UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

FACULTAD DE INGENIERÍA

COMPUTACIÓN GRÁFICA E INTERACCIÓN HUMANO-COMPUTADORA

FINAL PROJECT - TECHNICAL MANUAL

Team 10

NAME:

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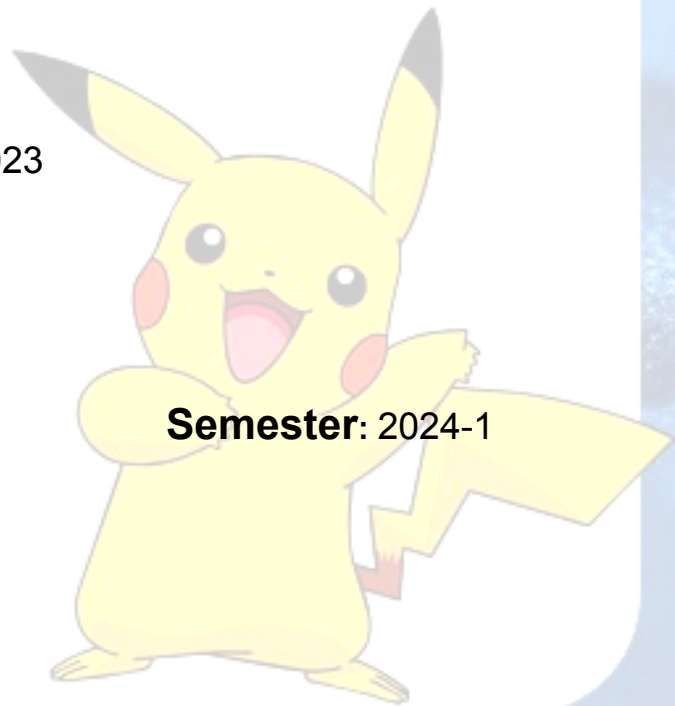
Arturo Pérez De la Cruz

Delivery: Wednesday, 22 / November / 2023

Group: 1

Semester: 2024-1



Description

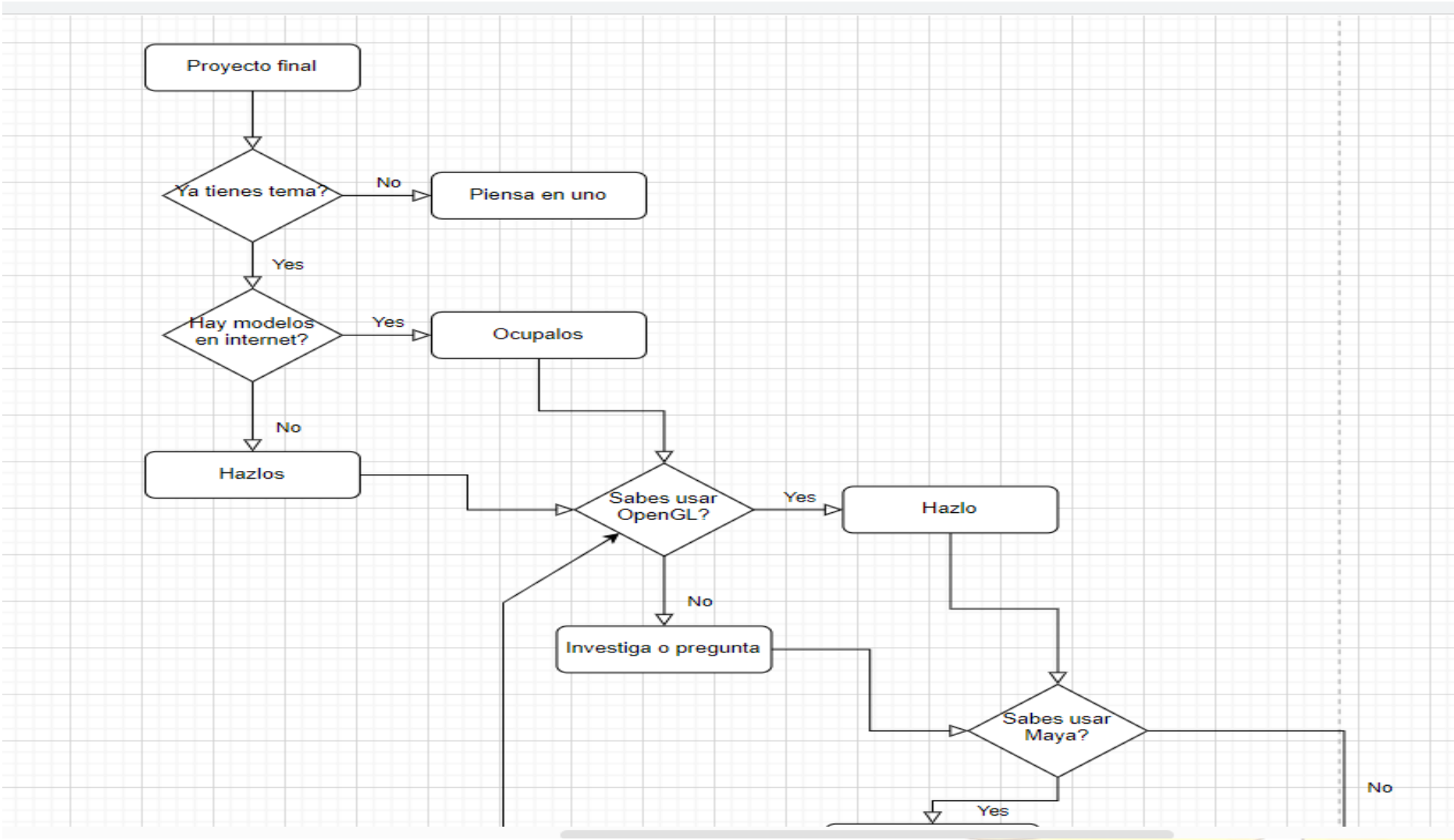
This project has the main objective of providing Pokémon fans and anyone interested with a unique experience: a digital interactive visit to a museum dedicated to the iconic Pokémon franchise. In this project, our focus will be on the creation and 3D modeling of Pokémon figures to bring to life the rich history and world of these adorable characters that held significant meaning in the childhoods of countless individuals.

