



National Autonomous University of Mexico
Faculty of Engineering

Final Project.

Subject: Computing graphics and human-machine interaction.

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Final Project.

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Goal.

The student will conduct the final project of Computing graphics and human-machine interaction, in which he will apply the concepts seen throughout the course. The project will show a real housing complex (made in the laboratory), as well as two rooms according to the proposed images.

Requirements.

- Said document, in addition to being accompanied by reference photos, must list the five elements to be recreated in each room and the artistic style of each of the elements must be in accordance with a real or fictitious space according to its reference photos.
- Integrate synthetic camera.
- It must contain four animations.
- Project documentation must be prepared (Gantt chart, user manual where project objectives and interaction are stated, technical manual).
- The documentation must be in both Spanish and English and Google's translator should not be used 100% to do the translation as this will lower the score.
- A cost analysis of the project must be done (This analysis must contain how much it costs and how much you sold it, arguing said costs and prices).
- The delivery of documentation must be done in digital format.
- An executable file must be delivered (the executable, it is not the one in the debug folder).
- The realism of the space will be evaluated.
- The project must be on GitHub.

Introduction.

For this project, it was decided to model the Villa Olympic housing unit, located in the Tlalpan mayor's office in Mexico City, specifically on the nine-hectare property between Avenida Insurgents Sur and Avenida periférico, really close to Ciudad Universitaria.

The complex was built by the National Bank of Public Works and Services to House of Mexicana Olympic athletes, it consists of twenty-nine buildings that have a total of 5,044 rooms and 2,572 bathrooms in 904 apartments, of the total number of buildings, of which 24 were intended for male players and 3 for female athletes, the remaining two were intended for the press (Edificios de México, (s. f.)).

This place was initially chosen for team mates to live there, which made it easier to model the objects to place in the project. Taking advantage of the fact that the buildings have the same shape, the only thing missing is the design of a building and duplicating it as many times as desired, in addition, this place allows us to place various elements that allow us to cover the tax requirements by the teacher. It should be noted that we gave ourselves the freedom to modify some objects to fit our vision, such as reducing the number of buildings, the location of an OXXO store, and a generic court.

For the individual rooms I planned to use the *Low Poly style*, since it allows to make models a little simpler but at the same time they give it a unique style, so for this project I used references such as the video game **Tunic (2022)** and an image of a room with this style.

Finally, the design is shown with the layout of the elements considered in the project proposal.

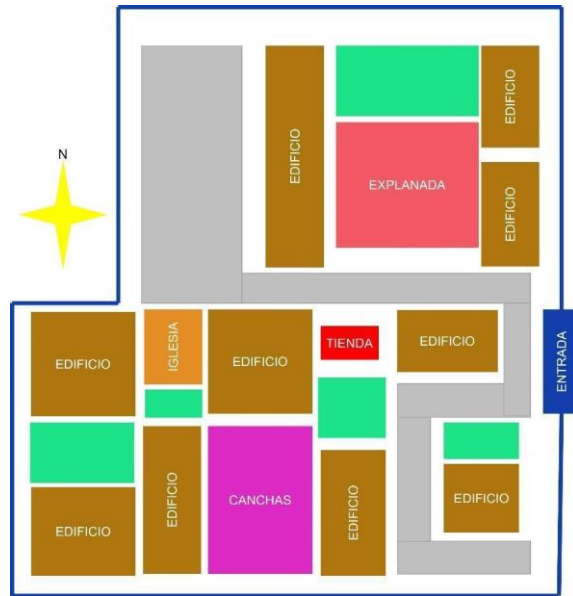


Figure 1. Proposal map.



Figure 2. Room 1 - Tunic.



Figure 3. Room 3 - Low Poly Room

A change was made for the front part, since the exposed proposal did not agree with the original idea, so the correct front part is presented below.



Figure 4. Reference unit building.

Development.

Model information.

Next, the download data of the models obtained from the internet and some details of the models made by my laboratory colleagues as well as me for this project will be shown.

