



## Final Project

Universidad Nacional Autónoma de México  
Facultad de Ingeniería

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Computación Gráfica e Interacción  
Humano-Computadora

Ing. Luis Sergio Valencia Castro

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Due Date: November 25, 2021

## INTRODUCTION

In this project we applied all the knowledge we acquired during the semester, the knowledge of the theory class and the laboratory class to manage different tridimensional models, lights, and animations inside the Visual Studio GUI, to create a tridimensional where there is a fully furnished house with different animations. It is important to mention that in order to finish the project successfully we have to know programming fundamentals in C language to write efficient code.

## SUMMARY

In this project we had to work with the last code we used in the laboratory practices of the subject Graphic Computation and Human-Computer interaction, where the first job to do was to download different models in the internet page “Turbo-Squid” and adapt the necessities within the furnitures around the house, where we played with the transformation about scale, position and rotation to use then in an appropriate way, where the moldes were designed on the software “Blender” y “3D Max” so we can import the result to Visual Studio, we also worked the texturized in those softwares. We continue with the procedural animations and make the keyframes animation, finishing the work with the music library and the camera configuration to navigate in the space without a problem.

## WORK DIVISION

The team consist in three people, Miguel Alejandro Padilla Reyes, Eslavica Monserrat Ramirez Flores y Fernando Rodrigo Valenzuela García de León.

We divided the jobs in the next table:

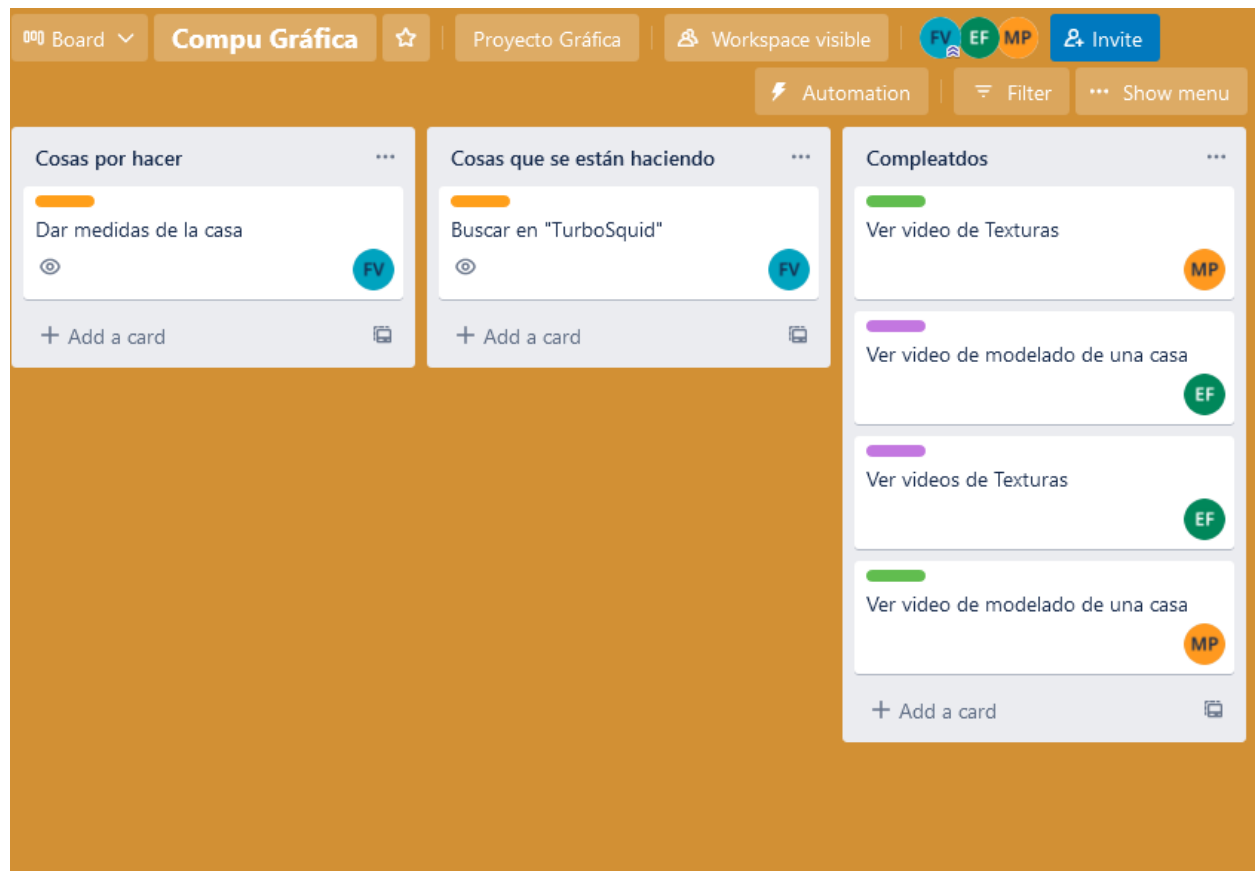
MEMBER	TASK
Padilla Reyes Miguel Alejandro	Texturized, meet documentation creator, modeler support and Keyframes animator.
Ramirez Flores Ramirez Flores	Modeler, implementation support and texturized support.
Valenzuela García de León Fernando Rodrigo	Project leader, modeler searcher, main implementation, procedure animator and documentation creator.