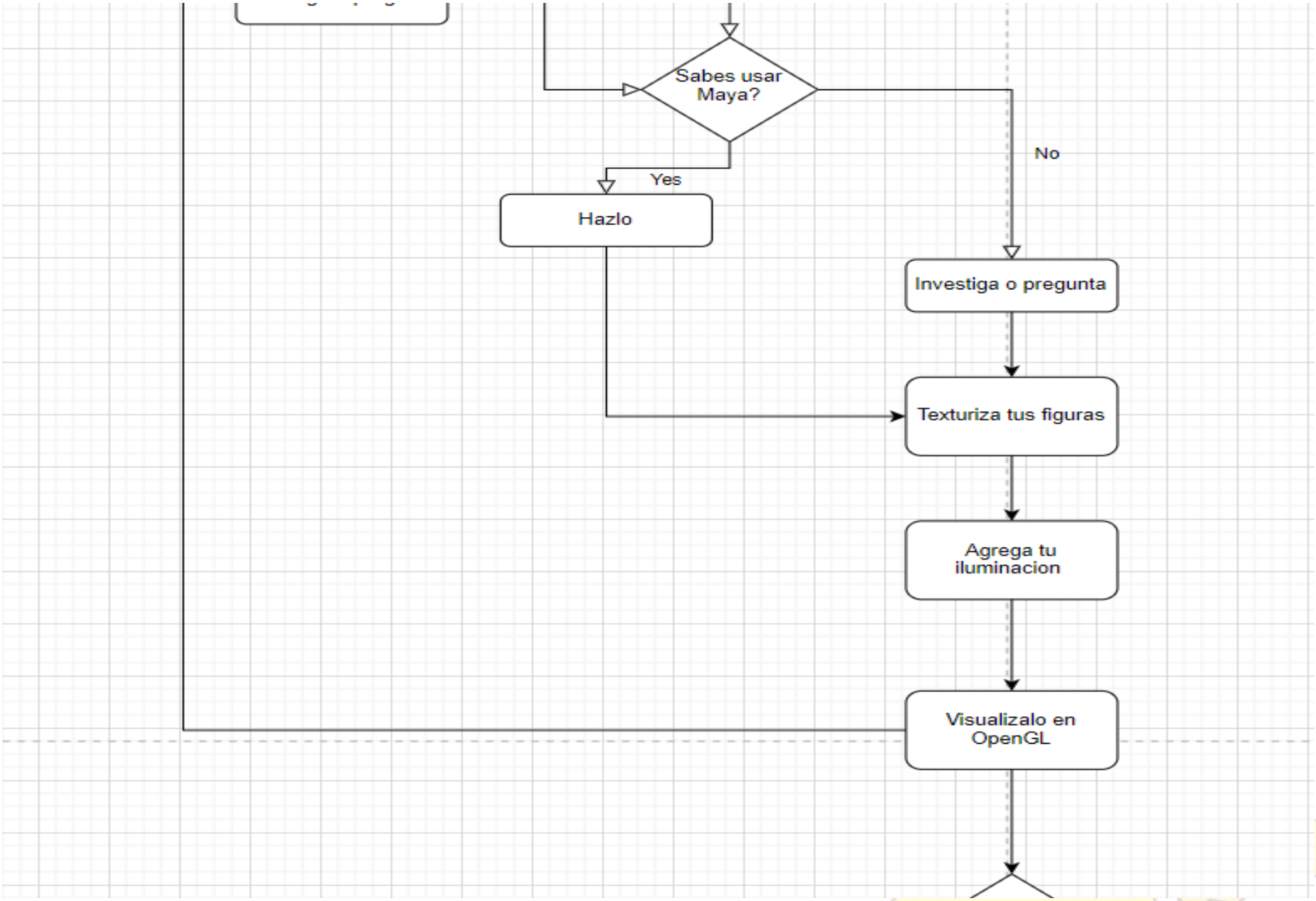
Additionally, it will serve as a tool to assist team members in developing, reinforcing, and applying the knowledge acquired in both theoretical and laboratory aspects of the Computer Graphics course. This will be done using applications such as Visual Studio and modeling software like Maya or similar tools.

