

Universidad
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ABUELITO

ANIMATION PROJECT

Degree in Design and Development of Videogames
(2022-2023)

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1. Introduction

"Abuelito" is a walking simulator that includes some mechanics of the FPS genre. In this videogame, the player will play an old man who will move around his huge garden and water plants with a water gun. Thanks to these mechanics, the player will be able to explore the scenery and discover the personality and story of the main character: Grandpa Manuel. This project consists on the design and implementation of a 3D character and scenario for this videogame.

Like most games in this genre, "Abuelito" will be a first-person 3D game, with an aesthetic that aims to convey tranquillity but with a touch of joy and nostalgia, which will make the player want to know more about the story. To achieve this atmosphere, a modelling and animation style similar to works such as "Animal Crossing: New Horizons", "Overcooked! 2" or "Sky: Children of the Light" has been used, in which all the elements of the scenery and characters are very cartoonish and rounded.



Image 1: Animal Crossing: New Horizons



Image 2: Character from Overcooked! 2



Image 3: Sky: Children of the Light

2. Modeling

2.1. Character

2.1.1. Concept and references

Manuel, the main character of the video game, is an elderly man, 73 years old, who has lived all his life in Asturias (Spain). A few years ago he worked as a carpenter, but he is now retired. He became a widower just over 10 years ago and it was at that time that he became interested in gardening, as it helped him to escape. Little by little he improved his gardening skills and today he has a large garden with a wide variety of plants.

Manuel is a very friendly and cheerful man, although he is sometimes a bit cantankerous and stubborn, like any man from the north. He is also very familiar and playful, especially with his grandson, to whom he prepares circuits with targets in his garden to play with him with the water guns. Physically, Manuel is a rather agile man for his age, slim and with a long and not very well-groomed beard. He usually dresses in simple, comfortable clothes and always carries his tools with him when he goes to the garden, including his characteristic water gun for watering his plants.

For the design of this character, several references have been taken, most of them obtained from Pinterest. To facilitate the work, a board has been created on this web, so that this moodboard will be updated throughout the development of the project. The board can be visited through the following link:

<https://www.pinterest.es/luciafresnoolmeda/shooting-plants/>

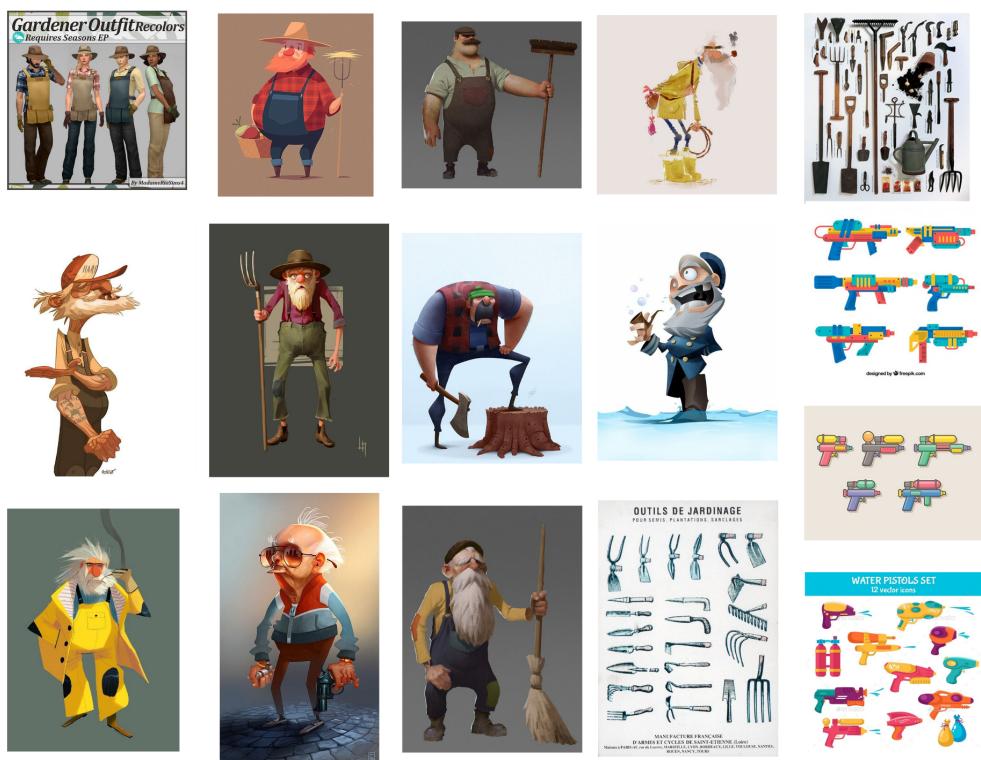


Image 4: References used for Manuel's design

From these references, an initial sketch of Manuel was developed:

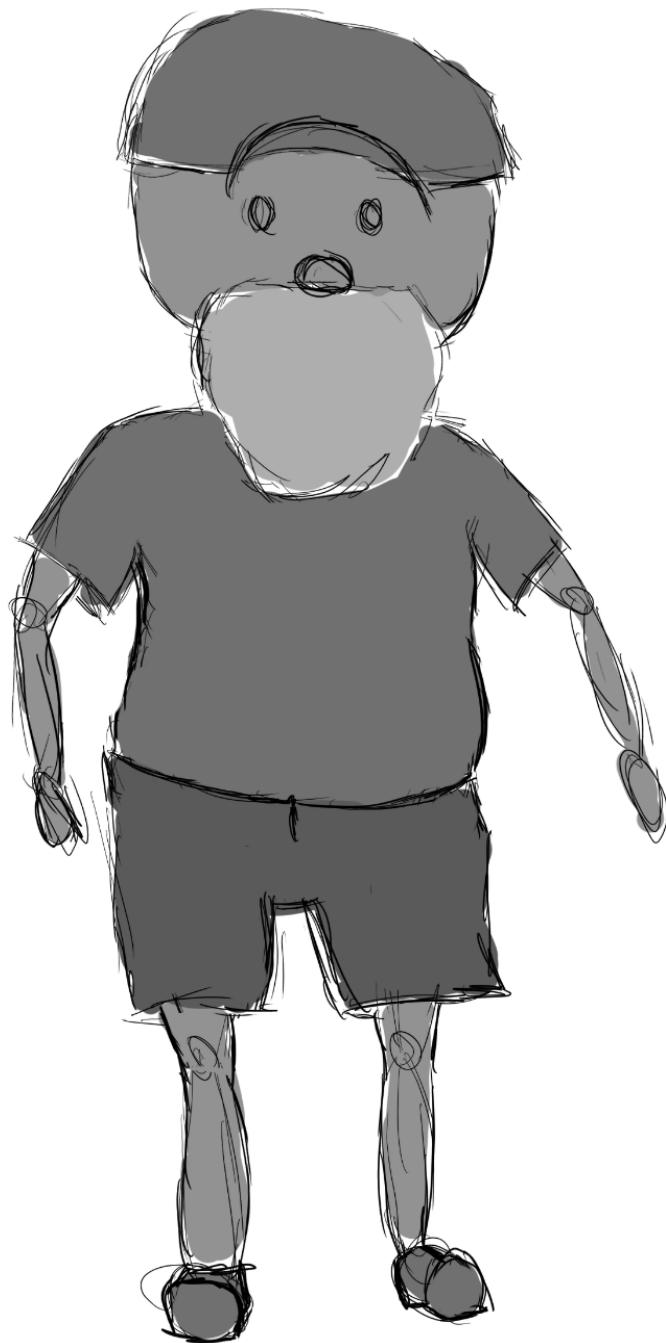


Image 5: Sketch of Manuel

2.1.2. Character Modeling

The character has been modelled in 3Ds Max using the symmetry tool. In order to make the modelling style more similar to the desired one, some elements have been modelled separately from the rest of the body. These are: the eyes, eyebrows, moustache and beard. The rest of the 3D model was made as a single piece and then separated into two pieces: the head and the body, so that facial animations could be applied to the character.