Downloaded from the internet:

Model: Man, 3D Model.

Animation. Person rides a bike.

Website: archive3d.net

Within the download page no type of restriction or use license for the model was found, the animations for the wheels, the pedal and the man pedaling were added.



Figure 5. Man on bike

Model: Pete

Animation. Man, who walks towards the oxxo (Left Strafe Walking).

Website: Mixamo.



Figure 6. Man walking from the left side.

Model: Samoyedo Dog Model 3D

Animation. Dog walking around the unit.

Website: open3dmodel.com



Figure 7. Dog.

Model: Shannon.

Animation: Person running football soccer style.

Website: Mixamo.



Figure 8. Athlete.

Model: Sporty Granny

Animation. Person walking around unit (Female Walk)

Website: Mixamo.



Figure 9. Female athlete.

Model: Vintage VW Volkswagen Beetle Car Model 3D.

Animation. Car that simulates driving through the drive.

Website: Open3DModel.

It was decided to change the color to the original model due to a problem with the textures. The tires were exported separately so that their rotation can be animated correctly.



Figure 10. Bocho.

Made by the team:

Model: Basketball Court.

Software: Blender.

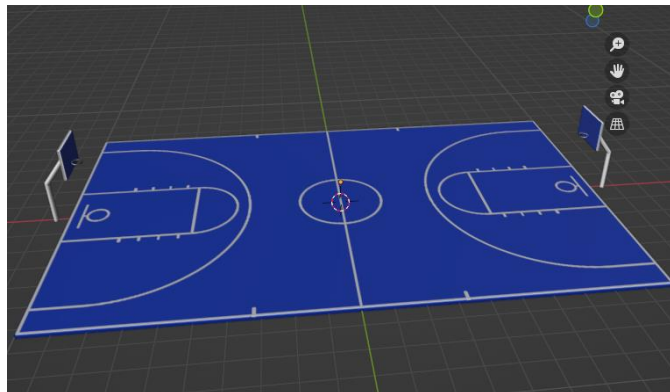


Figure 11. Basketball Court.

Model: Building.

Software: Blender.

The model corresponds to the buildings located in the unit. To model it, planes and cubes were used. With simple transformations and extrusions, a finish like our original references could be achieved.

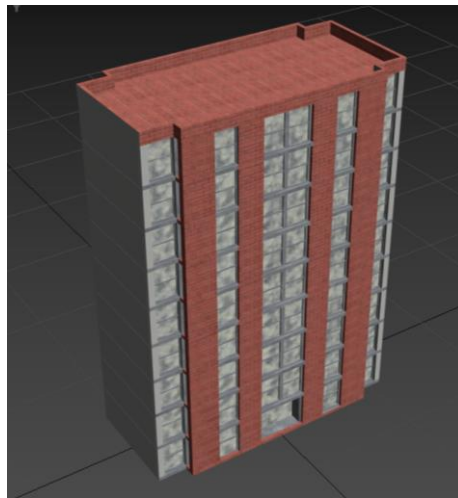


Figure 12. Building.

Model: Entrance.

Software: Autodesk 3ds Max.

This model corresponds to the entrance to the unit. Only primitive figures and a "TexPlus" were used for the numbers that indicate the direction.



Figure 13. Entrance.



Figure 14. Real front part of the entrance.

As seen in the reference image placed in the proposal, although a darker color texture was used for the model.

Model: Church.

Software: Blender.

The church model was also modeled using simple figures such as cubes to which scale and translation transformations were applied. For the stained-glass window, only a texture extracted from a photograph taken of the physical church was placed.