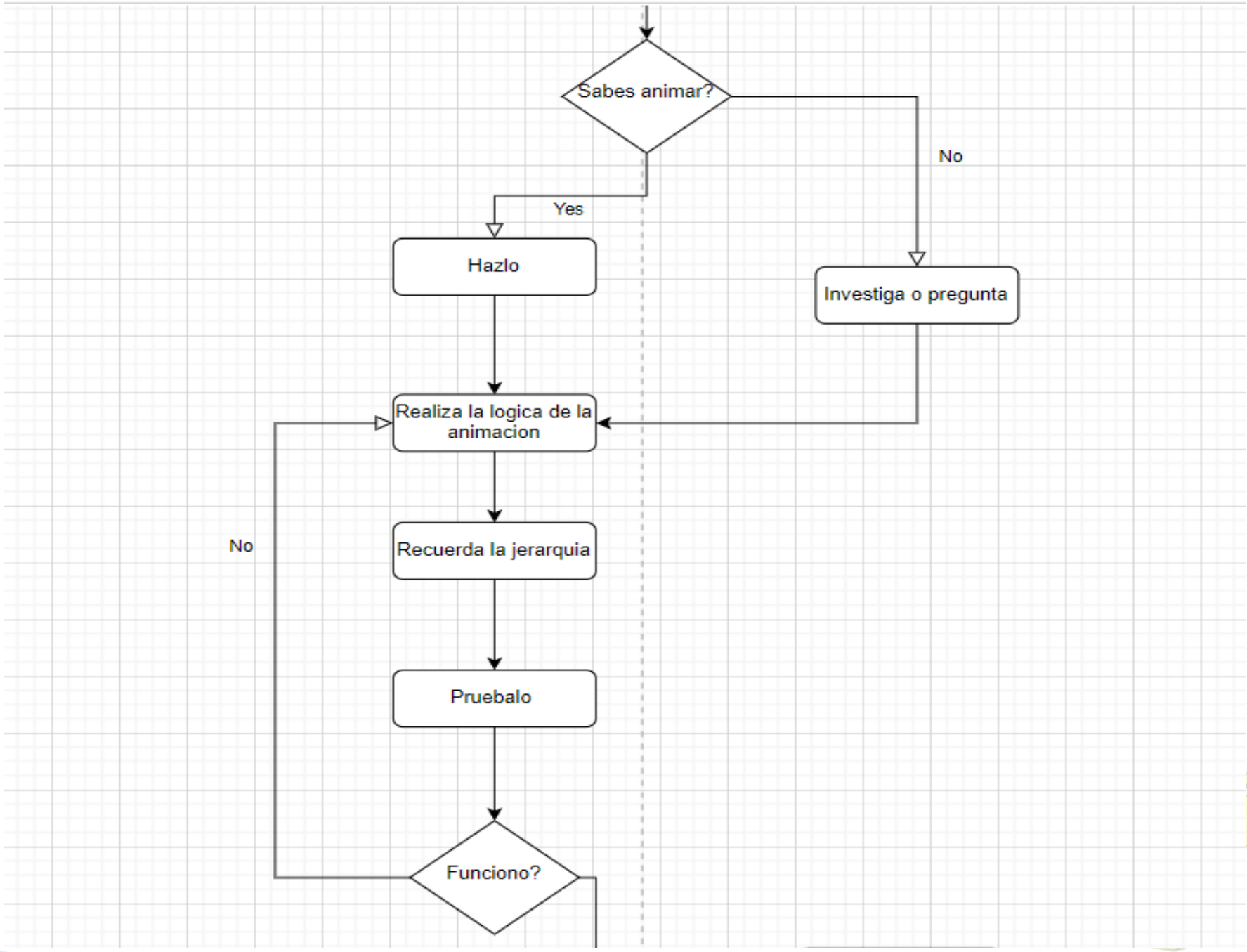
Objectives

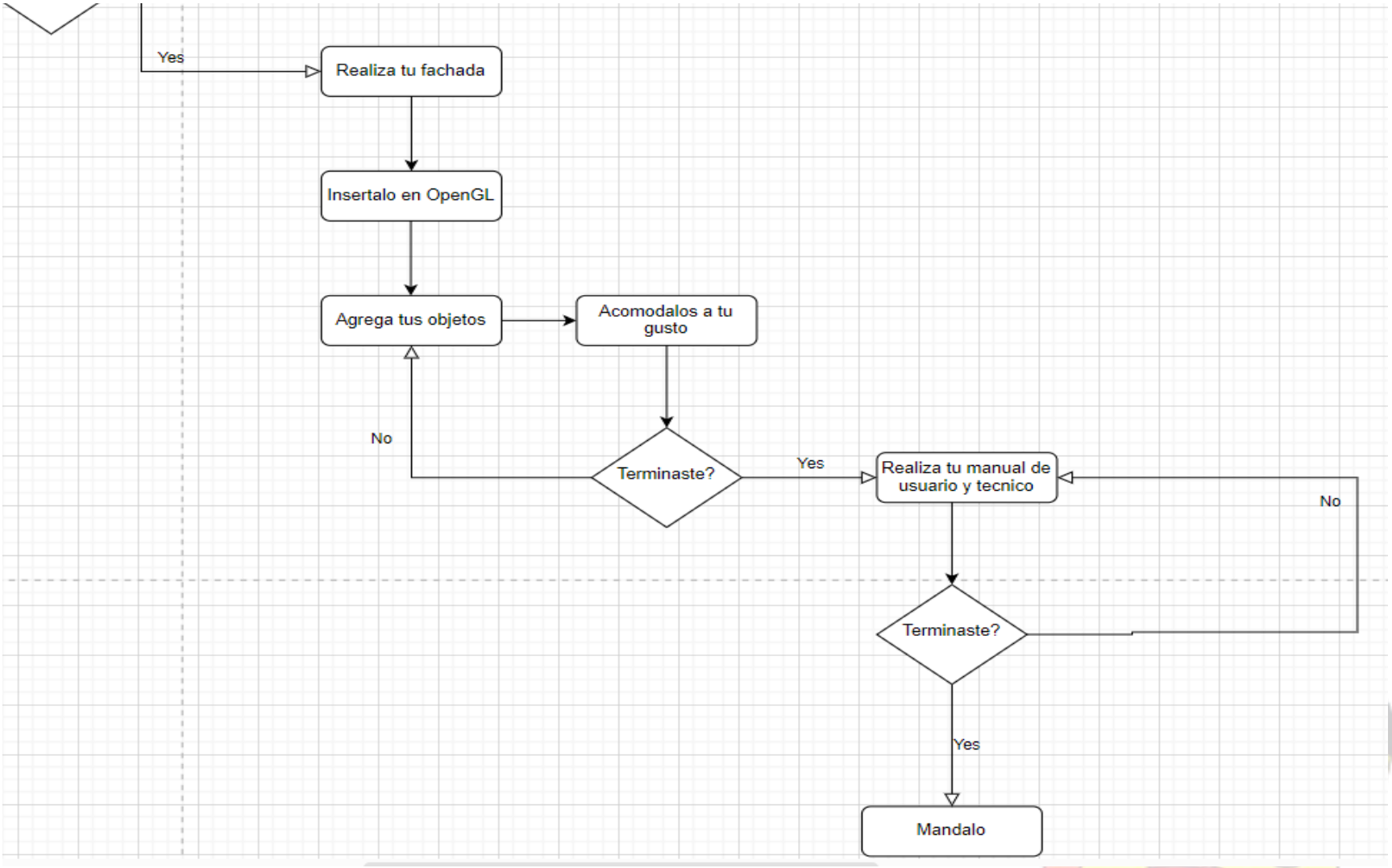
- Conduct a Digital Visit to the Pokémon Museum
- 3D Modeling in OpenGL
- Content Design in Autodesk Maya
- Integration of Animation Content
- Detailed documentation on the project along with a User Manual

Software Flow Diagram




Sabes usar Maya?
Yes
No
Hazlo
Investiga o pregunta
Texturiza tus figuras
Agrega tu iluminacion
Visualizalo en OpenGL


Sabes animar?
No
Yes
Hazlo
Investiga o pregunta
Realiza la logica de la animacion
Recuerda la jerarquia
No
Pruebalo
Funciono?



For a better view, please visit
https://drive.google.com/file/d/1x2DHGOBh9tpGSBkifsT_IrC-t2XOyoID/view?usp=sharing

Gantt Chart

Proyecto final de Computación Gráfica e Interacción Humano-Computadora

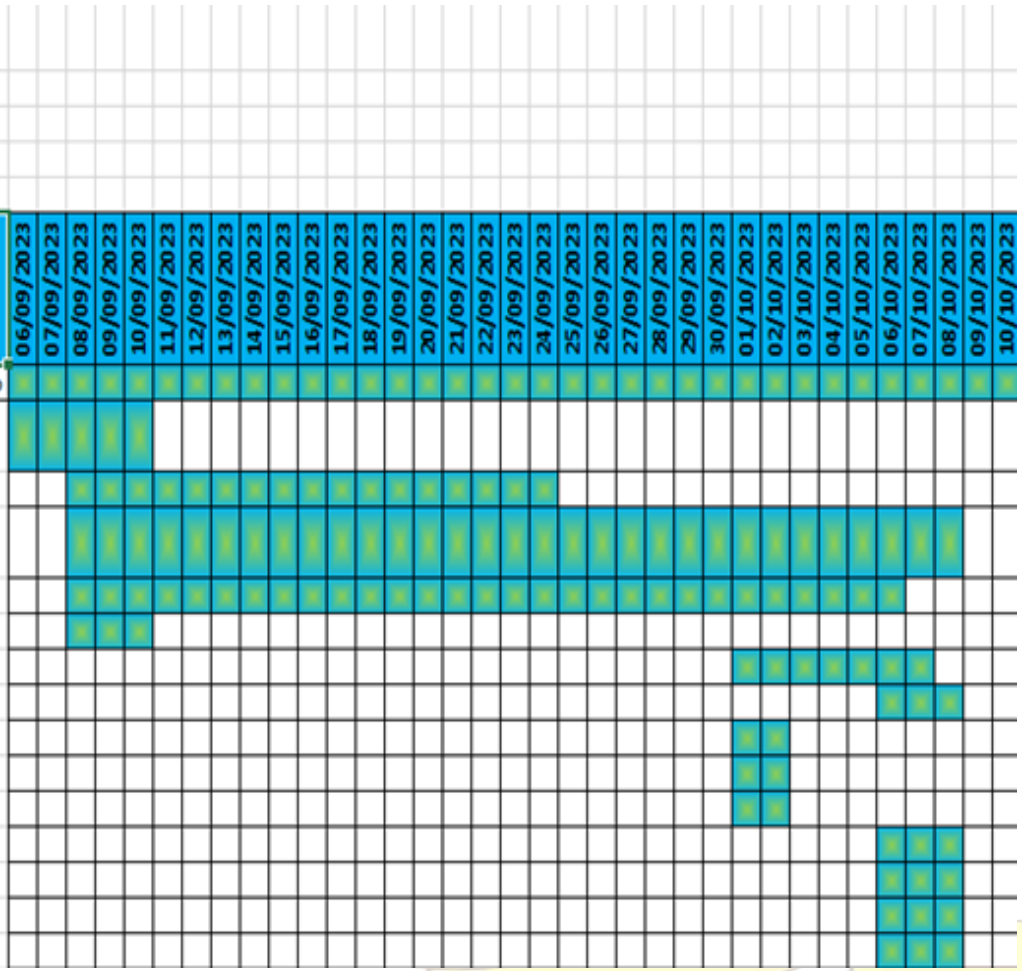
Integrantes:

Abad Vásquez Aldo

Caudillo Avilés Esteban Tonatiuh

Cruz Vazquez Zayra Sheccid

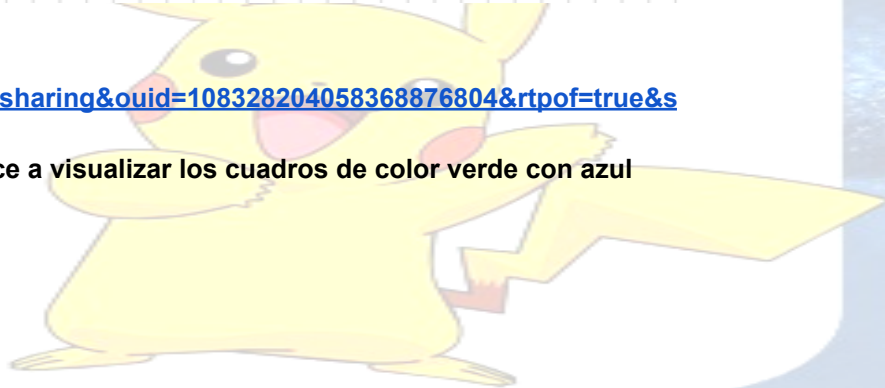
Nombre de la tarea	Fecha de inicio	Fecha de entrega	Asignado	Estado
Inicio del proyecto y fin de proyecto	06/09/2023	22/11/2023	Todos	En Progreso
1.- Entregar una lista con los nombres de los integrantes	06/09/2023	10/09/2023	Todos	Terminado
2.- Eleccion de tema	08/09/2023	24/09/2023	Aldo	Terminado
3.- Realizacion del documento de la propuesta del proyecto (borrador)	08/09/2023	08/10/2023	Todos	Terminado
3.1.- Realizar el croquis del Museo	08/09/2023	06/10/2023	Zayra	Terminado
3.2.- Análisis financiero	08/09/2023	10/09/2023	Esteban	Terminado
3.3.- Diagrama de Gantt	01/10/2023	07/10/2023	Esteban	Terminado
3.4.- Animaciones	06/10/2023	08/10/2023	Aldo	Terminado
3.5.- Descripción	01/10/2023	02/10/2023	Zayra	Terminado
3.6.- Objetivos	01/10/2023	02/10/2023	Zayra	Terminado
3.7.- Entregables	01/10/2023	02/10/2023	Zayra	Terminado
3.8.- Requisitos generales del proyecto	06/10/2023	08/10/2023	Esteban	Terminado
3.9.- Requisitos del cliente	06/10/2023	08/10/2023	Esteban	Terminado
4.- Eleccion de modelos	06/10/2023	08/10/2023	Aldo	Terminado
5.- Planeación de animaciones	06/10/2023	08/10/2023	Aldo	Terminado



5.- Planeación de animaciones	06/10/2023	08/10/2023	Aldo	Terminado
6.- Planeacion de salas	08/10/2023	18/10/2023	Zayra	Terminado
7.- Realizacion de modelados	08/10/2023	13/10/2023	Todos	Terminado
7.1.- Modelo 1	09/10/2023	09/10/2023	Esteban	Terminado
7.2.- Modelo 2	09/10/2023	09/10/2023	Esteban	Terminado
7.3.- Modelo 3	09/10/2023	09/10/2023	Esteban	Terminado
7.4.- Modelo 4	09/10/2023	09/10/2023	Esteban	Terminado
7.5.- Modelo 5	09/10/2023	09/10/2023	Esteban	Terminado
7.6.- Modelo 6	10/10/2023	10/10/2023	Zayra	Terminado
7.7.- Modelo 7	10/10/2023	10/10/2023	Zayra	Terminado
7.8.- Modelo 8	10/10/2023	10/10/2023	Zayra	Terminado
7.9.- Modelo 9	10/10/2023	10/10/2023	Zayra	Terminado
7.10- Modelo 10	10/10/2023	10/10/2023	Zayra	Terminado
7.11.- Modelo 11	11/10/2023	11/10/2023	Aldo	Terminado
7.12.- Modelo 12	11/10/2023	11/10/2023	Aldo	Terminado
7.13.- Modelo 13	11/10/2023	11/10/2023	Aldo	Terminado
7.14.- Modelo 14	11/10/2023	11/10/2023	Aldo	Terminado
7.15.- Modelo 15	11/10/2023	11/10/2023	Aldo	Terminado
7.16.- Modelo 16	12/10/2023	12/10/2023	Esteban	Terminado
7.17.- Modelo 17	12/10/2023	12/10/2023	Esteban	Terminado
7.18.- Modelo 18	12/10/2023	12/10/2023	Esteban	Terminado
7.19.- Modelo 19	12/10/2023	12/10/2023	Esteban	Terminado
7.20.- Modelo 20	12/10/2023	12/10/2023	Esteban	Terminado
7.21.- Modelo 21	13/10/2023	13/10/2023	Zayra	Terminado
7.22.- Modelo 22	13/10/2023	13/10/2023	Zayra	Terminado
7.23.- Modelo 23	13/10/2023	13/10/2023	Zayra	Terminado
8.- Realizacion de animaciones	13/10/2023	28/10/2023	Aldo	Terminado
8.1.- Animacion 1	13/10/2023	15/10/2023	Aldo	Terminado
8.2.- Animacion 2	15/10/2023	17/10/2023	Aldo	Terminado
8.3.- Animacion 3	17/10/2023	19/10/2023	Aldo	Terminado
8.4.- Animacion 4	20/10/2023	22/10/2023	Aldo	Terminado
8.5.- Animacion 5 (KeyFrames)	23/10/2023	28/10/2023	Aldo	Terminado
9.- Realizacion de modelado de museo	29/10/2023	08/11/2023	Todos	En Progreso
9.1.- Vestíbulo	29/10/2023	01/11/2023	Esteban	En Progreso
9.2.- Sala 1	01/11/2023	03/11/2023	Zayra	En Progreso
9.3.- Sala 2	04/11/2023	04/11/2023	Aldo	En Progreso
9.4.- Sala 3	05/11/2023	05/11/2023	Esteban	En Progreso
9.5.- Salida para ver el mar	05/11/2023	08/11/2023	Aldo	En Progreso
10.- Primera visita virtual	09/11/2023	10/11/2023	Aldo	En Progreso
11.- Mejoras y retoques	10/11/2023	12/11/2023	Aldo	En Progreso
12.- Creacion de documentacion final	12/11/2023	18/11/2023	Zayra	En Progreso
12.1.-Realización del manual de usuario	12/11/2023	14/11/2023	Esteban	En Progreso