Image 6: Final 3D model of Manuel

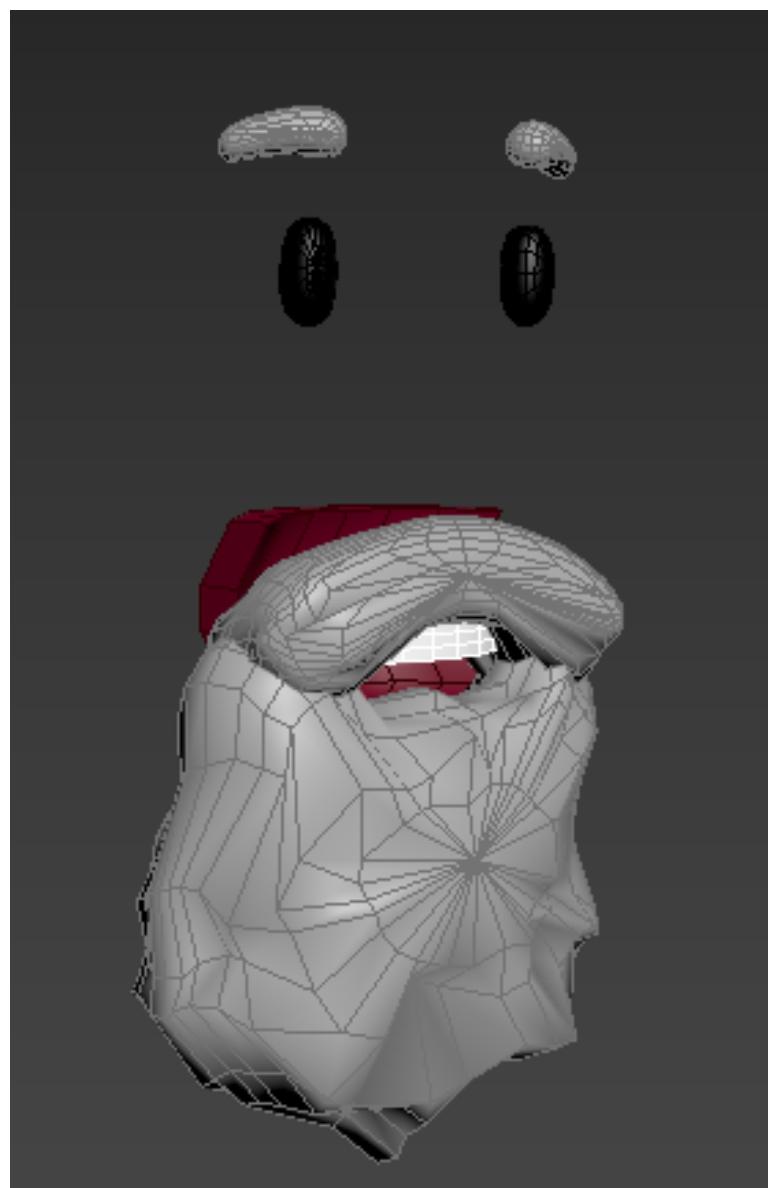


Image 7: Facial features



2.2. Scenario

2.2.1. Concept and references

Most of the narrative in this project focuses on the design of the setting, in which the player will find elements that will help him to learn more about the main character and his past.

The scenario developed is Manuel's garden on a sunny day, although other areas, such as his house, will be explored throughout the game. This setting is located in a small and cosy village in the Asturian mountains.

Manuel's garden has a wide variety of flowers and trees, including some typical of the area, such as holm oaks and heather. He also has a small greenhouse where he grows some fruits and vegetables. Finally, the garden has several decorative elements, including a small fountain that is often surrounded by butterflies, and dartboards scattered throughout the scene, with which he plays with his grandson.

The visual style used for the scenery, as for the whole game, is a cartoon style and very stylised, with rounded shapes that help to convey calm and create a cheerful atmosphere.

As with Manuel's design, a Pinterest board has been created on which a large number of references have been added.

Below you can find the link to this board, where you can see, among others, references from the greenhouse of the video game "Animal Crossing: New Horizons", or references from real gardens that can provide inspiration when designing the project space.

<https://www.pinterest.es/luciafresnoolmeda/jard%C3%ADn-de-manuel/>

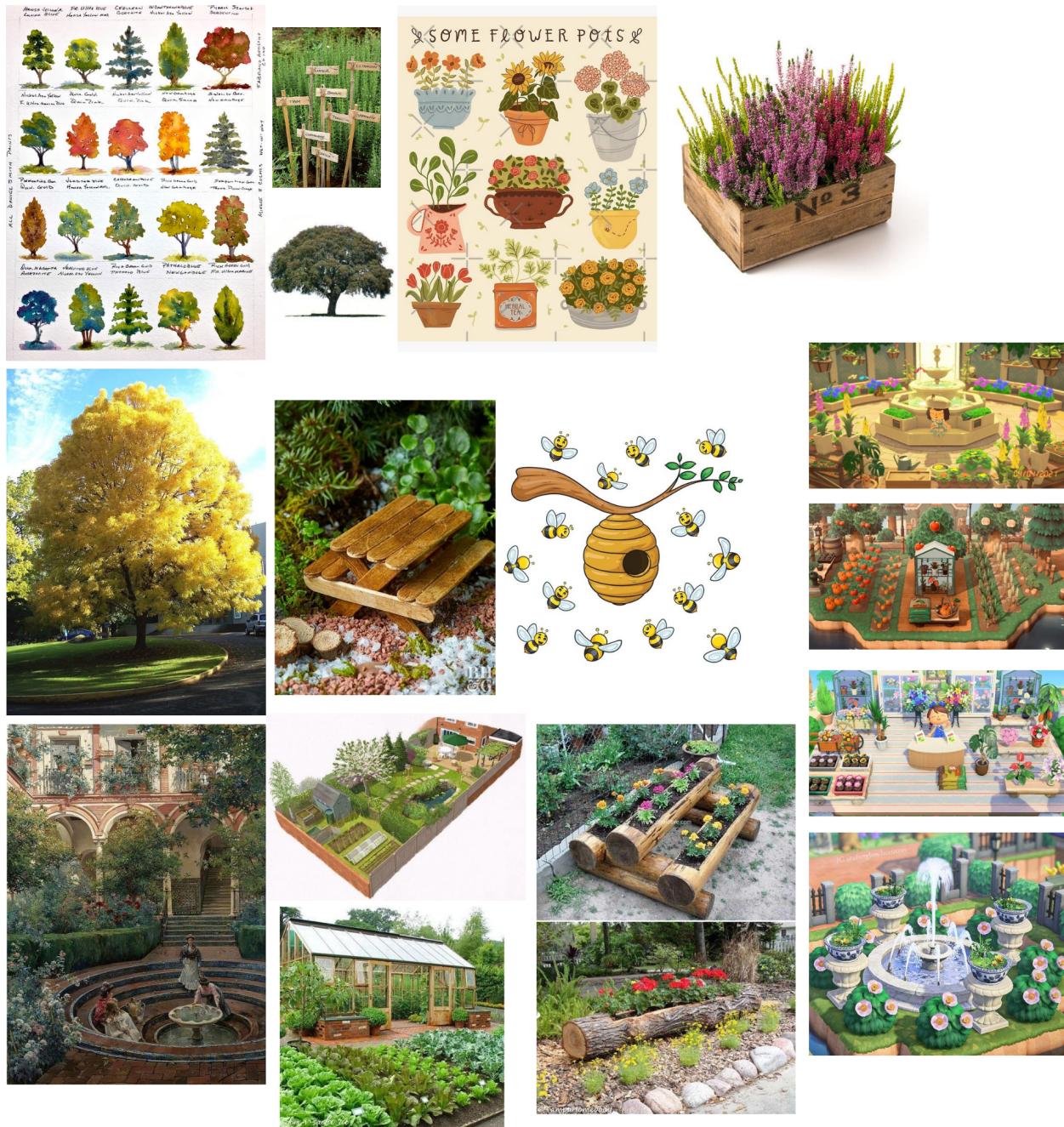


Image 8: References taken for the scenario design

As with the character design, a small sketch of the scenario with its main elements has been developed.

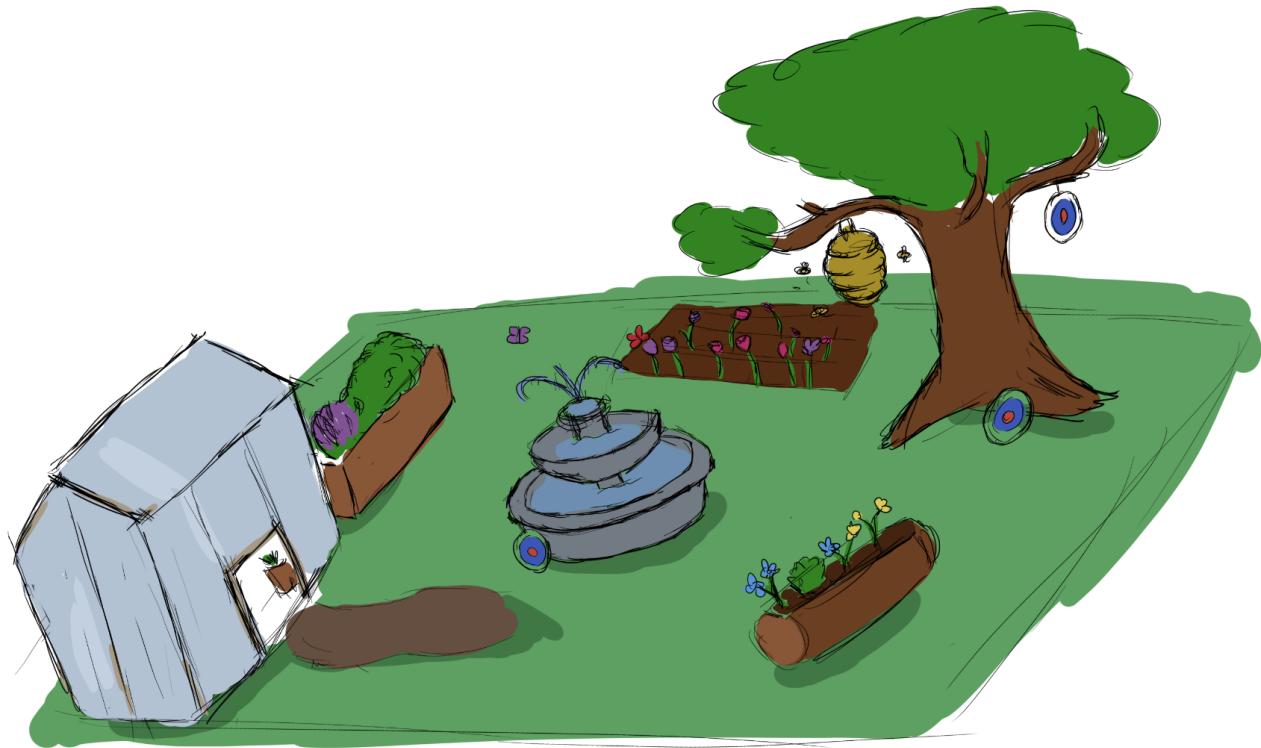


Image 9: Sketch of Manuel's garden

2.2.2. Scene elements

The scenery has several elements that will help to generate the feeling of calm and joy. In addition, some of them will contain animations and help to get to know the main character better, such as the targets.