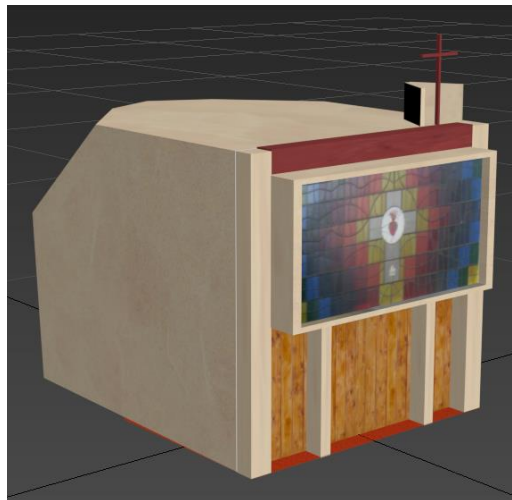


Figure 15. Church.

Model: OXXO.

Software: Autodesk 3ds Max.

The model corresponds to a branch of the Oxxo stores within the unit. For the modeling, construction plans, boxes, and cylinders were also to have the characteristic colors of the texture.



Figure 16. OXXO.

For the front part, the image “OXXO Store front part” downloaded from the “flickr.com” page and uploaded by the “FEMSA Corporativo” account was used.

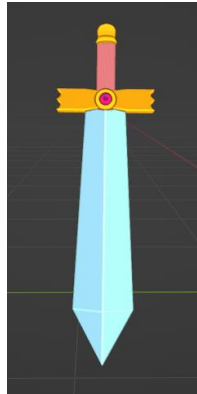


Figure 17. Front part OXXO.

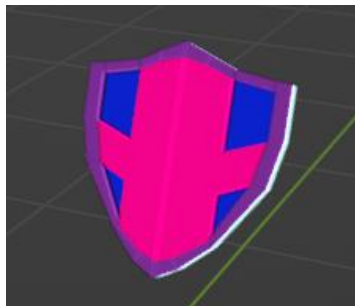
Model: Room 1.

Software: Blender.

