



National Autonomous University of Mexico

Faculty of Engineering

Division of Electrical and Electronic Engineering

Subject: Computer Graphics and Human-Computer  
Interaction

Final Project

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# **Final Project: “Gumball’s House”**

## **Technical manual**

### **Statement and Objective**

#### **Statement**

The aim is to create a virtual environment of the student's choice, where they can apply all the knowledge acquired during the course, including concepts such as texturing, animation, modeling, among others.

#### **Objectives**

The objective is to recreate the virtual environment of "Gumball's House," which will involve creating the complete exterior facade of the house and two rooms, namely the living room and the bedroom, for this project. Additionally, the goal is to incorporate animations such as sunset, turning lights on and off, opening and closing doors, and animating objects like the skateboard found in the bedroom.

### **Scope and Limitations**

#### **Scope**

Taking into account all the aforementioned objectives, the aim is to recreate the objects, animations, and overall graphical environment that successfully captures the style of the cartoon itself.

#### **Limitations**

Understanding the above and taking into account the nature and demands of this project, it is possible that not all desired details within the house can be achieved, either due to a lack of knowledge in modeling and texturing, specifically in efficiently handling Blender software.

## Gantt diagram



Image 1: Gantt Chart

## **Flowchart**

- Object selection
- Creation of interior and exterior blueprint
- Avatar selection
- Scale selection for interior objects
- Object search
- Object texturing
- Creation of the house exterior
- Animation
- Camera creation
- Documentation
- Delivery

\*\*The sales cycle is a while loop until a key is pressed.

## Development Methodology

The choice of development methodology for a project of this nature depends on several factors, such as the project's size, specific objectives, client requirements, development team, and time constraints. However, agile methods are more suitable for this type of project as they offer greater flexibility and adaptability, which are constantly required for creative aspects that often undergo changes. Therefore, the Kanban agile methodology has been selected, and to implement this methodology, we will outline the stages through which the project was carried out:

### 1. Identification of workflow stages:

The project's workflow was analyzed, and five stages were determined:

- Not started
- Starting
- All good
- Issues
- Almost finished
- Completed

Each stage has a legend that helps and motivates team members.

### 2. Creation of the Kanban board

The Miro tool was used to create a Kanban board, where we can visually see the different tasks with their respective dates, ensuring clear organization from the beginning of all the activities that need to be done. The board utilizes a color scheme to indicate the tasks' subject matter and includes columns to track their progress and status on a weekly basis.

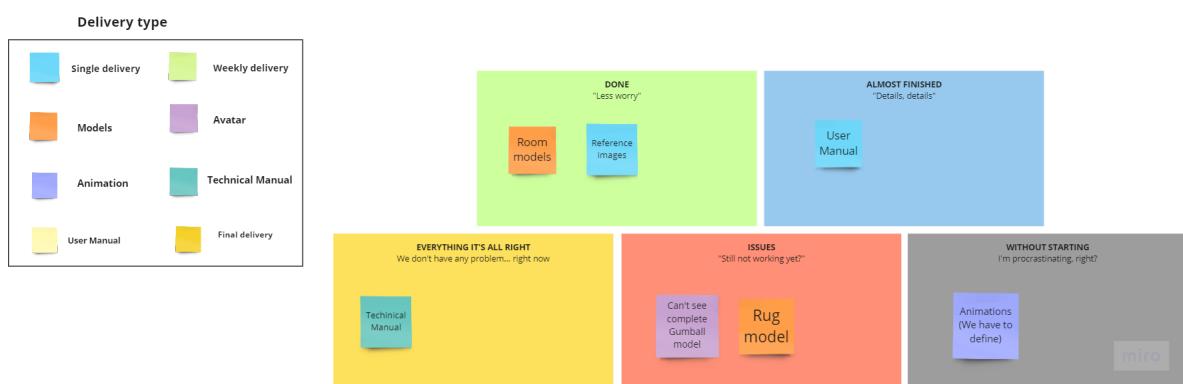


Image 2. Board in Kanban (Week 0)

### 3. Task identification

The types of deliverables were classified based on the specific areas to be covered and the frequency of each delivery.