7.10- Modelo 10	10/10/2023	10/10/2023	Zayra	Terminado
7.11.- Modelo 11	11/10/2023	11/10/2023	Aldo	Terminado
7.12.- Modelo 12	11/10/2023	11/10/2023	Aldo	Terminado
7.13.- Modelo 13	11/10/2023	11/10/2023	Aldo	Terminado
7.14.- Modelo 14	11/10/2023	11/10/2023	Aldo	Terminado
7.15.- Modelo 15	11/10/2023	11/10/2023	Aldo	Terminado
7.16.- Modelo 16	12/10/2023	12/10/2023	Esteban	Terminado
7.17.- Modelo 17	12/10/2023	12/10/2023	Esteban	Terminado
7.18.- Modelo 18	12/10/2023	12/10/2023	Esteban	Terminado
7.19.- Modelo 19	12/10/2023	12/10/2023	Esteban	Terminado
7.20.- Modelo 20	12/10/2023	12/10/2023	Esteban	Terminado
7.21.- Modelo 21	13/10/2023	13/10/2023	Zayra	Terminado
7.22.- Modelo 22	13/10/2023	13/10/2023	Zayra	Terminado
7.23.- Modelo 23	13/10/2023	13/10/2023	Zayra	Terminado
8.- Realizacion de animaciones	13/10/2023	28/10/2023	Aldo	Terminado
8.1.- Animacion 1	13/10/2023	15/10/2023	Aldo	Terminado
8.2.- Animacion 2	15/10/2023	17/10/2023	Aldo	Terminado
8.3.- Animacion 3	17/10/2023	19/10/2023	Aldo	Terminado
8.4.- Animacion 4	20/10/2023	22/10/2023	Aldo	Terminado
8.5.- Animacion 5 (KeyFrames)	23/10/2023	28/10/2023	Aldo	Terminado
9.- Realizacion de modelado de museo	29/10/2023	08/11/2023	Todos	En Progreso
9.1.- Vestíbulo	29/10/2023	01/11/2023	Esteban	En Progreso
9.2.- Sala 1	01/11/2023	03/11/2023	Zayra	En Progreso
9.3.- Sala 2	04/11/2023	04/11/2023	Aldo	En Progreso
9.4.- Sala 3	05/11/2023	05/11/2023	Esteban	En Progreso
9.5.- Salida para ver el mar	05/11/2023	08/11/2023	Aldo	En Progreso
10.- Primera visita virtual	09/11/2023	10/11/2023	Aldo	En Progreso
11.- Mejoras y retoques	10/11/2023	12/11/2023	Aldo	En Progreso
12.- Creacion de documentacion final	12/11/2023	18/11/2023	Zayra	En Progreso
12.1.-Realización del manual de usuario	12/11/2023	14/11/2023	Esteban	En Progreso
12.2.- Realización del manual de técnico	14/11/2023	16/11/2023	Zayra	En Progreso
12.3.- Pruebas en GitHub	16/11/2023	18/11/2023	Aldo	En Progreso
12.4.- Pruebas	18/11/2023	20/11/2023	Todos	En Progreso
13.- Entrega del proyecto final	21/11/2023	22/11/2023	Todos	En Progreso

Para observarlo mejor visite:
https://docs.google.com/spreadsheets/d/1Mur-xOHc1p8pzACTKCz-J5z-BH864xnd/edit?usp=sharing&ouid=108328204058368876804&rtpof=true&sd=true
NOTA: El archivo se hizo en una versión de excel actual, asi que es posible que no se alcance a visualizar los cuadros de color verde con azul



Project Scope

The objective of this project is to recreate a space from the well-known Pokémon series, considering some Pokémon to give the impression of a museum, as well as a recreational area for them.

- Design

The design of the facade was based on the Pokémon GO video game with a conservative style to what is known.

The reception is designed for visitors like Pokémon, where you can see some historical elements such as hieroglyphs or the anatomy of a Pokémon, with a back area where Pokémon can play and interact.

- References

In the museum, you can find representative figures from the series, including: Pokeball, Mimikyu, and Mew.

- Ambiance

Some additional items were included alongside the chosen objects, such as the addition of Mew, lamps, pots, trees, and an outdoor table.

Limitations

My limitations while working on this project throughout the semester were as follows:

- Lack of time

As this subject consumes a lot of time due to modeling, managing seven subjects made it difficult to dedicate time to this project. If I did, I had to dedicate a minimum of 2 hours a day from Friday, when the assignment was given, to Thursday, when reports and practices were due.

- Slow laptop

Similar to the above, having a computer without the necessary capacity to operate Maya or Visual Studio was challenging, as it took too long to open applications or compile code.

- Health problems

In the last two weeks before the project deadline, I underwent surgery, resulting in some time spent in the hospital. This situation, along with therapy sessions throughout the day, made it challenging.

- Lack of creativity

There was a moment where I got stuck at the end because I couldn't think of how to animate or what animation to apply. However, this turned out to be the least limiting factor as I received help from highly ingenious and creative minds suggesting animations for my objects.

Software Methodology

- Planning

At the beginning of the course, we were informed that a project would be required for this subject, but the details were not specified at that time. After a month, both theory and lab professors provided project requirements. The theory project allowed freedom to choose a theme for a museum, real or fictional, while the lab project gave us the option to work on the same theory project, but not submit the same work. After forming the teams, we decided:

- Our theme would be a Pokémon museum.
- Each member would create a different museum room, later combining them using the GitHub platform.
- Each person would create their animations.
- Progress updates would be checked weekly.

- Analysis

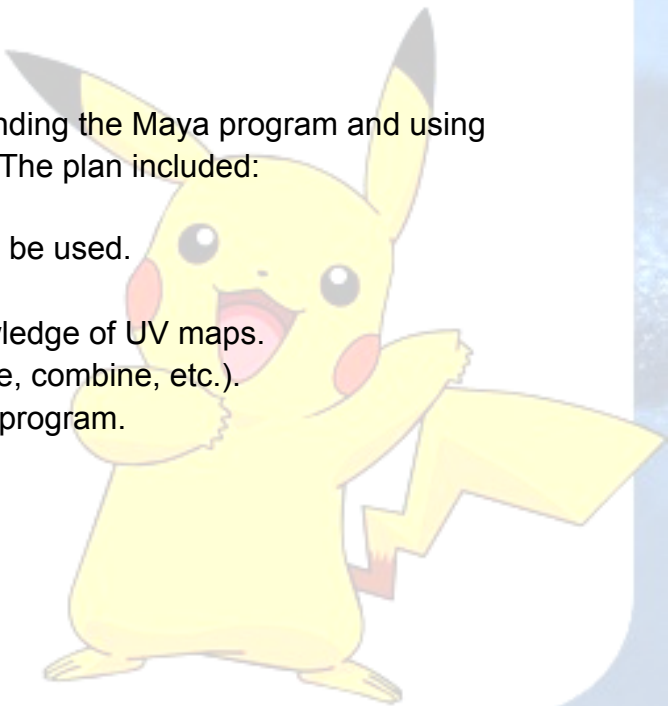
My lack of experience in the subject led me to find ways to be useful to my teammates, so the plan was:

- Be self-taught.
- Learn with the help of videos or like-minded individuals.
- Pay attention in lab classes.
- Ask questions about my doubts.