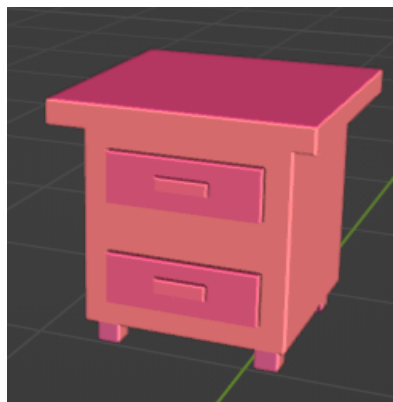
- **Sword.**



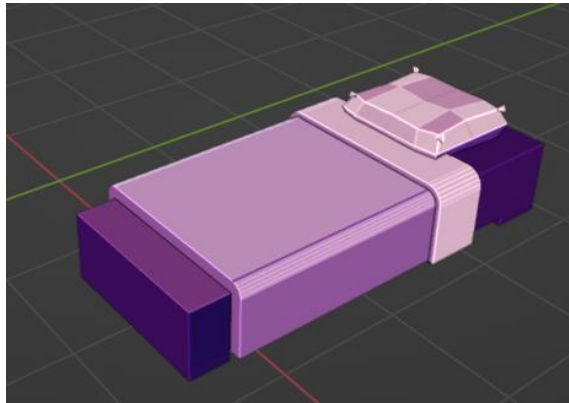
- **Shield.**



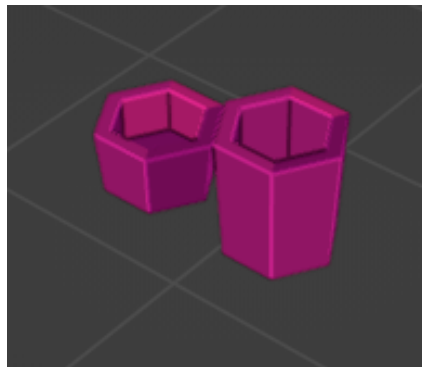
- **Piece of furniture.**



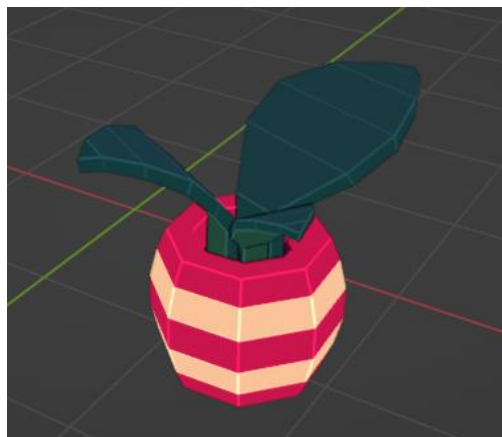
- **Bed.**



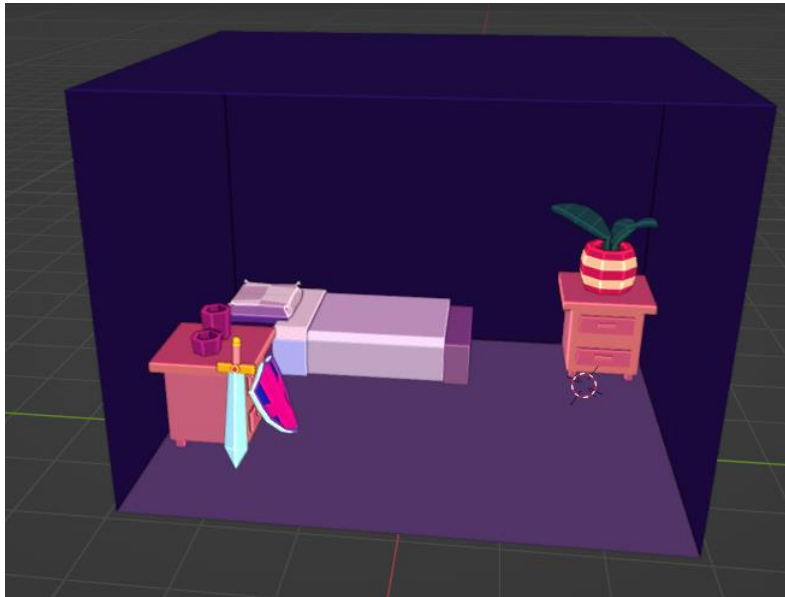
- **Flowerpot one.**



- **Flowerpot two.**



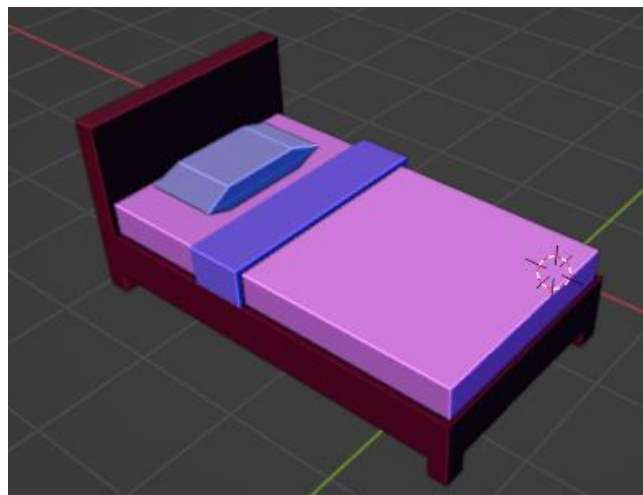
Room 1 in context:



Model: Room 2.

Software: Blender.