2.2.2.1. Tree with a bee hive

In the garden there is a tree with a bee hive and several bees around it. These bees will have a herd animation. The modelling of the bees and the hive has been done in 3Ds Max. Furthermore, a free model of a tree has been used to help create the scene. This model, as well as all the external resources that have been used for this work, are free to use and are referenced in the bibliography.

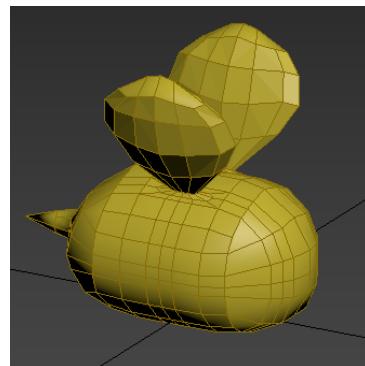


Image 10: 3D model of the bees

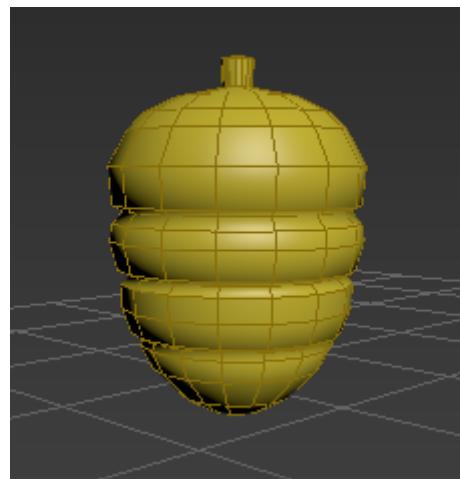


Image 11: 3D model of the hive

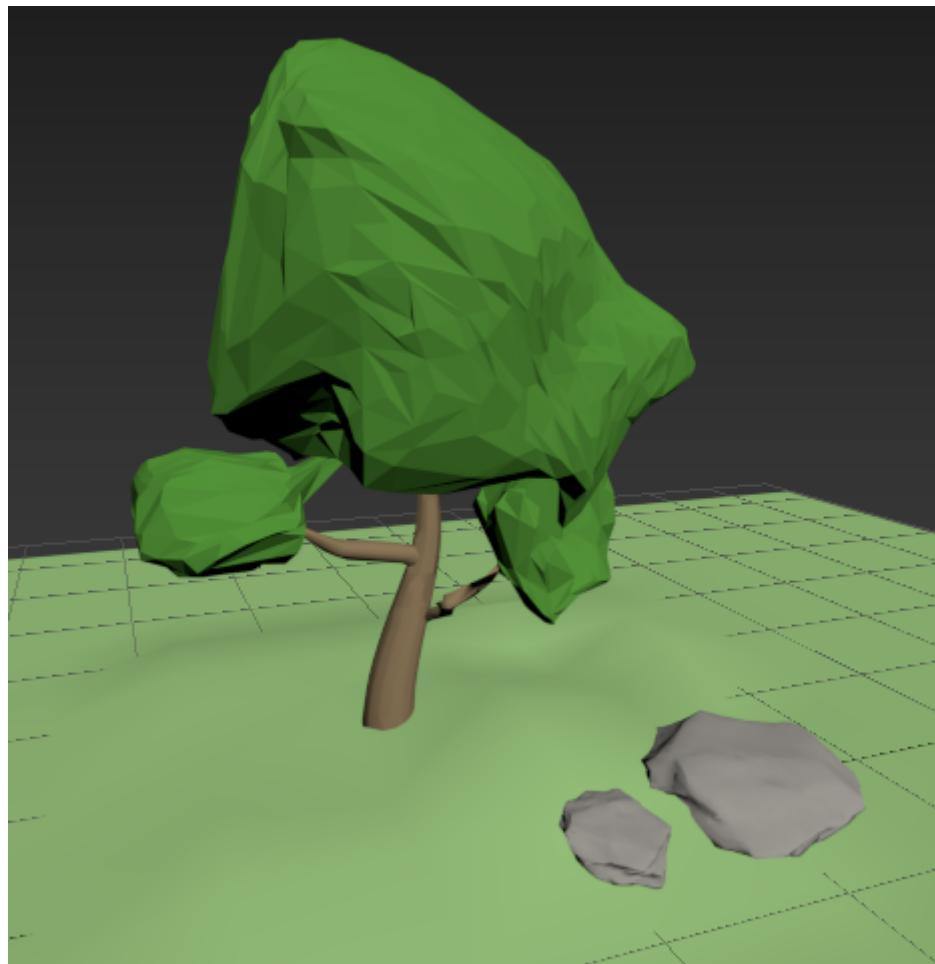


Image 12: External models used: tree and rocks

2.2.2.2. Fountain with butterflies

Manuel has a fountain in his garden, which is usually surrounded by butterflies. To create this element, a butterfly has been modelled and an external model of a fountain has been used.

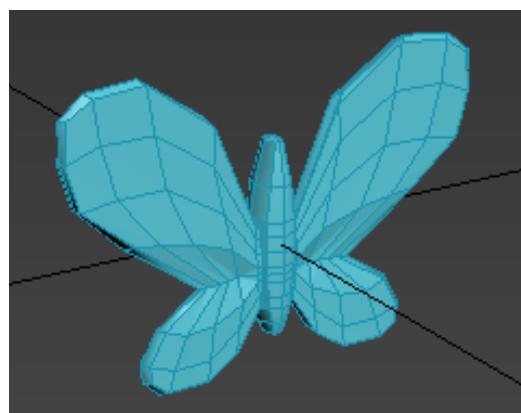


Image 13: 3D model of the butterflies

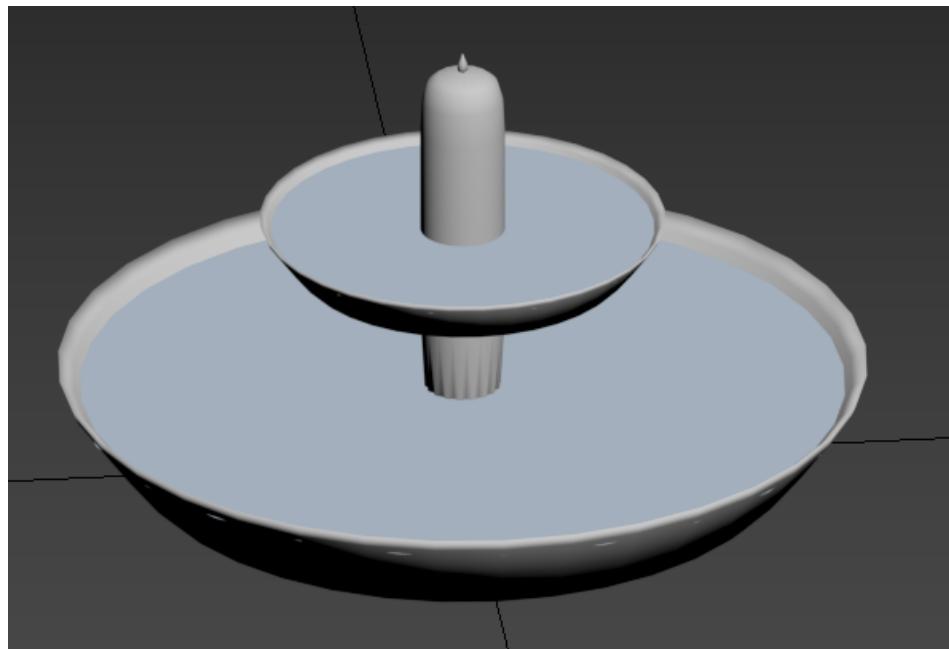


Image 14: 3D model of the fountain

2.2.2.3. Targets

Manuel has set up a course with several targets in the garden. These targets are a bit damaged, as Manuel and his grandson have played many times shooting them with water guns. To create this element, a target has been modelled from a cylinder and modified.

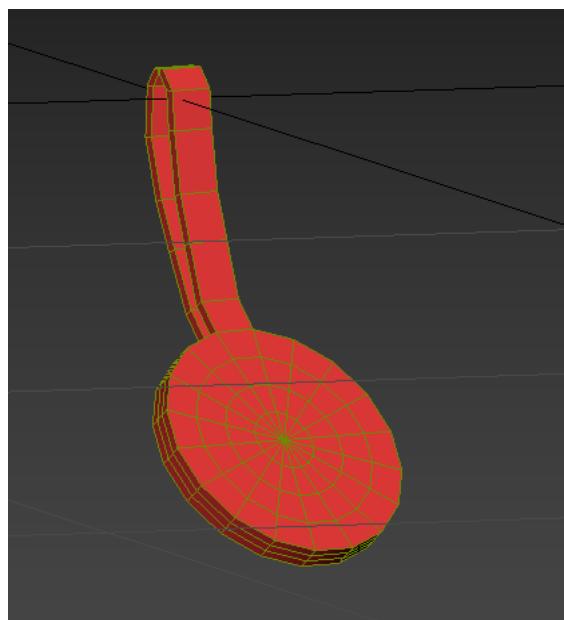


Image 15: 3D model of the targets

2.2.2.4. Picnic zone

The garden has a small picnic area, consisting of a wooden table and an awning. Manuel spends a lot of time resting there.