## TOOLS AND COMMUNICATION

For the correct process of the project we decided to use as our main communication channel the services of Google Meets, to make our different meetings so we can show our progress in the tasks so we can request for more tasks for the next meet. Another essential communication channel we used was the Whats App application, where we have a constant communication process if a problem or an issue happens.

We also worked with the tasks management using two different internet pages, the first one is GitHub where we uploaded different files so the other teammates can make use of them. We also worked with Trello where we can see the process of work of the different teammates and view if they finished the task they were asked to do while we worked on the project.

The model software we used to retouch some furniture was “Blender” and “3D Max” to generate files with the OBJ and MTL extension to implement them in OpenGL.



Cosas por hacer

Modelado de la casa

EF

Texturizado de la casa

MP

+ Add a card

Cosas que se están haciendo

Agregar muebles a Visual Studio

FV

+ Add a card

Compleatdos

Ver video de Texturas

MP

Dar medidas de la casa

FV

Buscar en "TurboSquid"

FV

Ver video de modelado de una casa

EF

Ver videos de Texturas

EF

Ver video de modelado de una casa

MP

+ Add a card

Cosas por hacer

Traducir minutas

Hacer la última minuta

Acabar la traducción de la documentación

+ Add a card

Cosas que se están haciendo

Animaciones principales

Buscar la librería de audio

Modificar texturas de la casa

Documentación general

+ Add a card

Compleatdos

Modelado de la casa

Texturizado de la casa

