Universidad Nacional Autónoma de México

Facultad de Ingeniería

Lab. Computación Gráfica e Interacción Humano Computadora

Proyecto Final. Documento Ingles

Alumno: Fuchs Hernández Ricardo

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Grupo: 12

Objective

The student must apply and demonstrate the knowledge acquired throughout the course.

Introduction

The student must select a facade and a space, which can be real or fictional, and present reference images of those spaces for their 3D recreation in OpenGL. The reference image should display 7 objects that the student will recreate virtually, and these objects should resemble their reference image as closely as possible, including their setting.

Project Scope

The project aims to achieve a recreation of an environment or house of our choice. In this case, I chose to recreate a house from a cartoon that I loved as a child, "The Flintstones". Initially, I was unsure where to start, but with the help of the professor, I gradually created objects that I knew would be useful and provide assistance. The professor guided us in creating objects using our modeling software, which in this case was MAYA 2023. It is a very useful software that we have access to through UNAM with a one-year license, allowing us to utilize this excellent tool. The objects I wanted to create seemed relatively uncomplicated at first, but as I began modeling and applying textures, I realized they were somewhat challenging. I used two dinosaurs from my reference image included in the project planning.

Software Methodology

The software methodology used during the project was:

- Waterfall Methodology: This methodology is a sequential and linear approach where the stages of the software life cycle are performed in sequence, meaning each stage begins after the completion of the previous one. It is suitable for projects with stable and well-defined requirements from the beginning.

We employed this methodology as we created the objects one by one and then progressed to the remaining objects while adding textures and, if possible, animations. One crucial aspect to consider from the start, which I believe is the most challenging, is creating the facade of the house and determining the size of each object we plan to create to avoid having to recreate them later with different scales.

To create the house, we needed to refer to various reference images, including revisiting the cartoon to gather ideas and references for the house. We had to determine the textures to be used and devise a gradual process using cubes, triangles, and other shapes. The house, the character Pedro, and the family car were the most challenging objects as they had many vertices, and shaping them proved to be one of the most complex tasks in this project. However, with the help

of several MAYA tutorials and the professor's guidance, we managed to understand and apply the planned techniques.

The code used for the project was based on the "Complex Animation" provided by the professor, which served as a starting point for making the necessary changes and adapting it to my project's requirements.

To avoid confusion among the files generated in MAYA, I organized them into separate folders for the exported .obj files and textures of each object.

Once the animations and the environment to be used were created, we needed the completed objects with assigned textures, pivots, and determined scales. That's why I chose the waterfall methodology for this project.

```
//Shaders que se van a utilizar
Shader lightingShader("Shaders/lighting.vs", "Shaders/lighting.frag");
Shader lampShader("Shaders/lamp.vs", "Shaders/lamp.frag");
```

The image will display the shaders to be used during the project.

```
//Carga de modelos
Model carro((char*)"Models/Picapiedra/carro/carro.obj");
Model pedro((char*)"Models/Picapiedra/pedro/pedro.obj");
Model telefono((char*)"Models/Picapiedra/telefono/telefono.obj");
Model reloj((char*)"Models/Picapiedra/reloj/reloj.obj");
Model dino((char*)"Models/Picapiedra/dino/dino.obj");
Model tele((char*)"Models/Picapiedra/television/tele.obj");
Model dinomesa((char*)"Models/Picapiedra/dinosaurio/dinomesa.obj");
Model sillon((char*)"Models/Picapiedra/sillon/sillon.obj");
Model piso((char*)"Models/Picapiedra/piso/piso.obj");
Model lampara((char*)"Models/Picapiedra/lampara/lampara.obj");
Model mesa((char*)"Models/Picapiedra/mesa/mesa.obj");
Model cochera((char*)"Models/Picapiedra/cochera/cochera.obj");
Model chimenea((char*)"Models/Picapiedra/casa/chimenea.obj");
Model principal((char*)"Models/Picapiedra/casa/principal.obj");
Model cerca((char*)"Models/Picapiedra/casa/cerca.obj");
Model tapete((char*)"Models/Picapiedra/casa/tapete.obj");
```

We can see how the models are loaded, and as mentioned earlier, I separated them into folders to avoid confusion and facilitate adjustments for each object.

```
//Carga de modelo
//Carro
model = glm::mat4(1); //set de matrices

model = glm::translate(model, PosIni + glm::vec3(movKitX, 0, movKitZ));
model = glm::scale(model, glm::vec3(0.2f, 0.2f, 0.2f));
model = glm::rotate(model, glm::radians(rotar), glm::vec3(0.0f, 1.0f, 0.0));
model = glm::translate(model, glm::vec3(5.5f, 0.0f, -4.0f));
glUniformMatrix4fv(modelLoc, 1, GL_FALSE, glm::value_ptr(model));
carro.Draw(lightingShader);
```