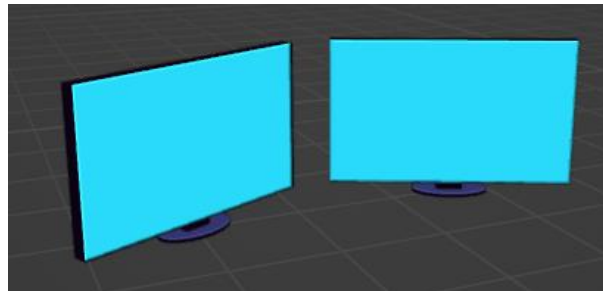
- **Bed**



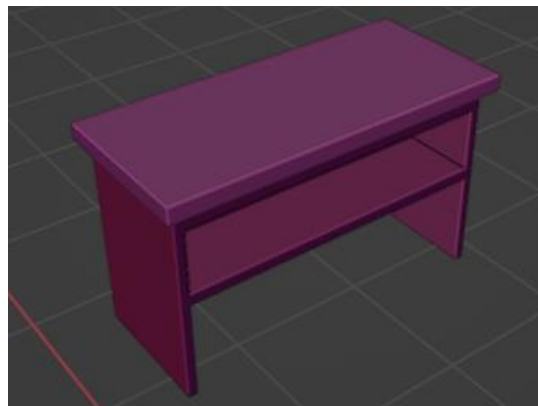
- **Window**



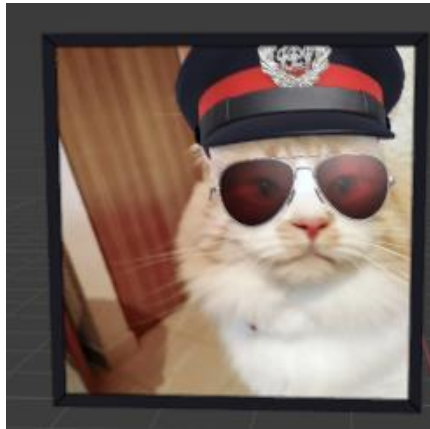
- **Screen**



- **Desk**



- **Picture**



Room 2 in context:



Explanation of activities.

Fernando Maceda Patricio.

Once the activities were distributed with the whole team, my main activities were:

- Store (Oxxo)
- Animated man on bicycle
- Animated man on tricycle with tamales

I started with the store model based on the following image:



Using the 3ds Max program I started creating simple figures, for the parking lot I used a plane and some cylinders, to create the advertisement I used a cylinder and a box adding and to create the store and the logo I used two boxes, with this I started adding the textures, create a UV map template and use the GIMP program to edit the store images and put them in their respective places.

Finally, the result is the following:



The next step was the model of the man on a bicycle, for this I downloaded a model made by Fima on the archive3d.net page (the model doesn't have any use license), I imported it into 3ds Max, and it already had all the textures, only I had to add the animation.



First separate the model by objects to have a better control of these, the objects are:

- Man
- Bicycle frame
- Wheels
- Pedals

The bike frame is a static object that only moves in the Z axis, so I didn't do any more modifications, for the wheels I added a rotation in the code to make it feel like it's

moving, I did the same for the wheel's pedals with this, the animation of the bike moving around the plane was complete.

For the animation of the man I had many problems since I only had the skin of the man, when I tried to move it the model was distorted a lot, this is where I discovered the rigging technique, which consists of putting bones on the model and the texture changes of position, with this technique I animated the man pedaling in 3d max using the Auto Key tool, once the animation was done I exported the model with .dae format as it was done in class and finally I just placed the character on the bicycle, the result was the following:



For the last part, I downloaded the model of the tricycle from the page 3dwarehouse.sketchup.com made by Luis Alberto Videira. The model has the General Model License which allows us to use the model for free.

With this I finished my main activities.

Reyes Avila David:

As soon as que activities were divided, I started with the ones I had to do, which are:

- Entrance.
- Car.
- Someone playing in the court.

The first thing I accomplished was the download of a character with an animation from Mixamo. I chose one with a texture which seemed like a soccer player. Then I settled him in the court, created some variables to move him through the plane and made the logic to move him and rotate him.

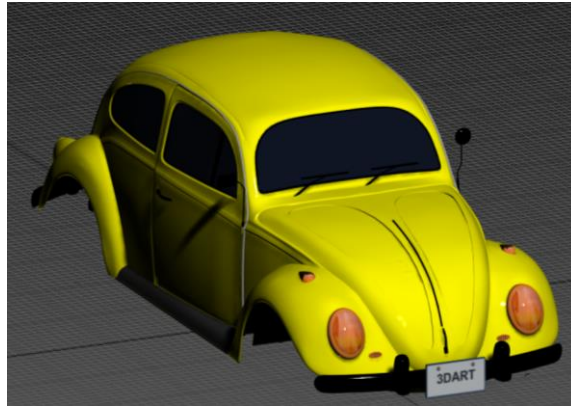


Then I began the creation of the building, I made it in 3ds Max, well before I had to watch some tutorials on YouTube because I had no idea of how I was supposed to begin. While I was creating the entrance, I had some serious problems with the exportation of the model to OpenGL. I still do not know what was wrong, but fortunately a teammate helped me to solve those problems.

