



Universitat Jaume I (Castellón de la Plana, España)

Degree in video Game Design and Development

Final Degree Project's Report



Development of a game for gamifying
places using beacons

Tutored by: Joaquín Huerta Guijarro

*Este proyecto está dedicado a mis padres,
sin los cuales nada de esto habría sido posible, gracias por estar siempre ahí.
A Zaray, por animarme cuando no veía salida y estar siempre a mi lado.
A mis hermanos, por su "apoyo" incondicional y sus grandes críticas,
si Rubén, te miro a ti.
Por último, a toda la gente que me apoyó y confió en mí.*

Gracias.

Table of contents

1 Introduction	5
1.1 Context	5
1.2 Motivation	6
1.3 Objectives	7
1.4 Related Subjects	8
1.5 Software and tools	8
1.6 Planification	9
2 Game Design Document	10
2.1 Plot	10
2.2 Target platforms	11
2.3 Target audience	11
2.4 Main game flow	11
2.5 Mechanics	12
3 Artistic design	13
3.1 Colour schemes	13
3.2 Creation process	14
3.2.1 Thumbnail Design	14
3.2.2 3D Modelling	15
3.2.3 Background Design	16
3.2.4 Animations	21
3.3 Final thoughts	24
4 Level Design	25
4.1 General process	25
4.2 Creation process for each level	25
5 Implementation	28
5.1 General implementation	28
5.2 Specific level implementation	30
6 Results and conclusion	33
7 Future work	34
8 Bibliography	35

Important note

This project began to develop before the current health crisis. At first, the idea was to use the bluetooth beacons to check that the player's position was correct, thus allowing the game to advance. When the situation worsened, we decided not to implement this last part, since it was not going to be possible to make a physical demonstration and when doing it telematically, the beacons would have to be disabled in order to show the entire game.

The reason why the beacons remain in the title despite not having been implemented is due to the fact that the whole project revolves around them. The game created has some characteristics that take advantage of and require the use of beacons, without them, it goes from being a gamification tool to a short graphic adventure. Although they have not been implemented in the final version, the project is prepared and thought so that they can be introduced at any time.

The time that was going to be invested in learning and implementing the beacons was reused to improve and add new elements. This is shown in the table with the project schedule.

Thank you very much for your understanding.

Keywords

Beacons, Escape Room, Gymkhana, Graphic Adventure, Explore

1 Introduction

The main aim of this project is the creation of a game that forces the player to explore his surroundings meanwhile he solves logic puzzles^[1]. One of the main advantages is that this project has not been developed having a certain place in mind, allowing it to be easily exportable anywhere.

To achieve this, the game will use beacons^[2], which are small devices that emit a unique signal. This signal can be received by smartphones, to do so, the bluetooth has to be on.

The game will use them to track where the players are in order to continue with the game.

Once the player arrives at the place where the beacon is, the smartphone^[3] will receive that signal and will communicate it to the game.

This opens a really wide range of possibilities because the app can be adapted to numerous places with little to no changes needed.

The main features of this project are the art and the aesthetics. From the beginning the aim of the project was to be really art based. At first, I wanted to create the concept art for an entire game, but it was not allowed, so I Finally decided to create a game which mixes the aesthetics of graphic adventure games^[4], with a mixture between escape rooms^[5] and gymkhanas^[6], focusing on the graphics.

Once the players start playing, they will be given the first clue, this clue will refer to a real place near him. When they arrive at the correct place, the game will continue and the players will see the first scene in his smartphone. Once they have solved the first scene, the game will give them the second clue, the players will have to guess which place is the correct one.

This loop is repeated until the game is finished and creates a mixture between the real world and the virtual one.

In this introductory section, some aspects of the project will be introduced such as the motivation that led me to make this project, a little bit context about the escape rooms, the objectives creating this project and the tools which have been used.

1.1 Context

This game creates a mixture between an escape room, using its typical logic puzzles, and a gymkhana, making the player move around his environment looking for clues.

But, before entering more in details, the basic concepts of both terms will be explained, so they are absolutely clear.

On the one hand, gymkhana is an indian term, which means place of assembly, but with the time, this meaning has evolved, now it is referred to the place where skill games are played.

Another variant of gymkhana, is the one in which the players are given some question with clues, and they have to explore the place in where they are, normally a village, following the clues in order to answer all the questions. This is the variant that will be used in my project.

On the other hand, escape rooms are puzzle based activities in which the players are introduced to a closed place from where they have to escape in certain time in order to complete it. The ambientation is one of their key features, every escape room game has its own theme, a little context is presented before it starts in order to introduce the players to the story presented. Once the presentation ends, they are alone in the room. Their objective is to gather the clues that let them solve the puzzle in order to move along. This process is repeated until they solve every puzzle and so, they escape the room.