Different elements have been used to create this area:

- An awning, created with a plane and some cubes that support it. The physical behaviour of fabrics was developed using C# scripts. In this way, the awning has a realistic movement.
- An external model of a wooden table, which can be found linked in the bibliography.

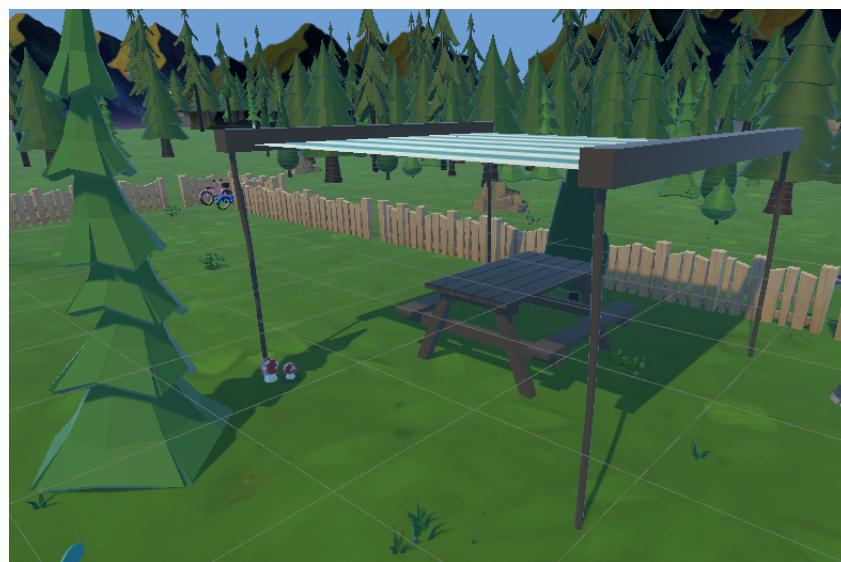


Image 16: 3D model of the picnic zone



Image 17: Physics simulation of the awning

2.2.2.5. Mushrooms

Mushrooms can be found in some areas of Manuel's garden. These mushrooms have been created using an external model and animated using elastic solid physics, programmed in several scripts. Thanks to this behaviour, the mushrooms bounce slightly.



Image 18: Mushrooms in Manuel's garden

2.2.2.6. Greenhouse and vegetable garden

In the garden there is a small greenhouse with a vegetable garden next to it in which Manuel grows some fruit and vegetables. Both elements have been implemented using external 3D models and their function is purely decorative.



Image 19:Greenhouse and vegetable garden

2.2.2.7. Forest and other decorative elements

Finally, the garden has been surrounded by a fence and a forest. Both are made of external 3D models and their only intention is to decorate the scenery. In addition, elements such as bicycles, weeds, rocks and more mushrooms have been added.



Image 20: Forest and other decorative elements

3. Textures

The texturing of this project mainly consists of textures with flat colours. Some of them have been exported directly from 3Ds Max and others have been added in Unity.



Image 21: Final scene in Unity

Most of the textures used were provided in the downloaded assets and have been modified to achieve the desired look. All these assets and their corresponding textures can be found in the bibliography of this document.

The texture used for the water is noteworthy, as it makes use of a shader that gives it a greater sense of movement.



Image 22: Shader used in the water

4. Animation

4.1. Character

In order to create the character animations, a CAT skeleton was created and the skinning was done using the vertex weighting technique.

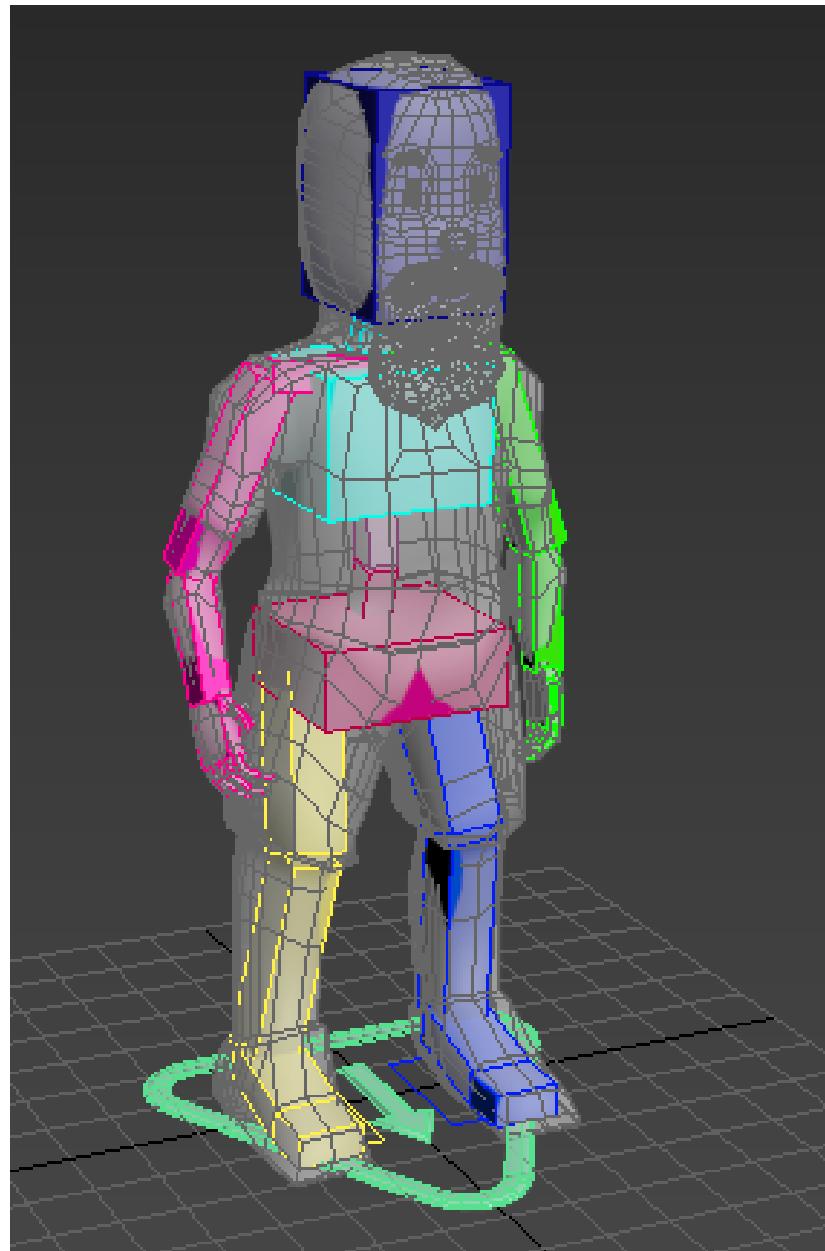


Image 23:Character with a CAT skeleton

4.1.1. Frame-by-frame animation: Idle

Idle's animation was made using the frame-by-frame animation technique. It is a simple animation in which the character lowers and raises his body slightly.

4.1.2. Parametric animations: walking, running and sneaking around

For certain actions, the character has been animated using parametric CAT animations and modifying their values. In general, the parameters have been modified so that the character moves slowly and a little stiffly, so that these movements simulate those of an elderly person.

With this technique, the walking, running and sneaking animations have been obtained. These actions could be seen in the game, for example, when Manuel remembers how he used to play with his grandson to shoot at the targets in the garden.