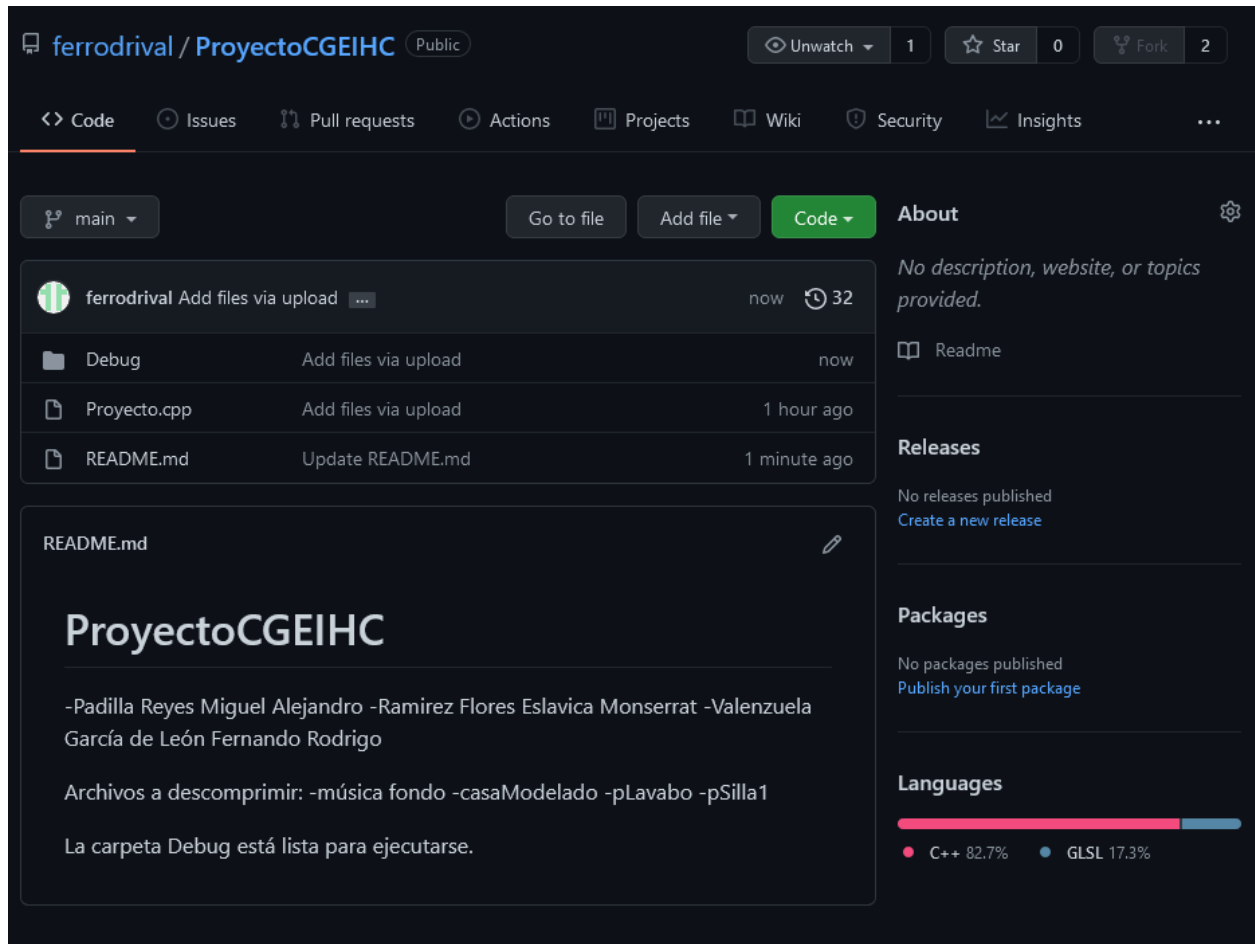
Ver video de Texturas

Dar medidas de la casa

Agregar muebles a Visual Studio

Buscar en "TurboSquid"

Ver video de modelado de una casa



## MODELING AND HOUSE TEXTURIZING

The most important part of the project is the house. We previously used a prototype to model where we worked with “Blender”, so we can build the house as the prototype we created before. After we finished the house with doors and windows, we imported the house to 3D Max to apply the textures.

It is important to mention that in the moment we model the house, we had the measurements of the house thanks to the videogame “Sims 3” where we made the prototype to know the exact measurements we need to have. We also worked with the primitives to modify them to adequate the form we needed for the house, we also used some plains to make the texturizing easier for the house floors.

About the textures, we had to search more images corresponding to the object to texturize it in 3D Max because it made it easier for these types of jobs. We also used it to generate MTL and OBJ Files for their implementation in Visual Studio.

## OBJECT MODELING

The most important part of the project is the house. We previously used a prototype to model where we worked with “Blender”, so we can build the house as the prototype we created before. After we finished the house with doors and windows, we imported the house to 3D Max to apply the textures.

When we had an object, it was imported to Visual Studio, for these objects we transform them on scale and rotation to adequate them in a desirable space and save the code lines to use them in the final implementation with the house.