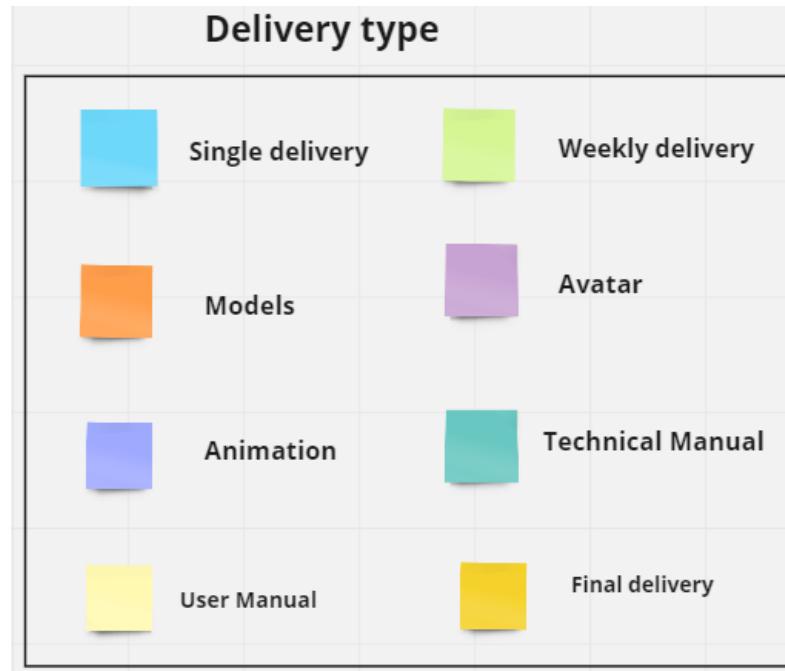


Image 3. Types of deliveries

### 4. Establishment of boundaries and task movement as a mark of "progress"

Every time a task was completed or progressed, it had to be moved to the corresponding column indicating the progress, allowing us to track the project's advancement.



Image 4. Board in Kanban (Week 3)

## **5. Prioritization and re-prioritization.**

At times, it was necessary to move tasks to different columns in order to prioritize them and, if needed, complete the assignment.

## **6. Identification of improvements.**

Every week, in addition to updating the board, all previous work was reviewed to identify any errors or if there were any questions that had been consulted with the professor, in order to provide feedback and enhance the progress.

### **Reference images**

For this final project, the cartoon "The Amazing World of Gumball" was chosen. Below are various images depicting the house facade and the two interiors to be modeled.

- **House facade reference**



Image 5: House Facade (Exterior)



Image 6: House Facade (Exterior, Angle 2)

- Room's Reference

### Room 1: Living Room

Objects to recreate: Sofa, rug, coffee table, lamp, and paintings.