- Development

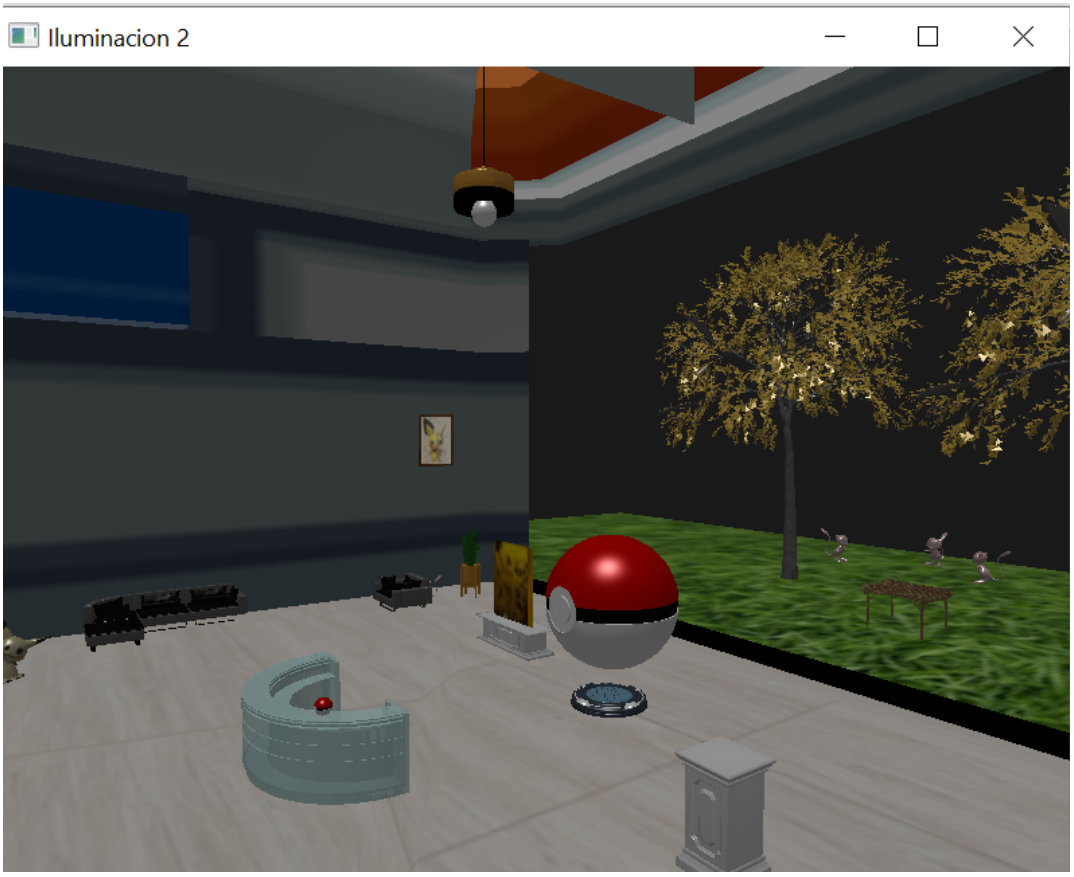
Unlike my team members, I was new to understanding the Maya program and using OpenGL, so at first, it was challenging to keep up. The plan included:

- Search for models on the internet that could be used.
- Learn to use the Maya program.
- Know how to apply textures and apply knowledge of UV maps.
- Use Maya's provided tools (separate, reduce, combine, etc.).
- Learn to reduce texture quality in the GIMP program.
- Use the pivot as a way to animate.
- Understand how to use shaders.
- Place lighting.



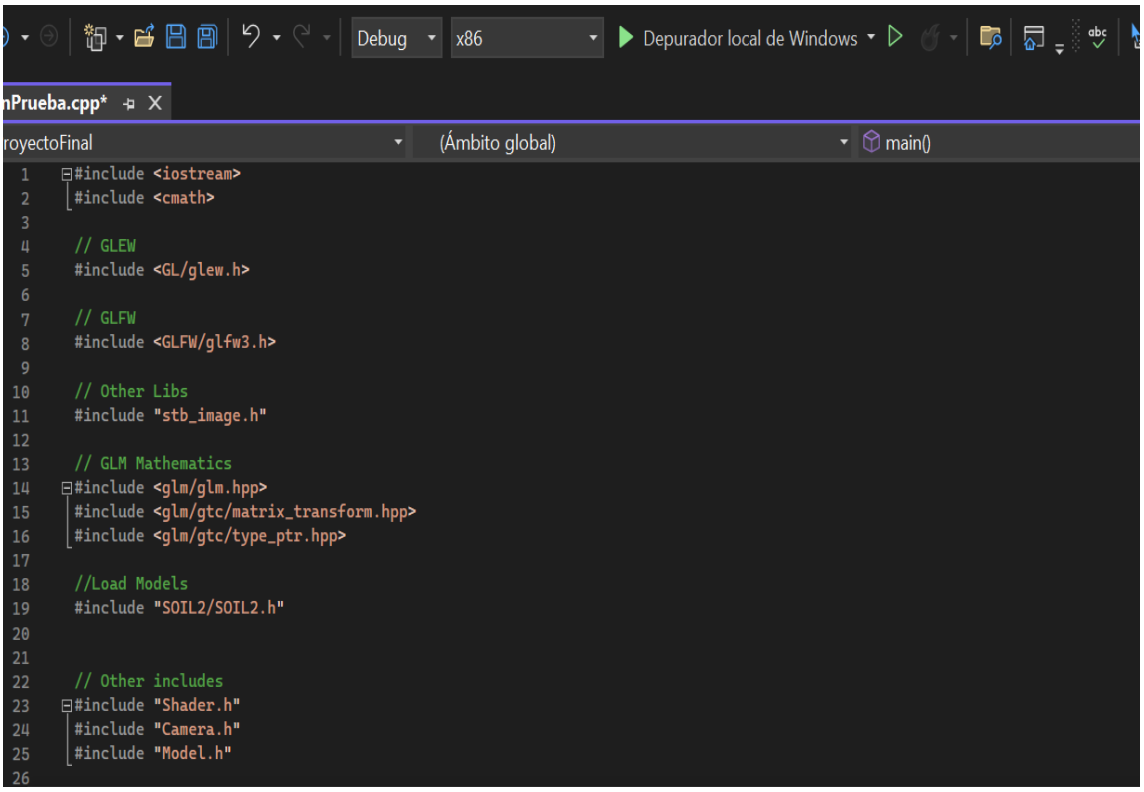
- Analyze what would be animated and choose the keys to use.
- Conduct tests and add or remove things depending on interests or perspective.

Results



Code Documentation

Libraries are added, and x64 is changed to x86.

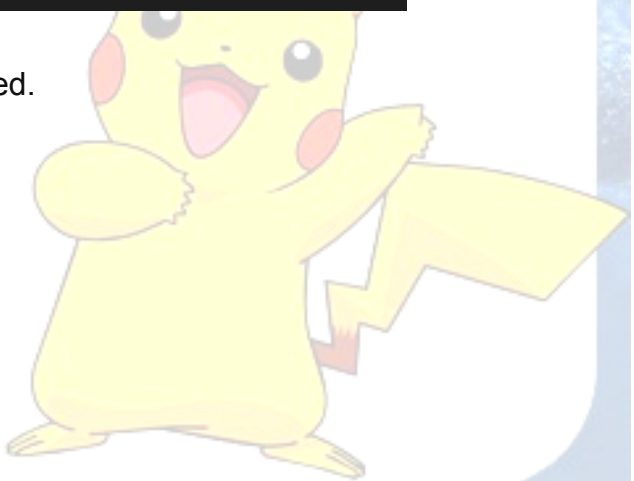



```cpp
#include <iostream>
#include <cmath>

// 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 are added, and the camera is configured.

```cpp
// Function prototypes
void KeyCallback(GLFWwindow* window, int key, int scancode, int action, int mode);
void MouseCallback(GLFWwindow* window, double xPos, double yPos);
void DoMovement();
void animacion();
void animacion1();

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

// Camera
Camera  camera(glm::vec3(0.0f, 0.0f, 3.0f));
GLfloat lastX = WIDTH / 2.0;
GLfloat lastY = HEIGHT / 2.0;
bool keys[1024];
bool firstMouse = true;
// Light attributes
glm::vec3 lightPos(0.0f, 0.0f, 0.0f); //posicion
```

Variables to be used throughout the project are created.