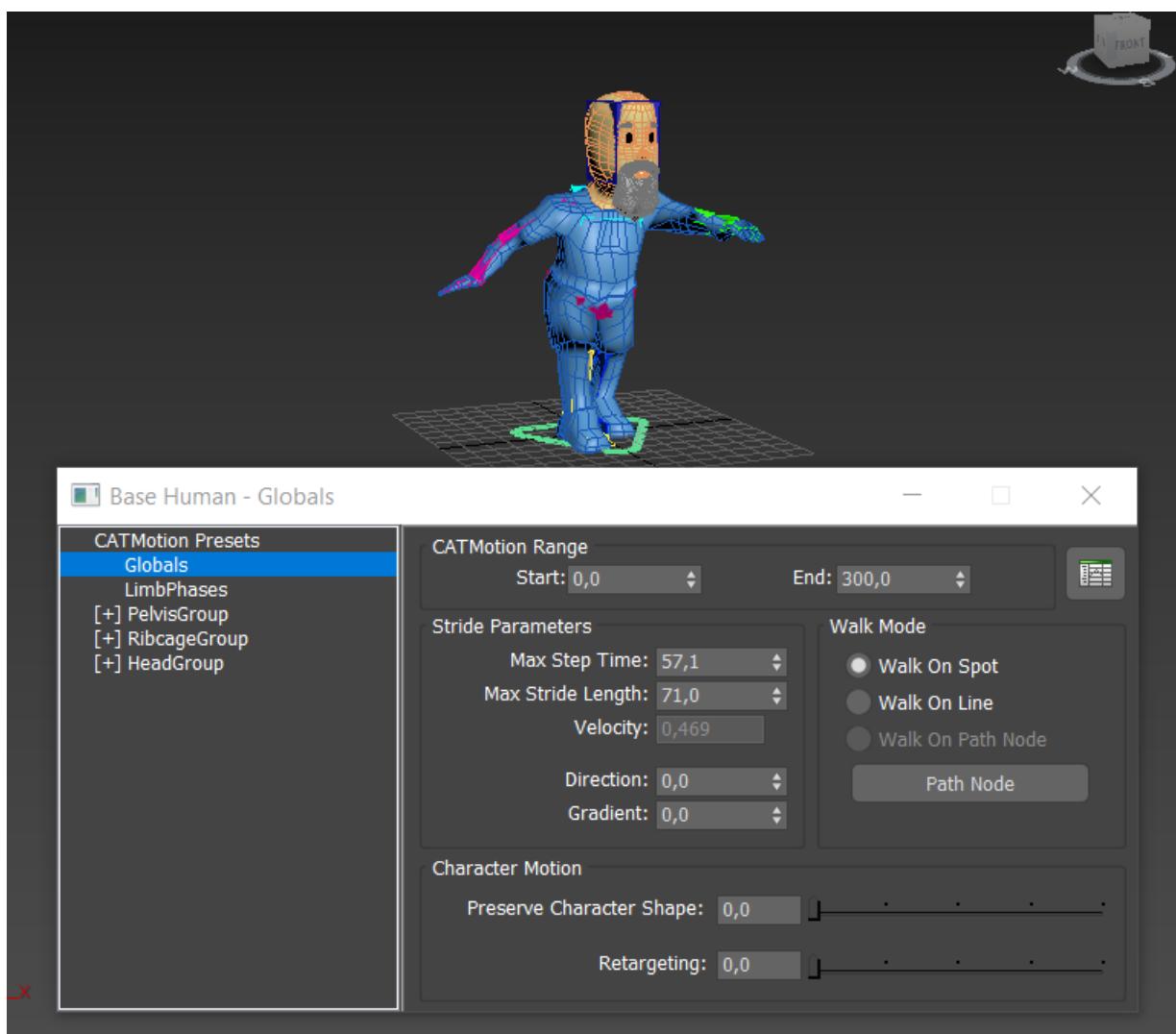


Image 24: Parametric animations

4.1.3. Shooting animation

The shooting animation is the most complex of those developed in the project. It was done using frame-by-frame animation technique with direct and inverse animation.

The direct animation was used to make the character crouch down to reach the water gun on the floor. When Manuel picks up the gun, reverse animation is used. The gun is moved instead of the character's arm bones. However, in this section the bones of the rest of Manuel's body are also placed manually. Finally, when Manuel is in the shooting position, the direct animation is used again, and the reaction to the shot is done in this last way.

The weapon used in this animation has been downloaded from the Sketchfab website. This model of a lowpoly water pistol can be found linked at the end of this document.

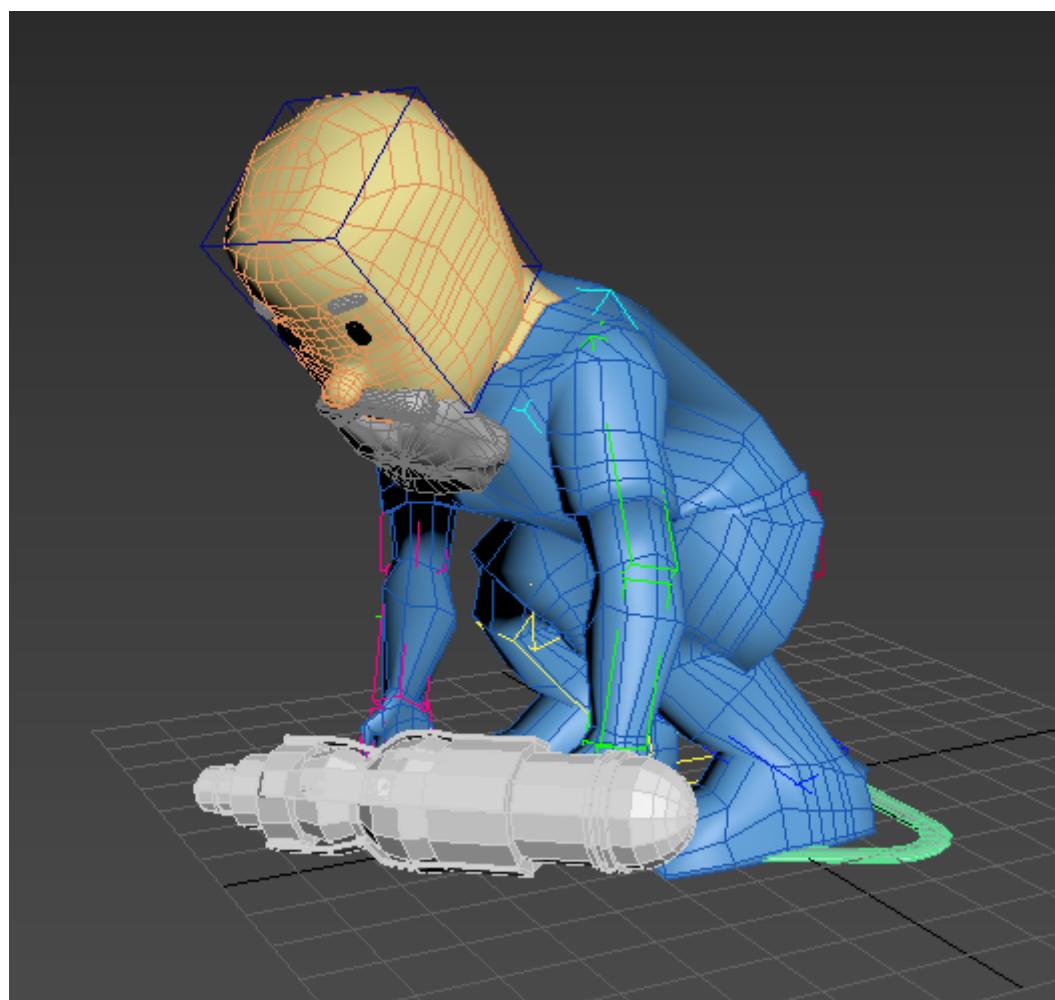


Image 25: Manuel picking up the water gun (direct animation)

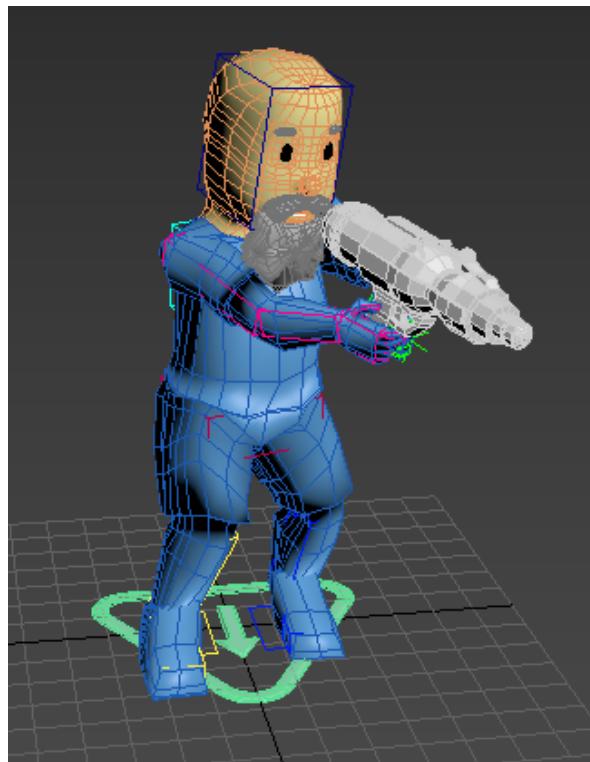


Image 26: Shooting position (reverse animation)

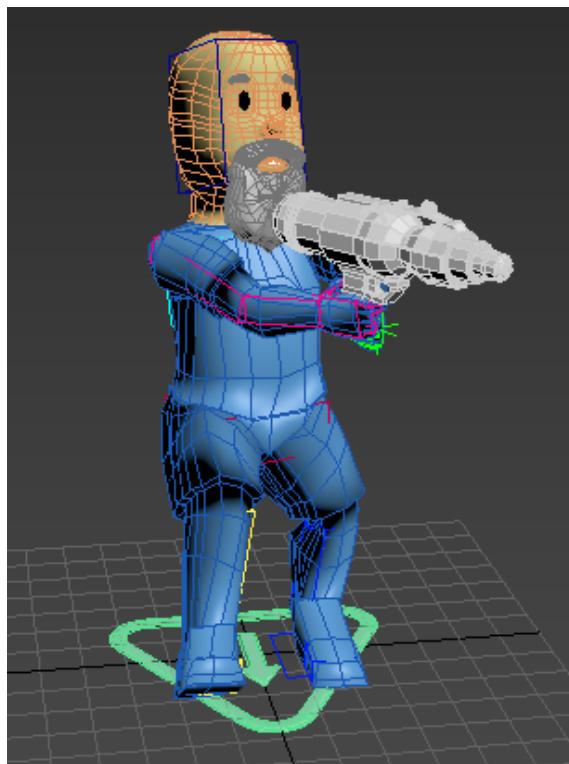


Imagen 27: Reaction to the shot (direct animation)

4.1.4. Facial animations

Finally, a series of facial animations have been prepared, but were not included in the final project.