Image 7: Room 1 Reference: Living Room

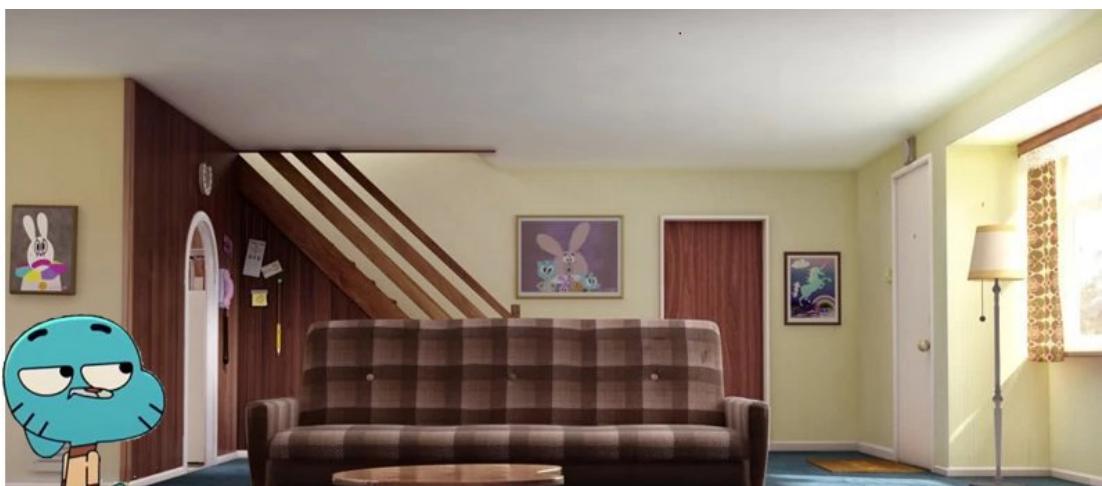


Image 8: Room 1 Reference: Living Room (Angle 2)

- Room 2: **Gumball's Room**

Objects to recreate: Bunk bed, nightstand, desk, PC, chair, and skateboard.



Image 9: Room 2 Reference: Gumball's Room



Image 10: Room 2 Reference: Gumball's Room (Angle 2)



Image 11: Room References

## Plans and Models

### Plans

In order to achieve this model, a plan had to be created in order to have an approximation of the measurements and scales.

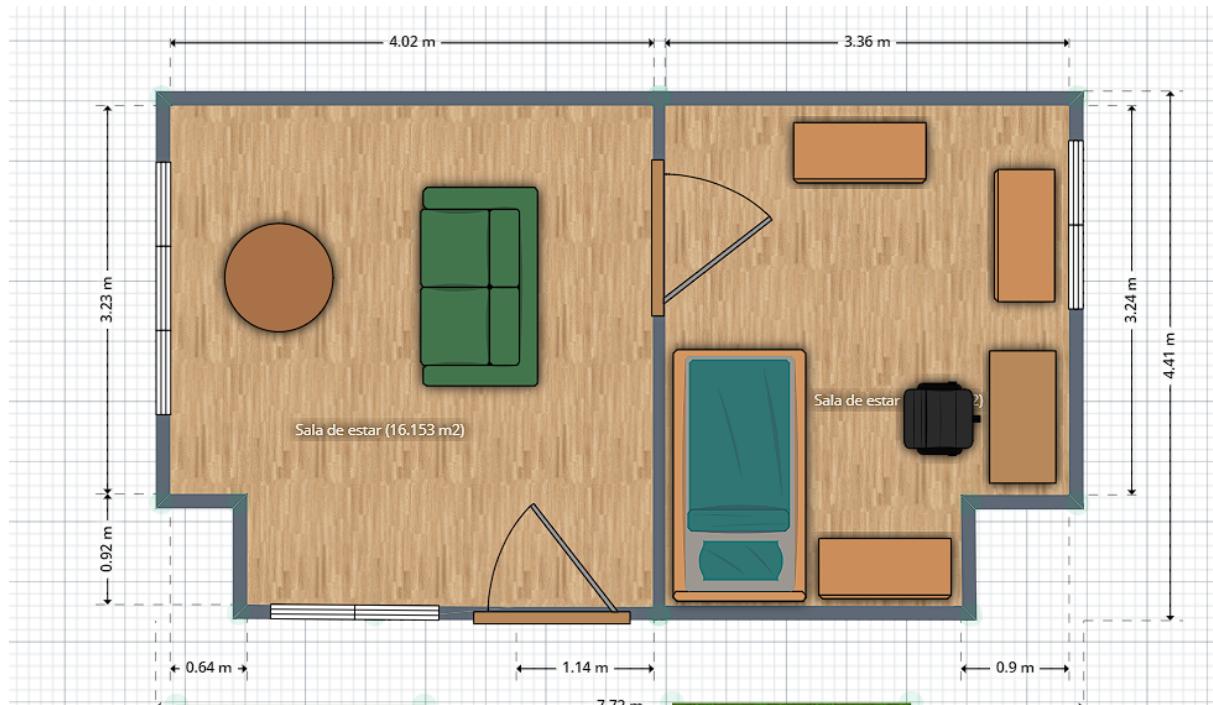


Image 12: House Floor Plan

### Models

All the models that were used for the development of the project are attached (they are already referenced).