It is important to mention that various models we try to use could not be imported because it generated problems with the textures, so we searched for similar models to complete the furniture of the house.

## VISUAL STUDIO IMPLEMENTATION (OPENGL)

The implementation to Visual Studio with the different models was using the “Model” function that helps to import the OBJ file, we also need the address of the file for the correct use of the model.

After that function we use a variable “model” to add a translation, rotation and scale to our models, after “staticShader” where we can reference the same model, we modify it and finish it with “*model.Draw(staticShader)*” where the word “model” is the name we assign to the object we want.

It is important to mention that a bunch of the objects we used were downloaded from the page TurboSquid, and we also implement different portraits with images that later we decided to animate.

The Turbosquid objects are:

- Bed (Old Wood Bed 3D model)  
<https://www.turbosquid.com/3d-models/old-bed-pillows-3d-model-1409056>
- Bunk Bed (3D Bunk Bed Lowpoly)  
<https://www.turbosquid.com/3d-models/3d-bunk-bed-1581707>

- Picnic Table (table t 1)  
<https://www.turbosquid.com/3d-models/free-wood-table-3d-model/867557>
- House Table (Coffe Table Central)  
<https://www.turbosquid.com/3d-models/modern-coffee-table-c4d-free/1094971>
- Sofa (Sofa GM Italia Plutone)  
<https://www.turbosquid.com/3d-models/sofa-plutone-max-free/657824>
- Kitchen dishwasher (3D model Kitchen Sink)  
<https://www.turbosquid.com/3d-models/3d-model-kitchen-sink-1757550>
- Oven (Whirlpool Gas Cooker)  
<https://www.turbosquid.com/3d-models/whirlpool-gas-cooker-max-free/750657>
- Bathroom (The small washbasin)  
<https://www.turbosquid.com/3d-models/3d-small-washbasin-model/933649>
- Inodoro Sink (Toilet & Toilet Plunger (LD))  
<https://www.turbosquid.com/3d-models/toilet-plunger-3d-model/501150>
- TV (TV 1 c4d) <https://www.turbosquid.com/3d-models/free-tv-1-3d-model/521933>
- Bote de Basura (Urn model)  
<https://www.turbosquid.com/3d-models/urn-solidworks-urna-model-1542446>
- Bath (Squaro Edge Bath 3D model)  
<https://www.turbosquid.com/3d-models/bath-3d-model-1145938>
- Plushie (Teddy Bear)  
<https://www.turbosquid.com/3d-models/free-teddy-bear-3d-model/955596>
- Closet (3D model White kids drawer)  
<https://www.turbosquid.com/3d-models/3d-model-drawer-bedrooms-1229280>
- Videogame (Atari-ish 3D) <https://www.turbosquid.com/3d-models/atariish-3d-1760002>
- Can (Trash Basket)  
<https://www.turbosquid.com/3d-models/everyday-trash-bin-dxf-free/604444>
- Chair (Chair) <https://www.turbosquid.com/3d-models/free-obj-mode-chair/909968>

For the correct implementation of these, we had to make a lot of tries to see if the object is as correct as we desire to be, with the correct scale, also thinking about the space of the different animations we want to manage.

## ANIMATIONS

After we implemented some objects inside the house we thought a lot of different animations to make, we are going to describe them:



1. The first animation is with the portraits we implemented with the images, where we worked each of the transformations like position, rotation, scale, moving 5 portraits at the same time.
2. The second animation is an interaction between the TV and the sofa, where the TV changes its scale and the sofa changes its position and rotation.
3. This animation changes the position using two axes, applying more complexity to the animation, watching how the chairs pass through the table.
4. The fourth animation is about a bear plushie where it begins to move and go up and then starts rotating and speeding up, at the same time it moves vertically until the animation finishes and repeats itself.
5. The fifth animation is about two portraits of the superior level, where two of them scale down and then change position and rotation, when it finishes this, they scale up again, finishing with the animation and repeating itself.

## CONTROLS

The next table shows the inputs for the different actions we can do.