The following facial expressions have been developed: doubt, surprise, anger and joy.

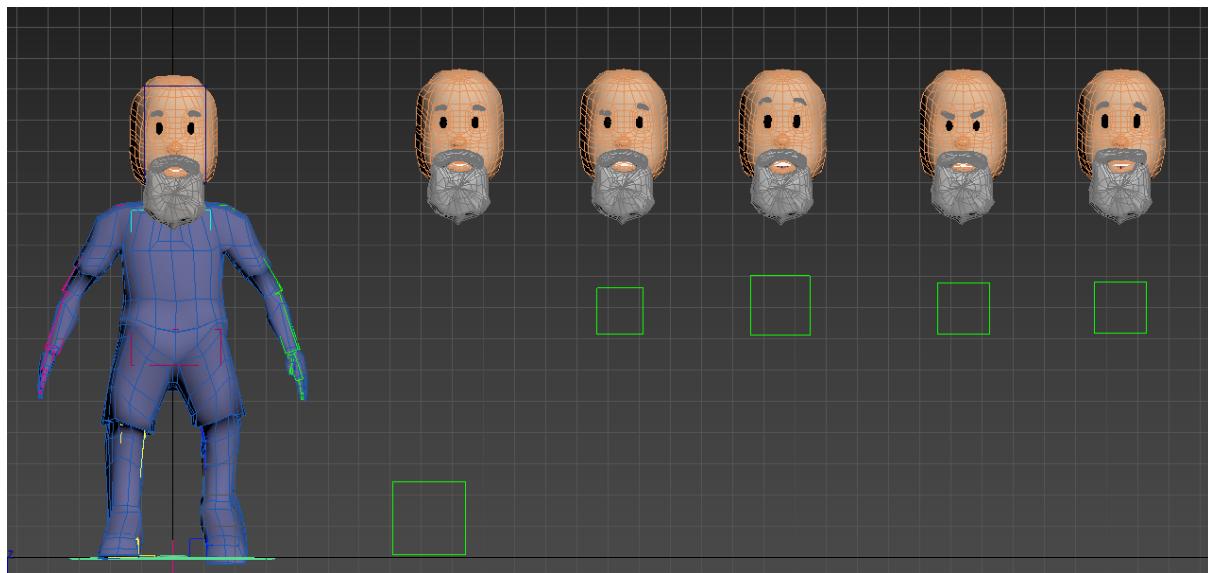


Image 28: Facial expressions

4.2. Scenario

4.2.1. Solid - rigid physics animation: Hive

An animation has been made using the MassFx tools. This animation consists of a hive of bees that falls from the branch of the tree it is on and breaks when it hits the ground.

As can be seen in the following images, the beehive has been divided into a series of fragments (kinetic objects). Thanks to the force of gravity, this beehive falls and when it hits the ground (which is a static object), it splits into different fragments.

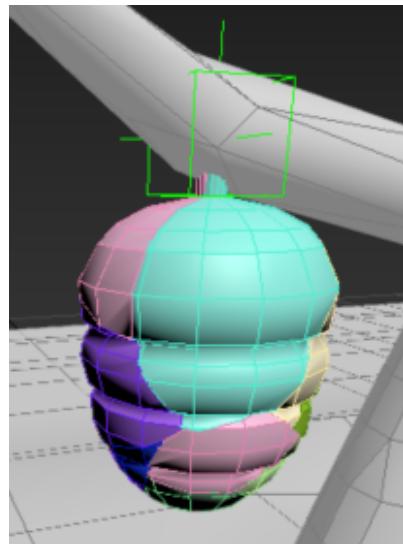


Image 29:Divided hive

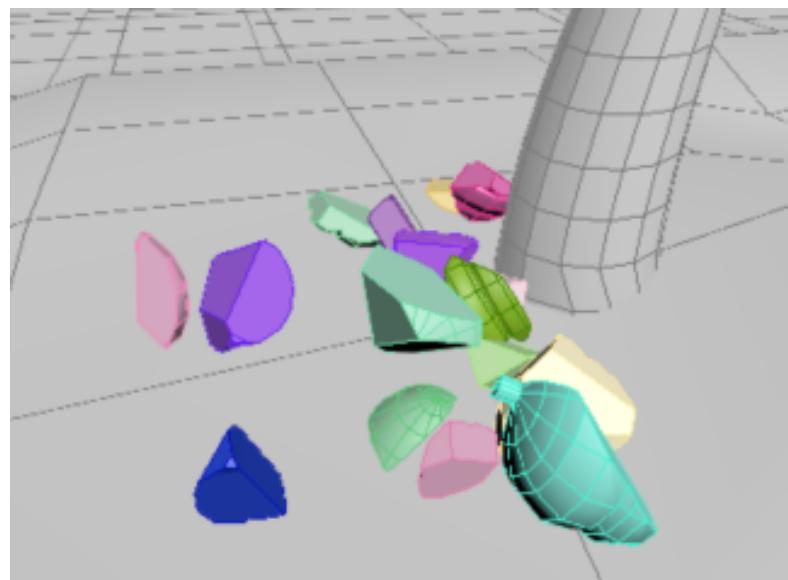


Image 30: Broken beehive

4.2.2. Herd animation: Bees

Related to the previous animation, we have developed an animation of a bee swarm, which leaves the hive when it hits the ground.

In the first place, the flight of the bees was done by moving their wings.

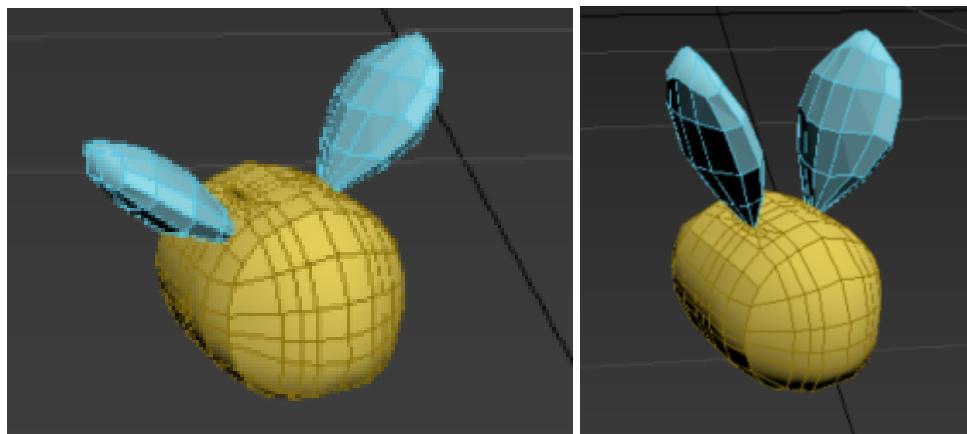


Image 31:Bee flight animation

Once the flight was animated, a Crow object was created and a "Wander" behaviour was added to the herd of bees. In addition, the speed and range of movement parameters were adjusted so that they spread quickly across the stage after the hive fell, making them look scared.

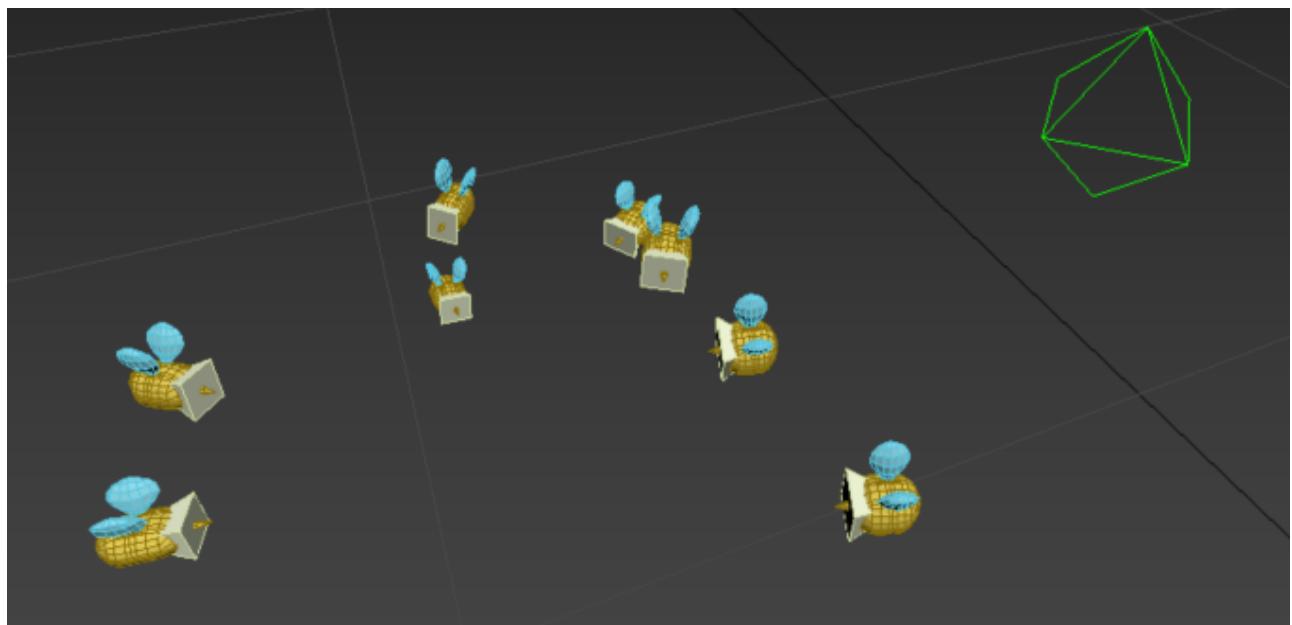


Image 32: Herd animation

This animation was combined with the animation of the hive, so that they were well coordinated. The bees must "get out of the hive" when the hive hits the ground. To achieve this effect, the initial position of the bees was placed where the hive hits the ground. In the frame 23 of the animation of the hive is when the impact occurs, so the behaviour of the bees has been adjusted so that they start to move in this frame.