#### Gumball Model

"Gumball (FusionFall Heroes)" (<https://skfb.ly/onqT7>) by kbaffourjr is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

#### Parts of the house

##### ❖ Mailbox

"Mailbox" (<https://skfb.ly/orQsN>) by julius.j.bib is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>)

## **Living room**

### ❖ **Armchair**

"armchair-sillon" (<https://skfb.ly/otuQC>) by Emanuek is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

### ❖ **Lamp**

"Modern lamps" (<https://skfb.ly/oznUt>) by Jack John is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

### ❖ **Coffee Table**

"Round Range Coffee Table, Oak and Copper" (<https://skfb.ly/6AnHZ>) by MADE.COM is licensed under Creative Commons Attribution-NonCommercial (<http://creativecommons.org/licenses/by-nc/4.0/>).

## **Room**

### ❖ **Bunk**

"Simple Bunk Bed" (<https://skfb.ly/6FZZr>) by Blender3D is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

### ❖ **Nightstand**

"13\_BURO MADERA" (<https://skfb.ly/oqqvA>) by WHA Arquitectos is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

### ❖ **Desk**

"Simple dirty Desk" (<https://skfb.ly/opWOM>) by Thunder is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

### ❖ **PC**

"Personal Computer" (<https://skfb.ly/6u6KN>) by UROD Engine is licensed under Creative Commons Attribution-ShareAlike (<http://creativecommons.org/licenses/by-sa/4.0/>).

### ❖ **Office Chair**

"Office Chair" (<https://skfb.ly/owNAR>) by Mutablecoffee is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

### ❖ **Skateboard**

"skateboard" (<https://skfb.ly/l4j3hd0a>) by Chaitanya Krishnan is licensed under Creative Commons Attribution (<http://creativecommons.org/licenses/by/4.0/>).

## **Cost and Price Analysis**

Cost and price analysis within a programming project involves identifying and quantifying all the necessary elements and resources for its execution. Therefore, we will divide it into two parts: fixed costs and variable costs. Taking into account determining factors such as the project duration (35 days), 8-hour workdays, and consumed inputs, we will calculate the final amounts required.

### **Fixed Costs**

#### **Electricity (CFE Contract)**

We have tariff 1 and the suggested price based on the amount assigned per consumption level according to the CFE portal in 2023. We take the difference between the cost for excess consumption (3,474 MXN) and the intermediate consumption (1,188 MXN).

#### **Natural Gas Service**

Gas supply is required every 6 months, contracted with the company UNIGAS. The invested amount is 1,900 MXN in 2023. The result is multiplied by the hours of service usage during the project's operating time, estimated at 3 hours per day.

#### **Drinking Water Service**

The water supply corresponds to a domestic contract with SACMEX. The bimonthly charge is a total of 203 MXN. The result is multiplied by the hours of service usage during the project's operating time, estimated at 3 hours per day.

#### **Internet**

We have a 50 Mbps plan contracted with TELMEX, with a monthly price of 389 MXN. The result is multiplied by the hours of service usage during the project's operating time, estimated at 4 hours per day.

#### **Phone Plan**

We have a phone plan with TELCEL, which costs 250 MXN per month, with 8 hours of usage per day.

#### **Cost per Hour of Service**

The cost for the human capital involved in the project corresponds to a fixed amount of 150 MXN per hour. The calculation is based on 8 hours per day for the 35 days worked.

Servicio	Precio por hora [MXN]	Horas por día [HRS]	Total por día [MXN]	Total por un mes y 4 días [MXN]
Servicio de electricidad (CF)	2.037	8	16.296	570.36
Servicio de gas (CF)	0.4256	3	1.275	321.76
Servicio de agua (CF)	0.1364	3	0.5456	102.045
Servicio de Internet (CF)	0.522	4	2.088	398.54
Servicio de telefonía (CF)	0.336	8	2.688	260.752
Costo por hora de servicio (CF)	150	8	1,200	42,000
<b>Subtotal</b>				<b>43,653.45</b>

Cost Table (1)

## Property (Housing)

The residential property generates an annual expense of 380 MXN. Consider the 35 business days of project operation.