INPUT	ACCIÓN
Mouse Movement	Camera Orientation
W	Move Forward
A	Move to the left
S	Move backward
D	Move to the right
ESC	Close the program
1	Begins animation 1
2	Begins animation 2
3	Begins animation 3
4	Begins animation 4
5	Begins animation 5
0	Restore the animation values

P	KeyFrames animation
Space Bar	Car Animation

## TECHNIQUE STUDY

We researched about it, a virtual space can be cost between \$2,000.00 MXN to \$185,000.00 MXN and it depends about the different elements that the virtual space has, in our project, thinking about the objects implemented and the animations, we can say the cost of the project would be near \$6,000.00 MXN, because it was a simple furnished house with animations, and it is not directly interactive and also some textures are too general for the house, finally with its execution time.

## PERSONAL TASK DESCRIPTION AND CONCLUSIONS

### **Miguel Alejandro Padilla Reyes:**

The activities I did during the implementation of this project were about helping the house texturing process, and also I was in charge of making the meet documentation, supporting with some ideas for the keyframes animation.

The first part of the texture process was to practice with different models to manage the technique using Blender, and also search different web pages where we can download texture images to have a better realism of the models that we would need, I had to wait for the house model my teammate Eslavica was working on, she does not made me wait too much so I could work with time, and we worked together to know the best colors for the house model.

But this was not the best option, we had problems while importing the house to Visual Studio because we had to change the software to and texture once again the house with the same materials, we did not understand why this happened but we successfully resolve the problem as soon as possible.

Once we had the models that could be in the house by my teammates Eslavica and Rodrigo, I proposed some animations and I realized the keyframe animation, for me, this animation technique is easier than the others we saw in the laboratory, and I got some hints that helped me to implement them as easier as I could.

Finally I was the one who wrote the meet documents of each meet we had on these days, where we talked about different tasks we had to do, and also we talked about the ideas we had to satisfy the project requirements and express the problems we had and search a solution as a team, also we talked about the new tasks that were assigned and the achievements we reach for the next meet, we also had a schedule control and the attendance to work in harmony.

### **Eslavica Monserrat Ramirez Flores:**

My job in this project was to model the house architecture, and all its creation was recreated by the house that Rodrigo made in the "Sims 3" videogames, so I could model the house with realistic measures.

First I worked on "Blender" software, where I could easily create some walls, ceilings and floors. I use a convenient tool that Blender has, it is known as "Archimest" where I could easily create the walls and make them with some thickness and add floors and ceilings.

After that, I created the stairs step by step using some cube sections so the architecture of the house also was helped by this with the garage, in the main structure of the house I used plains that I modified to make a good perspective.

With the architecture finished I send the file to my teammate Miguel so he can texture the floors and the walls.

After creating the OBJ and MTL files to make the modifications needed for the house, we used "3D Max". I personally liked this software because it was easy for me to work and with the help of my teammate Miguel we made some holes for the house to make the doors and windows holes.

I also helped to texturize the house from "3D Max" because Blender gave us a lot of trouble with how the textures worked on Visual Studio.

I did changes in textures like the floor, the walls, the stairs, using neutral color to be appealing at view, this selection of colours were selected by me and Miguel.

I helped to generate additional models in "3D Max" like the ball and eight portraits with the pictures of our pets and personal hobbies to use as decoration in the room, finally I researched about an audio library, making sound proofs to generate the project.

## **Fernando Rodrigo Valenzuela García de León:**

My principal job was to organize and distribute the different tasks so we could work by the best way possible, trusting my teammates with their respective tasks, ones I delivered the main tasks, we divided the work in making the house, researching the library for the audio and implement textures, and the final main task was mine, it was to search different models to import them to the project using the page “TurboSquid”.