Finally, the visibility curves of the bees have been adjusted so that their geometry is not visible until frame 23. Furthermore, the curves at the end of the animation have been adjusted so that the bees fade away (this decision was inspired by games such as "Animal Crossing: New Horizons").

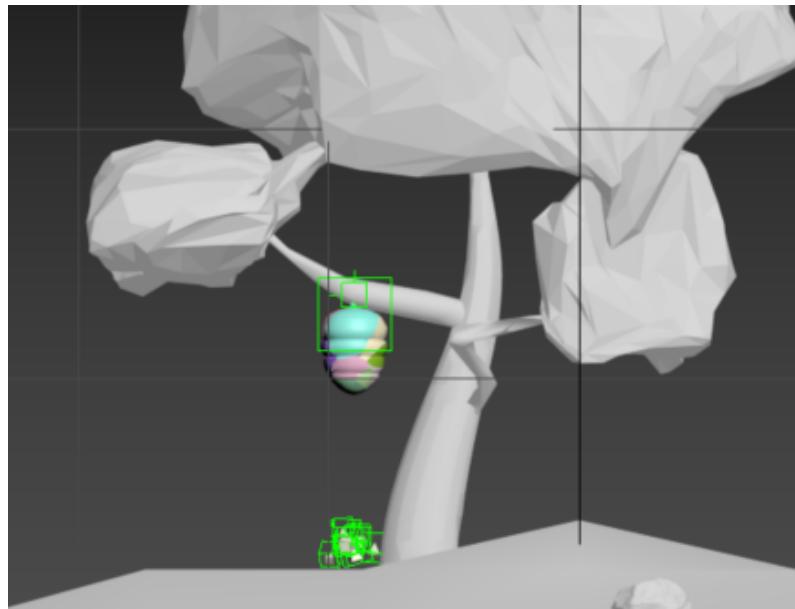


Image 33: Bees and hive animation

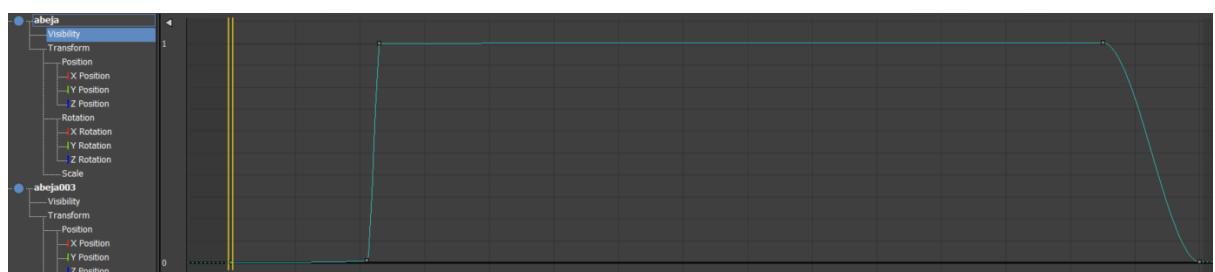


Image 34: Visibility curves of the bees

4.2.3. Animation using constraints: Butterflies

This animation consists of two fluttering butterflies, each of them moving and following a path. Therefore, a Path Constraint has been used. As with the bees, the first thing that was done for this animation was the movement of the butterflies' flight.

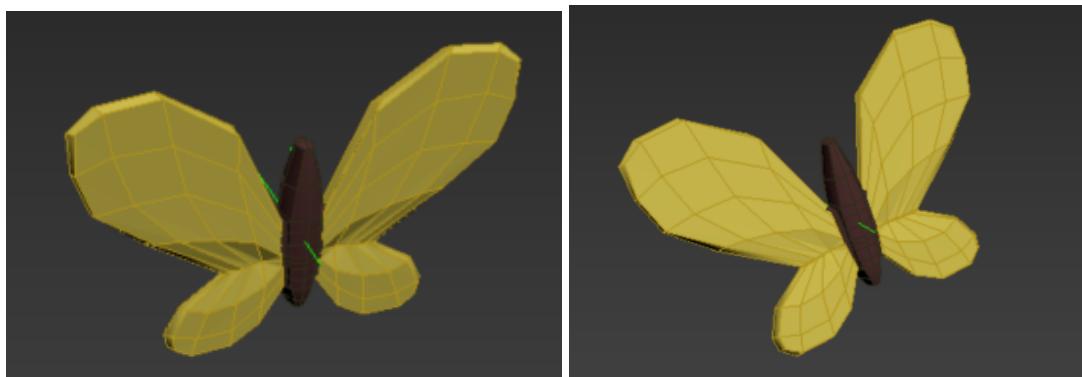


Image 35: Flight animation

Once this was done, two splines were created and each spline was assigned to each butterfly using a Path Constraint, as well as with the help of Point Helpers and Dummies.

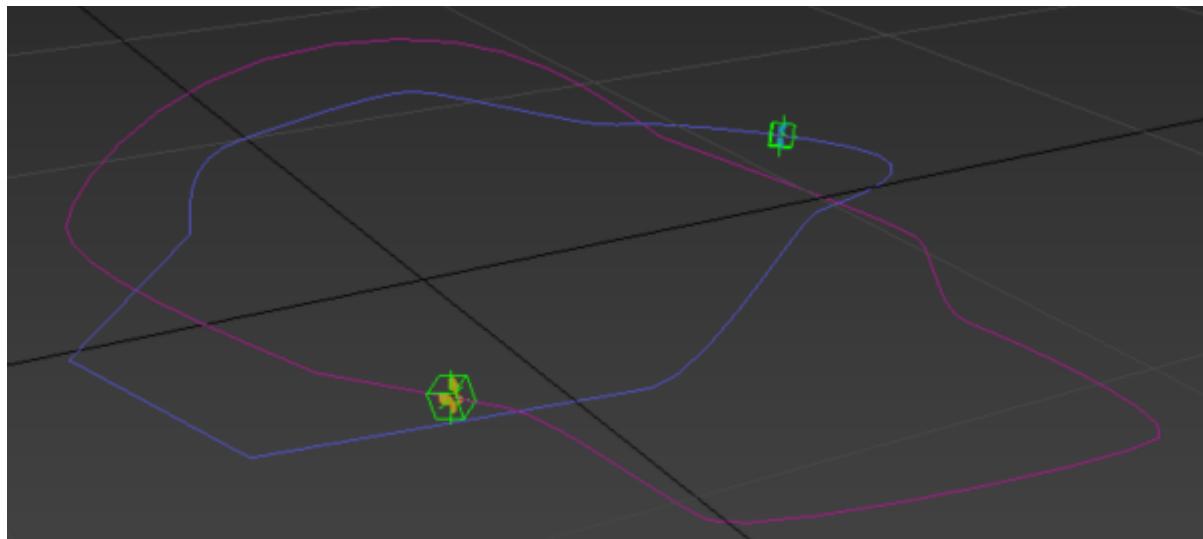


Image 36: Final animation butterflies

4.2.4. Animation using particle system: Fountain

An animation has been made using a particle system. This animation consists of a fountain from which water particles come out. A particle system and a force simulating gravity have been created, so that the water droplets do not move upwards infinitely. In addition, a couple of deflectors have been included so that the water planes of the fountain vibrate slightly when a drop collides with them.