So, the object results like this, it is some darker than the original one, (you can see it on the right), also I think it's a little bit larger.



Finally, I realized the animation of the car. I used a model from the Internet, it is a Volkswagen. There were few problems with the textures, so I had to change them. To pass it to OpenGL I exported the bodywork and the wheel separated.



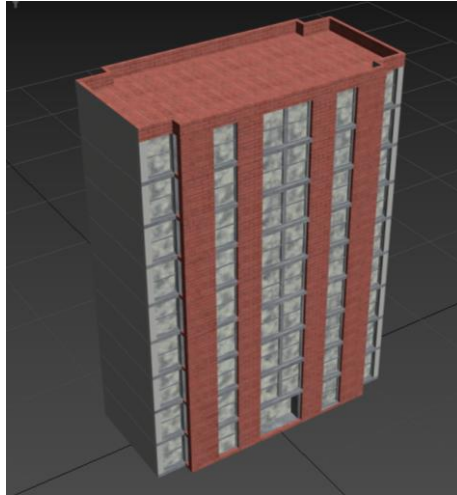
Then I collocated them next to the entrance so that I could make an animation of the movement of the car. The animation of the car needs the user type the space key to begin, the animation is formed of eight states, in the last one it packs and it is not possible to move it again.

Salinas Romero Daniel:

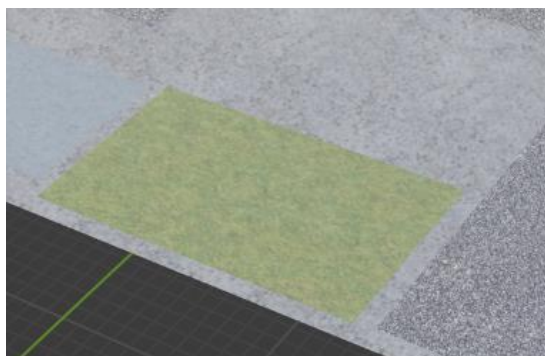
Once the tasks of the project have been distributed. I decided to use a different software than 3DS MAX. I used Blender because I know modeling and texturing tools a little better. Because the references for the building and church models were close to me, it was easy to get every angle of view of every object. The reason I did not use 3DS MAX is because it seemed a bit unintuitive when it came to loading textures, and there are plenty of tutorials out there to help.

The tasks to be performed were modeling and placing:

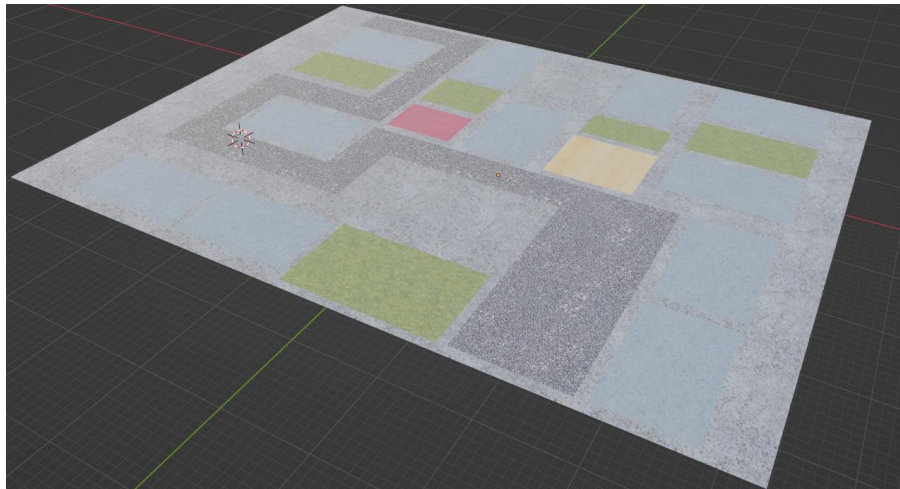
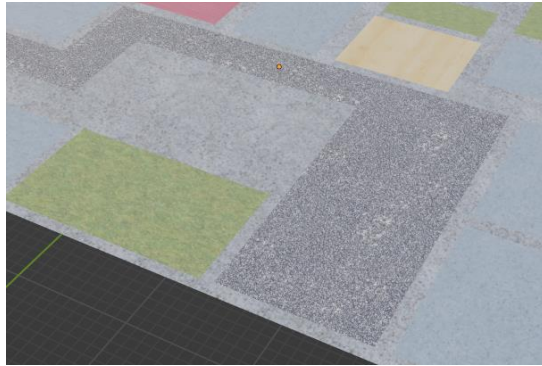
- Buildings.