First I searched the essential objects like the table, the chairs, the kitchen furniture like the fridge, the main oven to cook and also the different type of beds whose correspond to rooms that the house has, but for my surprise, when I downloaded a OBJ File and import it to Blender to export another OBJ File that Visual Studio can manage, but it sent me an error message, or the textures that come with the texture were not applied correctly, so I had to search more to import them, making it a repetitive and long task, while we were progressing with the different meets and talk about the models that has been implemented and what objects were still unavailable to find.

Inside the meets we also made a meet documentation in spanish made by m y teammate Miguel and I traduce them to english, and also manage the Trello tasks, being more time dedicated to the management of the project. We also progress in the general documentation of the project, in spanish and english.

Once I received the house model, there were a lot of problems importing them in Visual Studio because we had a lot of error messages, we thought it was about the textures that were in the MTL file, but I configured the correct way but the error messages still there, so we decided to import it to 3D Max because the house was made in Blender, and we modify it in 3D Max so we could export it again with an OBJ file to import it to Visual Studio, and it worked, but we had problems with the texture because it was not seen as it should be, so we worked again in 3D Max.

The last thing I work on was in the 5 principal animations first thinking about how to apply to a conceptual level and coding level, playing with the different objects imported to do the animations, it took too much time and effort, there were occasions where the animations didn't execute as it should be, but it was corrected until I get the results that we wished, finally working in the documentation.

## MEET MINUTE

**MEET:** No. 2.  
**DATE:** November 4, 2021.  
**TIME ON MEET:** 21:00 Hrs - 22:30 Hrs.  
**MINUTE CREATION:** 23:50 Hrs - 00:20 Hrs.  
**PLACE:** Videoconferencia por Google Meet.

### MEET OBJECTIVES:

- Organized the team to work on the “Computación Gráfica e Interacción Humano-Computadora” subject project

### PARTICIPANTS:

NAME	ATTENDANCE
MP. Padilla Reyes Miguel Alejandro	Attended 4/11 Necessary attendance
ER. Ramírez Flores Eslavica Monserrat	Attended 4/11 Necessary attendance
FV. Valenzuela García de León Fernando Rodrigo	Attended 4/11 Necessary attendance



## **SUBJECTS TREATED**

1. Check the project requirements.
2. Localize the web tools for the project.
3. First division of the tasks.

## **CONCLUSIONES**

1. We identify the different parts that we have to investigate and to realize for the correct elaboration of the project.
2. The tools that will be used are GitHub and Trello, to have an adequate project progress.
3. We divided in three parts the most important tasks.

## Pending Tasks

No.	Tasks	Responsible	Due Date
1	Start the models in Blender and let to know the different measures of the house to the other team members.	● FV	Next Meet 9/11/21
2	Get familiarized with the documentation format, and watch texture and modeling tutorials in Blender.	● MP	Next Meet 9/11/21
3	Start the house model and watch texture and modeling tutorials in Blender.	● ER	Next Meet 16/7/21

## MEET MINUTE

**MEET:** No. 2.  
**DATE:** November 10, 2021.  
**TIME ON MEET:** 19:30 Hrs - 21:00 Hrs.  
**MINUTE CREATION:** 21:30 Hrs - 22:00 Hrs.  
**PLACE:** Google Meet.

### MEET OBJECTIVES:

- Analyze the progress of the previous tasks, talk about the details that need to be corrected about the progress and talk about new tasks to finish the project.

### PARTICIPANTS:

NAME	ATTENDANCE
MP. Padilla Reyes Miguel Alejandro	Attended 10/11 Necessary attendance
ER. Ramírez Flores Eslavica Monserrat	Attended 10/11 Necessary attendance
FV. Valenzuela García de León Fernando Rodrigo	Attended 10/11 Necessary attendance



## **SUBJECTS TREATED**

1. Show the progress of the house model and the furniture in it.
2. Add activities to each member about their tasks.
3. Talk about the different animations that could fit the project having in mind the different requisites that the project needs.

