019 o 2022 community para Windows
- OpenGL versión 3.3
- Archivos:
    - Models (carpeta)

- Images (carpeta)
- Shaders (carpeta)
- SkyBox (carpeta)
- assimp-vc140-mt.dll
- glew32.dll
- 316075189_PROYECTO_FINAL_GPO09
- 316075189_PROYECTO_FINAL_GPO09.pbd

Todos los archivos deben estar contenidos en una misma carpeta.

CONCLUSION

Las aplicaciones de la computación gráfica dan mucho beneficio a la ingeniería, ciencia, educación y arte, la adquisicion de los conocimientos de este curso nos brindo la herramientas para el desarrollo de este proyecto; y aunque se presentaron varios retos a lo largo de este, todos fueron resuleltos. Fue muy importante conocer los conceptos teoricos que representaba la creacion y diseño de cada objeto, para que cada uno de de estos tuviera las caristicas designadas.

Tomando en cuenta que el objetivo principal de la computación grafica es la generación de imágenes digitales dentro de un contexto informático y tecnológico, podemos decir que este proyecto, a pesar de no ser el mejor, cumple con el proposito de la computacion grafica.