## Food

A monthly expense of 2500 MXN is considered for groceries. Consider the 35 business days of project operation.

## Computer Equipment

We have a computer equipment [Asus VivoBook] with an approximate value of \$17,000 MXN. Considering that computer equipment has a lifespan of 5 years in Mexico, we obtain the residual value, which is 3400 MXN, and the depreciation of the equipment is 13,600 MXN. For preventive and corrective maintenance purposes, a charge of 15 MXN per functional hour of the equipment is applied. Consider the 35 business days of project operation.

Servicio	Precio por día [MXN]	Total por un mes y 4 días [MXN]
Vivienda (CF)	1.021	35.744
Alimentos (CF)	80.64	2,822.56
Equipo de Cómputo (CF)	15	$525 + 13,600 = 14,125$
<b>Subtotal</b>		<b>16,983.30</b>

Cost Table (2)

## Variable Costs

### Software and/or Licenses

The project development did not require the use of any paid licenses since Blender is open-source software.

### Graphic Design

The cost of a graphic designer is added, with a base salary of 10,000 MXN per month. Consider the 35 business days of project operation.

Servicio	Precio por día [MXN]	Total por un mes y 4 días [MXN]
Software y/o licencias (CV)	0	0
Diseñador gráfico (CV)	322.580	11290.32
Equipo de Cómputo (CF)	15	$525 + 13,600 = 14,125$
<b>Subtotal</b>		<b>25,415.32</b>

Cost Table (3)

The previous calculations allow us to obtain the total cost of the project, where the sum of the variable and fixed costs, including the applied tax, gives us a **TOTAL AMOUNT** of: **86,052.07 MXN.**

## **Conclusions**

Upon reviewing the main objectives, it can be observed that the majority were successfully accomplished. Furthermore, implementing all the theory behind a graphical environment helped reinforce concepts that may have been not fully understood in the theoretical part. As a personal comment, even though I don't have mastery over the use of the open-source software Blender, it was the part that I enjoyed the most as it gave me a certain level of freedom when it came to modeling.

## **References**

1. OBS Business School. (n.d.). Cómo elegir la metodología de un proyecto. Retrieved from <https://www.obsbusiness.school/blog/como-elegir-la-metodologia-de-un-proyecto>
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# Final Project: “Gumball’s House”

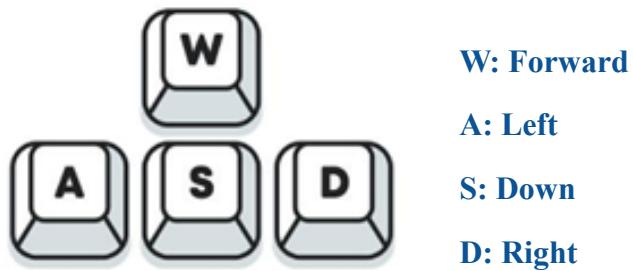
## User Manual

### Objectives

This manual has been created to explain how to navigate and observe the implemented animations in the project.

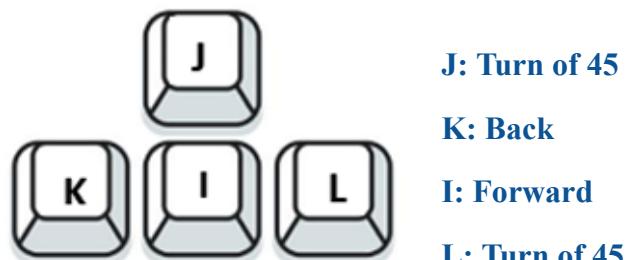
#### 1. Movement Keys on the Plane

Within the virtual environment, we can move in any direction (first-person) using the depicted keys (A, W, S, D) while pointing in the desired direction with the mouse.



#### 2. Character Movement Keys

Within the virtual environment, we can move using an avatar named "Gumball."



### **3. Camera Switch**

The camera can be switched using the Q key, allowing you to transition from third-person view to an isometric camera.



### **4. Day and Night**

To appreciate the day and night cycle, we need to press the Z key.