```
50
51      bool active = false;
52      bool activAnim = true;
53      bool rotatePoke2 = false;
54      bool rotatePintu = false;
55      bool movePika = false;
56      bool animacionActivada = false;
57      bool activePot = true;
58      bool moveSofa1Positive = false;
59      bool moveSofa1Negative = false;
60      bool circuito = false;
61      bool recorrido1 = true;
62      bool recorrido2 = false;
63      bool recorrido3 = false;
64      bool recorrido4 = false;
65      bool recorrido5 = false;
66      bool recorrido6 = false;
67      bool circuito1 = false;
68      bool reco1 = true;
69      bool reco2 = false;
70      bool reco3 = false;
71      bool reco4 = false;
72      float pikaSpeed = 0.01f;
73      float poke2Rotation = 0.0f;
74      float pokeRotation = 0.0f;
75      float pikaPosX = 0.0f;
76      float pikaY = 0.0f;
77      float pikaPosY = 0.0f;
78      float sofa1PosZ = -4.0f;
79      const float sofaSpeed = 0.01f;
80      const float bounceSpeed = 1.5f;
81      const float rotationSpeed = 50.0f;
82      float movKitY = 0.0;
83      float movKitX = 0.0;
84      float movKitZ = 0.0;
85      float rotKit = 0.0f;
```

Point lights are positioned where desired.

```
100
101     // Positions of the point lights
102     glm::vec3 pointLightPositions[] = {
103         glm::vec3(7.0f, 1.0f, 0.0f),
104         glm::vec3(1.0f, 1.0f, -3.0f),
105         glm::vec3(-4.5f, 1.5f, -4.0f),
106         glm::vec3(0.0f, 12.8f, -0.12f)
107     };
```

Models to be used are created.

```
204
205     Shader lightingShader("Shaders/lighting.vs", "Shaders/lighting.frag");
206     Shader lampShader("Shaders/lamp.vs", "Shaders/lamp.frag");
207
208     Model sofa((char*)"Models/Pokemon/sofaPok1.obj");
209     Model sofa1((char*)"Models/Pokemon/sofaPok2.obj");
210     Model mesa((char*)"Models/Pokemon/mesaRecep.obj");
211     Model poke((char*)"Models/Pokemon/pokebola1.obj");
212     Model pedes((char*)"Models/Pokemon/pedes.obj");
213     Model pika((char*)"Models/Pokemon/pikachufanta.obj");
214     Model piso((char*)"Models/Pokemon/pisoMus.obj");
215     Model pedes2((char*)"Models/Pokemon/pedes2.obj");
216     Model jero((char*)"Models/Pokemon/jeropok.obj");
217     Model fachada((char*)"Models/Pokemon/fachada1.obj");
218     Model poke2((char*)"Models/Pokemon/poke2.obj");
219     Model pintura((char*)"Models/Pokemon/pinturaPok.obj");
220     Model pedes3((char*)"Models/Pokemon/pedesPok.obj");
221     Model skybox((char*)"Models/Pokemon/skybox.obj");
222     Model lampara((char*)"Models/Pokemon/lampara.obj");
223     Model maceta((char*)"Models/Pokemon/maceta.obj");
224     Model mesaext((char*)"Models/Pokemon/mesaext.obj");
225     Model mew((char*)"Models/Pokemon/mew.obj");
226
227
```

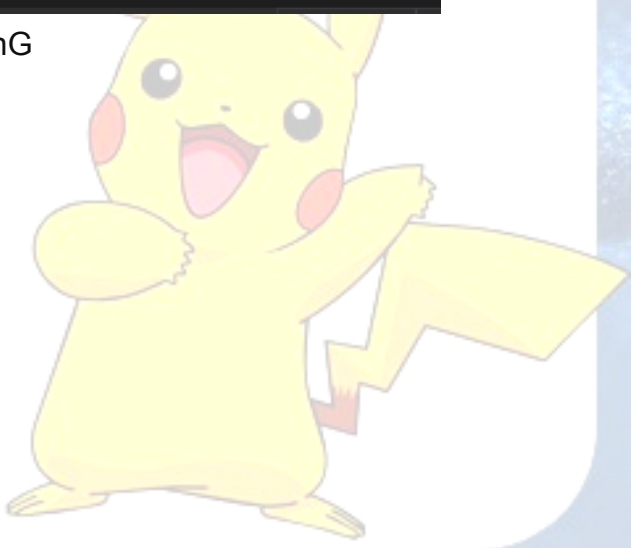
The main loop begins; it is important to call all the prototypes that will be used, in my case, it was what we already had plus animation and animation1.

```
// 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();
    //animacion(deltaTime);
    animacion();
    animacion1();


    // 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);
```

Point lights and the spot light are specified.

```
glUniform1i(glGetUniformLocation(lightingShader.Program, "material.diffuse"), 0);
glUniform1i(glGetUniformLocation(lightingShader.Program, "material.specular"), 1); //carga la especular comentar para no hacer cal
glUniform1f(glGetUniformLocation(lightingShader.Program, "material.shininess"), 32.0f);
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"), 0.3f, 0.3f, 0.3f); //un numero grande lo hace mas br
glUniform3f(glGetUniformLocation(lightingShader.Program, "dirLight.diffuse"), 0.3f, 0.3f, 0.3f);//se cambia ambiental y difusa
glUniform3f(glGetUniformLocation(lightingShader.Program, "dirLight.specular"), 1.0f, 1.0f, 1.0f); //aumenta la intensidad
//tansparencia imagenes png

// Point light 1
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[0].position"), pointLightPositions[0].x, pointLightPositions
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[0].ambient"), 0.05f, 0.05f, 0.05f);
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[0].diffuse"), LightP1.x, LightP1.y, LightP1.z);
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[0].specular"), LightP1.x, LightP1.y, LightP1.z);
glUniform1f(glGetUniformLocation(lightingShader.Program, "pointLights[0].constant"), 1.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program, "pointLights[0].linear"), 0.7f);
glUniform1f(glGetUniformLocation(lightingShader.Program, "pointLights[0].quadratic"), 1.8f);

// Point light 2
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[1].position"), pointLightPositions[1].x, pointLightPositions
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[1].ambient"), 0.05f, 0.05f, 0.05f);
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[1].diffuse"), LightP2.x, LightP2.y, LightP2.z);
glUniform3f(glGetUniformLocation(lightingShader.Program, "pointLights[1].specular"), LightP2.x, LightP2.y, LightP2.z);
glUniform1f(glGetUniformLocation(lightingShader.Program, "pointLights[1].constant"), 1.0f);
glUniform1f(glGetUniformLocation(lightingShader.Program, "pointLights[1].linear"), 0.7f);
glUniform1f(glGetUniformLocation(lightingShader.Program, "pointLights[1].quadratic"), 1.8f);

// Point light 3
```

Models are called to be drawn and presented in OpenG



```
//Carga de modelo
view = camera.GetViewMatrix();
model = glm::mat4(1);
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));

//model = glm::mat4(1);
//skybox.Draw(lightingShader);


//fachada museo
model = glm::mat4(1);
fachada.Draw(lightingShader);