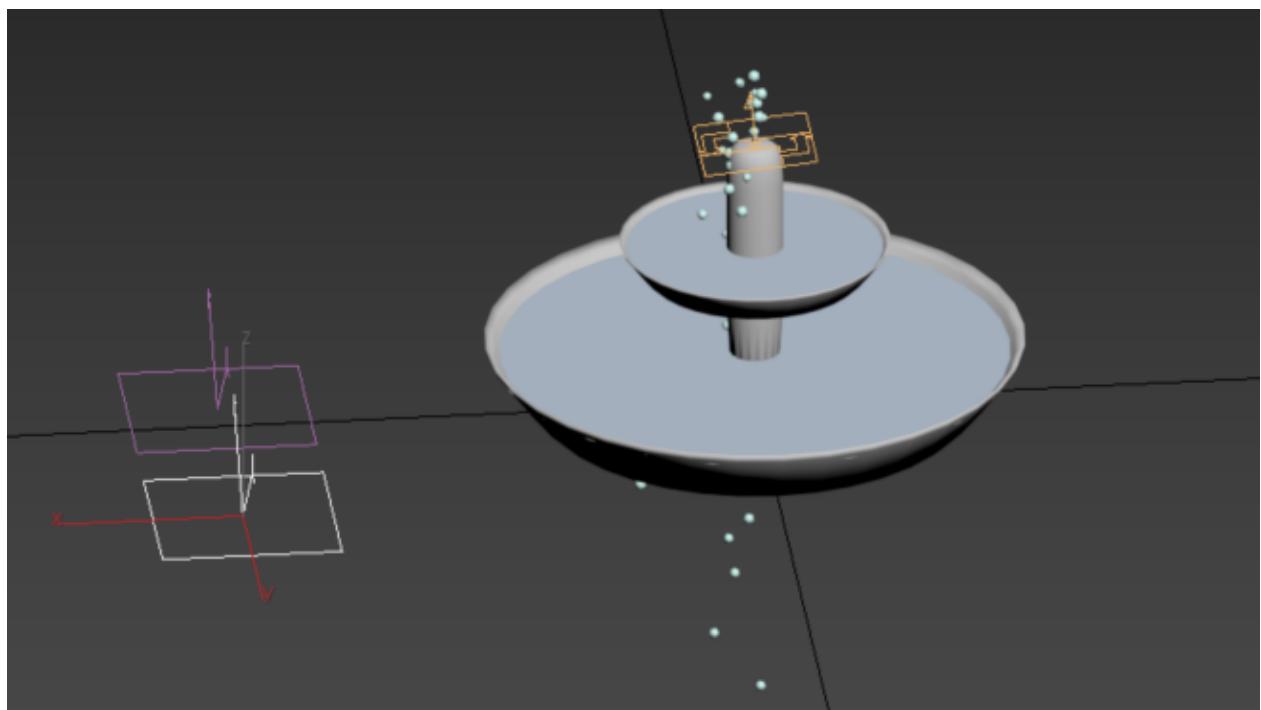


Image 37: Fountain animation

4.2.5. Animation using bones and physics: Targets

At Manuel's garden, there is target swinging while hanging from a tree branch. This animation has been made using a chain of bones, whose angle of movement has been restricted. A physical simulation has been made with these bones, so that all of them swing except the first one, which would be the part of the target that is fixed in the tree.

In order for this movement to be reflected in the target, a "Skin" modifier was applied to the geometry.

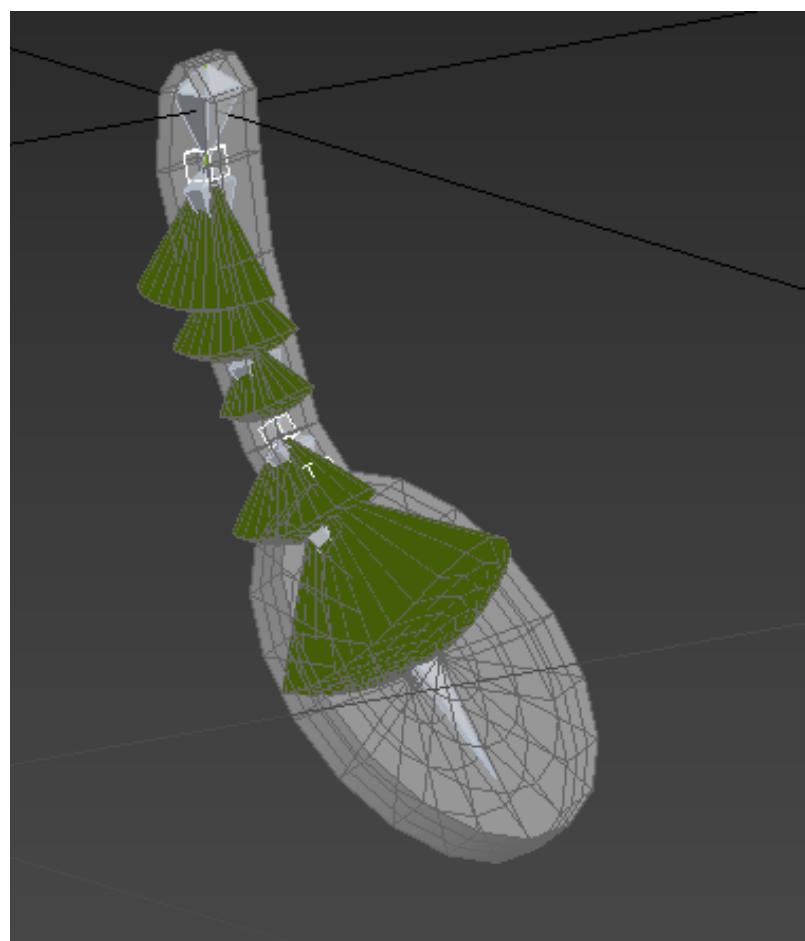


Imagen 38: Animación de la diana

4.2.6. Physical animations: cloth and solid-elastic material

Physics animations have been created for a cloth and for a gelatinous object (solid-elastic). Both animations have been integrated into the scenery in different elements and have been developed thanks to C# scripts.

The cloth behaviour has been included in the stage awning, which is attached to two cubes (with a Fixer behaviour).



Image 39: Awning animation

On the other hand, the elastic solid behaviour has been added to mushrooms.

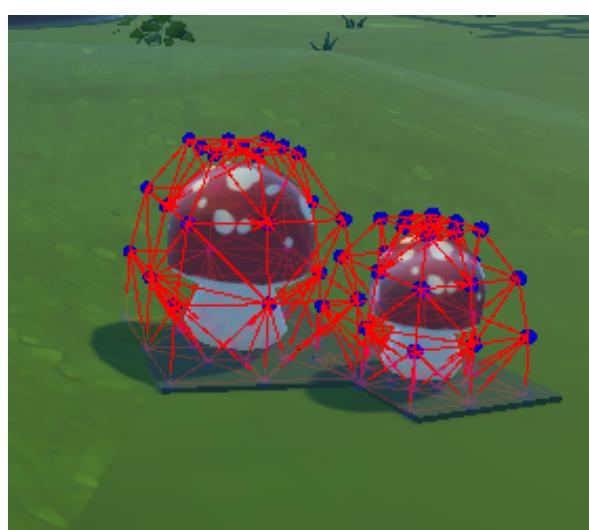


Image 40: Mushrooms animation

5. Unity implementation

To finish, the animations developed were included in the Unity game engine. All the animations were exported as .fbx from 3Ds Max and included in a scene in Unity with the help of Animation Controllers.

In order to make the scenery less empty, it has been decorated with the different elements mentioned in this practice. In addition, the colour of the sky and the light has been modified. As a highlight, several shots with images of mountains have been added to the back of the stage to give the player a greater sense of being inside a larger and more complex stage, although the most interesting part is the garden.



Image 41: Unity implementation

A camera that orbits around the character using the mouse has been included. The character's movement has been programmed so that the character moves using the arrow keys and executes all his animations. The images below show the final result of the project.



Image 42: Gameplay inUnity



Image 43: Gameplay inUnity



Image 43: Gameplay inUnity

6. **Bibliography**

- 3D model of trees:
 - <https://www.turbosquid.com/es/3d-models/tree-art-commercial-3d-1291907>
 - <https://sketchfab.com/3d-models/lowpoly-tree-cd5a7dc13ea8469e81a7908090e96b8e>
 - <https://sketchfab.com/3d-models/lowpoly-tree-game-asset-09ed6aeb11a74cc2bba18bc735d1fbcd>
 - <https://sketchfab.com/3d-models/lowpoly-tree-75fba1cab5ec4f2796579e784e4e6fb3>
 - <https://sketchfab.com/3d-models/lowpoly-trees-set-f7b457b0d443488a87d16b210d1be4ba>
- 3D model of the fountain:
<https://www.turbosquid.com/es/3d-models/free-max-model-water-fountain/316445>
- 3D model of the water gun:
<https://sketchfab.com/3d-models/lowpoly-watergun-c9eb5afe553a4551b958ce8628ccd4f6>
- 3D model of the watering:
<https://www.turbosquid.com/es/3d-models/watering-v2-dxf-free/817236#>
- 3D model of the greenhouse:
<https://sketchfab.com/3d-models/greenhouse-bf455e7e9c434bd0abc2351fb3d24975>
- 3D model of the fence:
<https://sketchfab.com/3d-models/low-poly-wood-fence-on-grass-d35a038f74ea47819459cabae8c28c62#download>
- 3D model of the mushrooms:
<https://sketchfab.com/3d-models/mushroom-99cd3901e0f94cf7a621c89dfde9e86e>
- 3D model of the picnic table:
<https://sketchfab.com/3d-models/wooden-bench-remastered-56cd826c0df3468fa07b868368866a42>
- 3D models of plants:
 - <https://sketchfab.com/3d-models/low-poly-shrub-or-grass-clover-acb337dd8f5e41beba654111e3f2475a>
 - <https://sketchfab.com/3d-models/low-poly-stylized-clover-grass-61b48bdf1ad343f08360c8d380c3d71a>
 - <https://sketchfab.com/3d-models/grass-c572f5724e20413faf9433e6a0a5d83e>
 - <https://sketchfab.com/3d-models/low-poly-grass-pack-2ffb4d5302c14d038eaf6488b8c7ede2>

- 3D models of rocks:
<https://sketchfab.com/3d-models/desert-rock-fixed-pack-00c4468f1bca48509d7d2bd66b564cbc>
- 3D model of the vegetable garden:
<https://sketchfab.com/3d-models/orchard-4d3eb0599e7b4a3b8a269adb4feaf60c>
- 3D model of the bicycle:
<https://sketchfab.com/3d-models/lowpoly-blue-bike-02dcf7624c21467fb391e4303823f8e6>
- Background mountains:
<https://drive.google.com/drive/folders/1KbUV0T0TQu6N3l0mAm3lIQMCx19OpR-w>