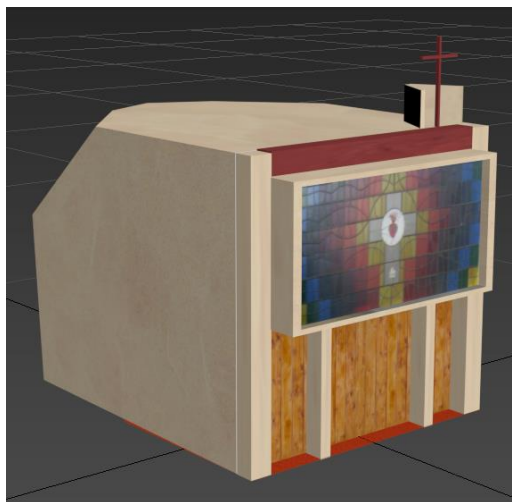
- **Green areas.**



- **Streets.**



- **Church.**





I must say that I had no problem modeling any of the above points. Each model was built from simple figures such as cubes or construction planes. So, there was no need to search for any free models on the internet. The only inconvenience I had was finding an adequate proportion and placing each building following the plan that we proposed in the design. However, reference photos were added to the design proposal.

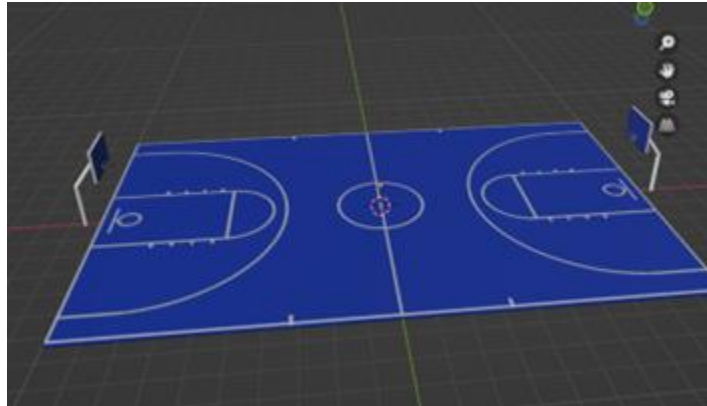
Vaquero Barajas Alexis:

The activities that I had to do were.

- Basketball court.
- Person walking a dog.
- Person walking.

For the basketball court, what I did was create the texture in Photoshop, where I used an image that had just the outlines of the court and then I added the blue background color to it so I could use it in the model. This one was created in Blender software, where the court was made with a cube, the baskets with cylinders and cubes, to finally be textured with the image.

The result:



For the person walking the dog, I used a model from Mixamo, which is a lady in sportswear doing a walking animation. Otherwise, I got the dog model from open3dmodel and to make its animation I used the “biped” tool in 3ds Max. I used the keyframe animation to each paw move in a 30-frame period.