//mesa recepcion
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(0.0f, 0.22f, 4.0f));
glEnable(GL_BLEND);//Avtiva la funcionalidad para trabajar el canal alfa se pone objetos translucidos
glBlendFunc(GL_SRC_ALPHA, GL_ONE_MINUS_SRC_ALPHA); //operaciones de transparencia
glUniform4f(glGetUniformLocation(lightingShader.Program, "colorAlfa"), 1.0f, 1.0f, 1.0f, 0.3f); //TRANSPARENCIA definir
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
mesa.Draw(lightingShader);
glDisable(GL_BLEND);  //Desactiva el canal alfa

//sofa
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-13.0f, -0.5f, 3.5f));
model = glm::rotate(model, glm::radians(90.0f), glm::vec3(0.0f, 1.0f, 0.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
sofa.Draw(lightingShader);

//sofa1
```

```
//maceta
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(11.0f, -0.47f, -6.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
maceta.Draw(lightingShader);

//maceta
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(-11.0f, -0.47f, -6.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
maceta.Draw(lightingShader);

//mesa exterior
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(0.0f, -0.47f, -18.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
mesaext.Draw(lightingShader);

//mew
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(0.0f, 1.65f, -18.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
mew.Draw(lightingShader);

//mew
model = glm::mat4(1);
model = glm::translate(model, glm::vec3(2.0f, -0.47f, -18.0f));
model = glm::rotate(model, glm::radians(270.0f), glm::vec3(0.0f, 1.0f, 0.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
mew.Draw(lightingShader);

glBindVertexArray(0);
```

DoMovement contains the ranges or keys that will make our objects move.

```
541  void DoMovement()
542  {
543
544      // Camera controls
545      if (keys[GLFW_KEY_W] || keys[GLFW_KEY_UP])
546      {
547          camera.ProcessKeyboard(FORWARD, deltaTime);
548
549      }
550
551      if (keys[GLFW_KEY_S] || keys[GLFW_KEY_DOWN])
552      {
553          camera.ProcessKeyboard(BACKWARD, deltaTime);
554
555
556      }
557
558      if (keys[GLFW_KEY_A] || keys[GLFW_KEY_LEFT])
559      {
560          camera.ProcessKeyboard(LEFT, deltaTime);
561
562
563      }
564
565      if (keys[GLFW_KEY_D] || keys[GLFW_KEY_RIGHT])
566      {
567          camera.ProcessKeyboard(RIGHT, deltaTime);
568
```

KeyCallback includes the preferred keys, and animation is initialized.

```
660  void KeyCallback(GLFWwindow* window, int key, int scancode, int action, int mode)
661  {
662      if (key == GLFW_KEY_Z && action == GLFW_PRESS)
663      {
664          rotatePoke2 = !rotatePoke2; // Cambia el estado de la rotación
665      }
666
667      if (key == GLFW_KEY_SPACE && action == GLFW_PRESS)
668      {
669          activePot = false; // Cambia el estado de la rotación
670      }
671
672      if (key == GLFW_KEY_8 && !rotatePintu) {
673          rotatePintu = true;  // Activa la rotación de la pintura
674      }
675
676      if (keys[GLFW_KEY_R] && !movePika) {
677          movePika = true;
678      }
679
680      if (keys[GLFW_KEY_1] && !moveSofa1Negative) {
681          moveSofa1Negative = true;
682      }
683
684      if (keys[GLFW_KEY_2] && !moveSofa1Positive) {
685          moveSofa1Positive = true;
686      }
687
688      if (GLFW_KEY_ESCAPE == key && GLFW_PRESS == action)
689      {
690          glfwSetWindowShouldClose(window, GL_TRUE);
691      }
692
693
```

Mouse movement on the machine is processed.

```
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);
}
```

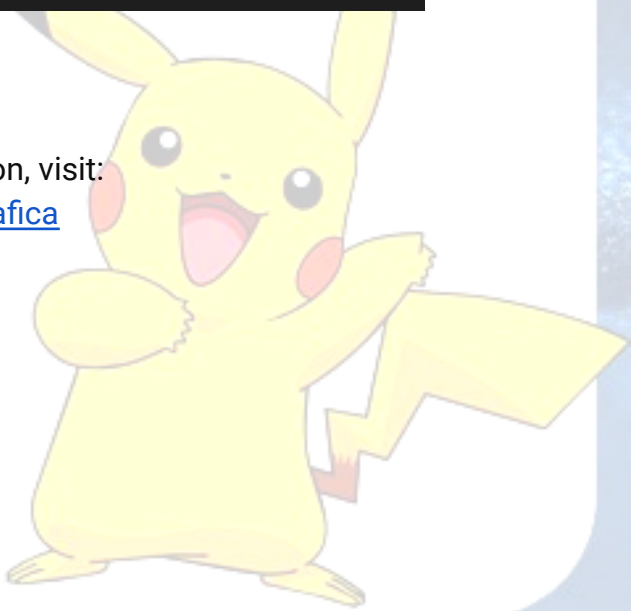
Void functions are created for complex animations.

```
void animacion() //circuito de la pokebola
{

    if (circuito)
    {
        if (recorrido1)
        {
            movKitY += 0.1f;
            movKitX += 0.1f;
            if (movKitY > 2)
            {
                recorrido1 = false;
                recorrido2 = true;
            }
        }
        else if (recorrido2)
        {
            movKitY -= 0.1f;
            if (movKitY < -1.5)
            {
                recorrido2 = false;
                recorrido3 = true;
            }
        }
        else if (recorrido3)
        {
            movKitY += 0.1f;
            movKitX += 0.1f;
            if (movKitY > 0.5)
            {
                recorrido3 = false;
                recorrido4 = true;
            }
        }
```

```
void animacion1() //circuito de la pokebola
{
    if (circuito1)
    {
        if (reco1)
        {
            rotPik = 360;
            movPikX += 0.1f;
            if (movPikX > 16.5) {
                reco1 = false;
                reco2 = true;
            }
        }

        else if (reco2)
        {
            rotPik = 90;
            movPikZ -= 0.1f;
            if (movPikZ < -9.0)
            {
                reco2 = false;
                reco3 = true;
            }
        }

        else if (reco3)
        {
            rotPik = 270;
            movPikY += 0.1f;
            if (movPikY > 1.75)
            {
                reco3 = false;
            }
        }
    }
```

End of the code.

For further understanding of the code and visualization, visit:
https://github.com/ZayraSheccid/ProyectoCompuGrafica



Conclusion

- Cruz Vazquez Zayra Sheccid

The purpose of this project was to demonstrate everything learned throughout the semester, although it was supposed to take less time since we started working on the models halfway through the semester. I realized that this was not the case.

Despite choosing the models, creating the facade was challenging, and in the end, it didn't turn out as I would have liked.

The most challenging part of completing the project was the animation since my figures were more like furnishings than characters or things that wouldn't look strange when animated. Simple animations were the easiest, as it involved modifying the rotate or translate in the main loop, adjusting the DoMovement, and KeyCallback.

As for complex animations, the difficulty lay in the analysis to make them work, which took me more than a day to figure out and implement correctly. In the end, it turned out as I wanted, so I am satisfied in that regard.

The most challenging aspect of this project was the abandonment by my teammates, one a few days before the deadline, removing the elements he had contributed, and the other just an hour before delivering the project. As a result, I was only able to complete the minimum requirements in the end.

In conclusion, I understood that, at the end of the day, computer graphics is a very beautiful and interesting subject. Although it consumes a lot of time, it is very rewarding to see models or animations created by oneself. I will carry that feeling of knowing how to use new software and a different way of using Visual Studio.

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