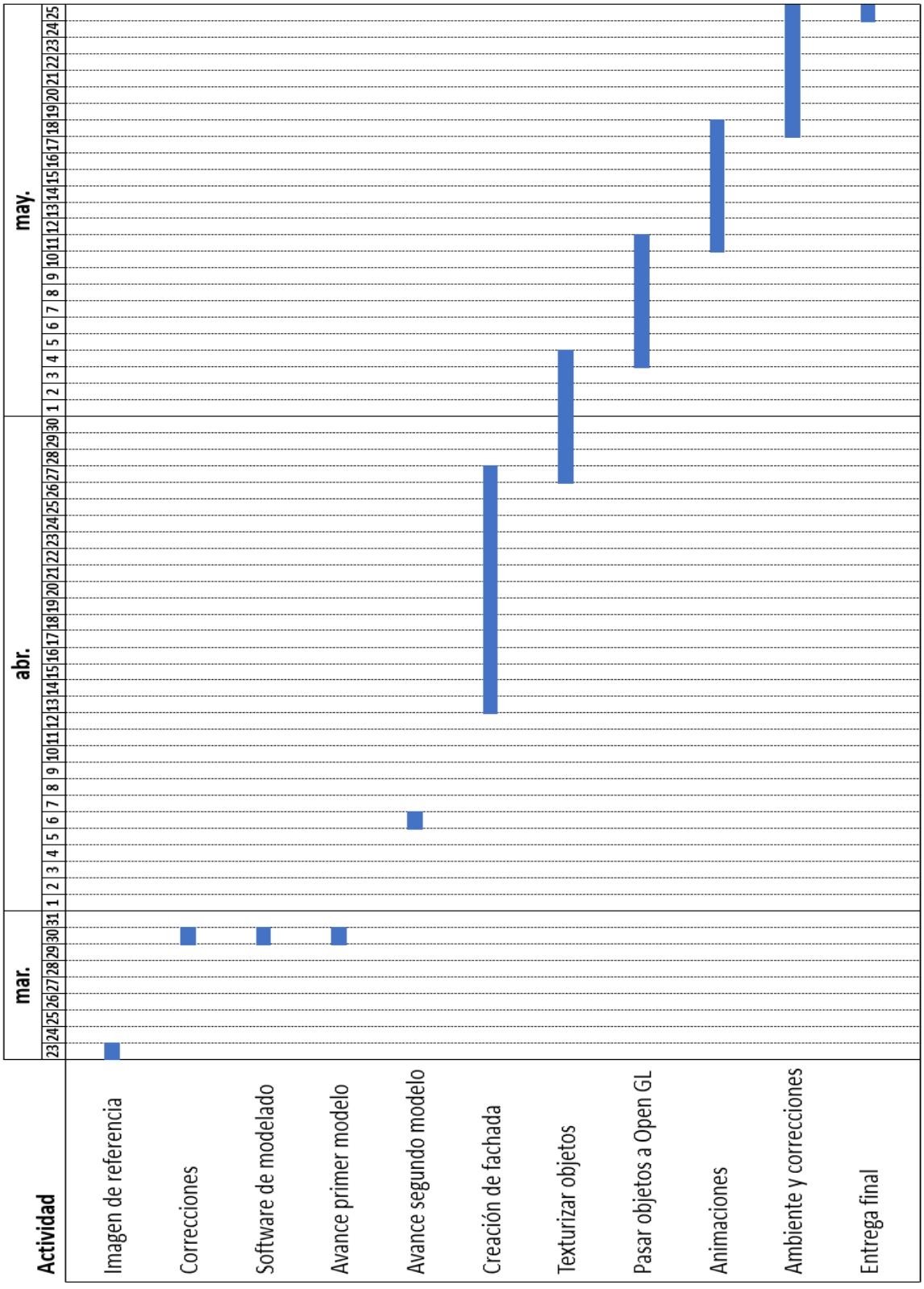
From this point, we will load the models and set the matrices for them to be drawn from the origin and proceed with the drawing process.

The "scale" part will help us determine the scale of the objects we are working with. After selecting the scale, we will then proceed to translate our object, which is when we reach the stage of arranging all the objects where we want them to be located. This placement will vary depending on each object, but part of the decision-making process for each object depends heavily on the location of the house because the objects will be placed inside the house, or most of them will be. In my case, one of the objects I chose is the Flintstone car, which will have a garage next to the house where the majority of the objects will be placed.

To move the camera and navigate within the environment, we will use the keys "W, S, A, D," allowing us to move freely throughout the defined space within the program.

```
// 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);
```

Gantt Chart


Actividad
mar.
abr.
may.
23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Imagen de referencia
Correcciones
Software de modelado
Avance primer modelo
Avance segundo modelo
Creación de fachada
Texturizar objetos
Pasar objetos a Open GL
Animaciones
Ambiente y correcciones
Entrega final

Conclusions

It was a very interesting project and, for me, one of the best projects I have worked on at the university. It applied many concepts learned in both theory and the lab, and I can confidently say that the lab portion had a more significant impact on learning and project completion. I greatly appreciated the opportunity to put into practice everything we covered throughout the semester, from creating objects to texturing them, animating them, and more. The project consumed a considerable amount of time, but it was necessary to deliver a high-quality project that met all the professor's requirements.

The most challenging aspect of the project for me was creating the house, Pedro, the Flintstone car, and the animations that I added to enhance user interaction with the program.

One thing I particularly enjoyed about this project was being able to recreate a house from a cartoon I watched as a child, something I never imagined would be possible. Moreover, I had the opportunity to start from scratch and add my personal touch, leaving my mark on the project.