Finally, for the person who walks, I exported a model from Mixamo that is a working person and performs an animation of walking from the left side.



Room 1.

To recreate the room, I used the reference image that I based on a low poly build. Cubes and cylinders are used to create the models, so that the proposed style is achieved using the bevel, extrusion, and division tools.

Regarding the texturing of the objects, it was conducted using the same reference image using the uv map, as well as using transformations (translation, rotation, and scale) to place the objects in a cube (simulating a room), in this way obtaining the expected result.



Room 2.

In the same way as the previous room, the bevel, extrude and split tools were used, in addition to texturing with the same image except for the window and the box, since they include a glass texture and my cat.

To place the objects in the same way, a cube with the corresponding transformations was used, the result:



Gantt Diagram

| Activities | Week one | Week two | Week three | Week four | Week five | Week six | Week seven | Week eight | Week nine |
|--|----------|----------|------------|-----------|-----------|----------|------------|------------|-----------|
| Project proposal. | | | | | | | | | |
| Entrance. Car, Person. | | | | | | | | | |
| Building (10). Esplanade, paths, and green area. Church. | | | | | | | | | |
| Basketball court. Person-Dog. Person walking. | | | | | | | | | |
| Room 1 | | | | | | | | | |
| Room 2 | | | | | | | | | |
| Execution Manual. | | | | | | | | | |
| User Manual. | | | | | | | | | |
| Credits. | | | | | | | | | |
| Documentation | | | | | | | | | |

Estimated costs and sale price of the project:

Together with my laboratory work team and my complementary tasks to this project, I oversee the following functions:

- Project leader.
- Commercial leader.
- Designer.
- Programmer.

To estimate the costs, a working day of 8 hours is considered.

| Job position | Salary per day | Work hours | Workdays | Date | Total |
|-------------------|----------------|------------|----------|--------------------|-----------|
| Project leader | \$1500 | 8 | 40 | March 25 to May 23 | \$60,000 |
| Commercial leader | \$900 | 6 | 20 | May 2 to May 27 | \$18,000 |
| Designer | \$700 | 6 | 40 | March 25 to May 23 | \$28,000 |
| Programmer | \$750 | 8 | 43 | March 25 to May 25 | \$32,250 |
| Total | | | | | \$138,250 |

Human Resources.

Considering slack of 5% and utility of 50%.

$$\text{Human Resources} = (1.5) \times (138,250) + (0.05) \times (138,250) = 207,375 + 6,762.5 = \text{\textcolor{red}{\$214,137.5}}$$

Services.

- **Internet.**
 - \$600.00 per month.
 - \$400.00 per 9 weeks.

- **Electric Power.**
 - \$150.00 average monthly.
 - \$100.00 per 9 weeks.

Services (Internet and pay electricity) = 400 + 100 = **\$500.00**

Stationery.

- Stationery: 50.00

Stationery = **\$100.00**

Net Payment.

NP = \$214,137.5 + \$500 + \$100 = **214,737.5**

NP = 214,737.5

According to these calculations, the final cost would be **\$214,737.5 (Mexican pesos)** with 9 weeks to deliver it, so you can pay 30% in advance and 100% upon completion of 9 weeks, in addition to being released and accepting the project.

Conclusions.

According to the project, I can conclude that the work summarizes perfectly everything seen in the laboratory, since designing models as well as importing, contains topics such as: Texturing, Model Hierarchy, Translation, Rotation, Scale, and others.

It was interesting to have conducted this project, besides that I consider it is great workload. However, this project made me admire more the work that is done in this type of projects with greater difficulty (such as movies, artistic designs, and video games), because now I know that a difficult job must be done.

References.

- Edificios de México (s.f.). Villa Olímpica Miguel Hidalgo [mensaje en un blog]. Recuperate from <https://www.edemx.com/site/villa-olimpica-miguel-hidalgo/>
- MIXAMO. (2022). Recuperate from <https://www.mixamo.com/#/>
- Open3DModel. (2022). Recuperate from <https://open3dmodel.com/es/>