## **CONCLUSIONES**

1. For the next meet we need to have a good portion of the house model and how to use the different models we used during the project.
2. The models created by the members will be texturized.
3. We proposed different ideas about the animations, how we are going to assign them and the new tasks we have to accomplish to reach all the different requisites of the project,

## Pending Tasks

No.	Tasks	Responsible	Due Date
1	Continue with the Blender Models.	● FV	Next Meet 9/11/21
2	Practice texturing and modeling on Blender with the different models and search for an audio library to make sounds on OpenGL	● MP	Next Meet 9/11/21
3	Continue with the house modeling.	● ER	Next Meet 16/7/21

## MEET MINUTE

**MEET:** No. 3.  
**DATE:** November 15, 2021.  
**TIME ON MEET:** 20:30 Hrs - 22:30 Hrs.  
**MINUTE CREATION:** 22:30 Hrs - 23:00 Hrs.  
**PLACE:** Google Meet.

### MEET OBJECTIVES:

- Analyze the progress of the tasks that were made in the previous meet and see the project progress.
- We will assign new tasks to each of the teammate in order to progress more in the project to finish the requirements.
- Express the difficulties and new solutions to them.

### PARTICIPANTS:

NAME	ATTENDANCE
MP. Padilla Reyes Miguel Alejandro	Attended 15/11 Necessary attendance
ER. Ramírez Flores Eslavica Monserrat	Attended 15/11 Necessary attendance
FV. Valenzuela García de León Fernando Rodrigo	Attended 15/11 Necessary attendance

## **SUBJECTS TREATED**

1. Present the progress of the models we wanted to import, like the house and furniture.
2. Show the progress of the knowledge we acquired in Blender and start texturizing the house.
3. Propose animations to satisfy the different tasks we had.

## **CONCLUSIONES**

1. The implementation of the house and its components had a considerable progress.
2. We verified what we know about the texture subject about objects and we started the texturize of the house, we accepted proposes for the textures to use.
3. We propose different ideas for the animations, and also assign new tasks to satisfy the pending requirements of the project.

## Pending Tasks

No.	Tasks	Responsible	Due Date
1	Finish the importing of the models to finish the house and support the documentation.	● FV	Next Meet 21/11/21
2	Start applying texture to the models and search for a sound library.	● MP	Next Meet 21/11/21
3	Search por the sound library and finish the implementation of the house model.	● ER	Next Meet 21/7/21

## MEET MINUTE

**MEET:** No. 4.  
**DATE:** November 21, 2021.  
**TIME ON MEET:** 20:00 Hrs - 22:30 Hrs.  
**MINUTE CREATION:** 22:30 Hrs - 23:00 Hrs.  
**PLACE:** Google Meet.

### MEET OBJECTIVES:

- Analyze the progress of the tasks that were made in the previous meet and see the project progress.
- We will assign new tasks to each of the teammate in order to progress more in the project to finish the requirements.
- Express the difficulties and new solutions to them.

### PARTICIPANTS:

NAME	ATTENDANCE
MP. Padilla Reyes Miguel Alejandro	Attended 21/11 Necessary attendance
ER. Ramírez Flores Eslavica Monserrat	Attended 21/11 Necessary attendance
FV. Valenzuela García de León Fernando Rodrigo	Attended 21/11 Necessary attendance



## **SUBJECTS TREATED**

1. Show the final models about the house and furniture.
2. Show the progress with the texture of the house.
3. Add tasks to each teammate to finish the project.
4. The problems we had in the import of the house model and coding of the project.
5. Propose animations to satisfy the requirements.

## **CONCLUSIONES**

1. We validated the house model and the furniture.
2. We verified the texture applied to the house, accepting the proposal.
3. Search for a solution to implement the house to Visual Studio.
4. We propose ideas for the animations, as well as assign new tasks to finish the project.

## Pending Tasks

No.	Tasks	Responsible	Due Date
1	Implement the models to Visual Studio, do the animations, finish the documentation.	● FV	Next Meet 24/11/21
2	Start the animations, support the documentation of the project and try the sound.	● MP	Next Meet 24/11/21
3	Support the project documentation, try the sound and start the animations.	● ER	Next Meet 24/7/21