This type of game originated in Japan 13 years ago, in 2007. In 2011 they were seen outside of Japan, where they were really well received. During the following years, the number of escape rooms was rising, being more than 8.000 by 2017. Here in Spain, in 2017 there were 540 escape rooms available, a number that will increase fastly, becoming more than 1.600 by 2020.

Overall, this type of activity has had a really nice reception. One of their main features is that the whole family or group of friends are able to participate at the same time, making it ideal to spend some time together.

One of the main disadvantages though, is the fact that an escape room can be only played once by a group of people, this is because once you have completed it, the puzzles are not challenging anymore. This forces the owners to change it from time to time, and as it was told before, the ambientation is a key feature, making the reformation really hard and costly. This project proposes an alternative, sacrificing some of the immersive part of a regular escape room, but on the other hand, resulting in a product which is much more universal and that does not tie the owner to a specific area. Once the app is designed, it can be played globally, making little changes in the dialogs and the clues.

1.2 Motivation

I discovered the escape rooms 4-5 years ago, since then, I have made close to 20 and they are one of my favourite types of activities: they make you think in a different way, you improve your problem-solving skills.

The day I went to talk to my tutor about my project, he showed me the project they had made, the basic idea was really similar to what I ended up deciding on doing. A puzzle game in which the player had to solve certain puzzles in his phone, and once they were solved, a hint will be revealed that will guide him to the next place, once he reaches that place, the app will continue showing the next puzzle.

I really liked that idea, I was able to design my own puzzles and I could make all the art needed in a project with a basic level of programming, so I started thinking about the possibilities.

Since I was a child, I have travelled a lot with my parents, I have visited numerous places and small villages, that, for me at that time, had little to no appeal. We visited a lot of churches, cathedrals, castles... I remember getting really bored because for me they were all the same. One thing I loved doing though, were gymkhanas. Sometimes, in some places they had a little game that involved visiting the village looking for certain things. I remember loving those types of activities, for me, that was the purpose of visiting that place.

When I mixed the escape rooms and the gincanas with the technology, this idea came to my mind: a game that gamifies visits, that can transform a place with no big landmarks into something that families can enjoy visiting. The parents will be able to walk admiring the views and the children will be entertained completing the game.

1.3 Objectives

The main objective is to produce a game that will emulate the feeling of completing puzzles from an escape room meanwhile encourages the players to explore certain places without being tedious.

This product will be easily exported from one place to another with the least material cost possible, making it possible to implement it in many different places. All the material costs will be the installation and maintenance of the beacons, a small device that emits bluetooth signals and that will help the game to track where the players are.

To achieve this, the game will count with different stages. On every stage the players will have to solve different puzzles and once the stage is completed, they will receive a hint to the next place they have to go, once the players arrive there, the beacon will confirm the game that they are there and the next stage will begin (Figure 1).

This design makes it really easy to apply this game to different places, the only part that will vary is the hint part, guiding the players to the place they want.

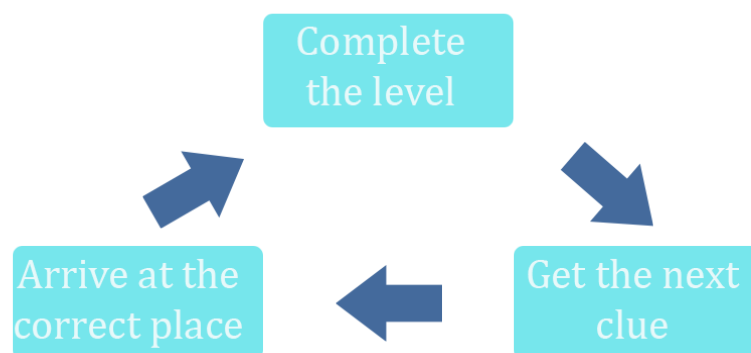


Figure 1: gameplay loop.

1.4 Related Subjects

- **VJ1223- Video Game Art**

Introduction on the different design aspects of a videogame, from background to

character design. It taught me how to use and explore all the tools available on Photoshop.

- **VJ-1222 Conceptual Video Game Design**

Taught me the different elements from a video game and how to design them in order to create the experience we aim for.

- **VJ-1226 Character Design and Animation**

Introduction on the design process of creating appealing characters, how to model them in 3D and how to texturize them.

- **VJ-1216 3D Design**

First touch with 3dsMax, software used in this project in order to model the different level layouts.

1.5 Software and tools

Unity 2019.2.14f1 (64-bit)^[7]

Unity is one of the most important game engines nowadays. It is relatively easy to start using it and it opens a wide range of opportunities while making a game.

I have chosen it because it is a game engine that we have practice with on the Degree, it really fit the project that I wanted to do with its 2D mode and finally but not least, because there are plenty of tutorials that may help me if I got stuck or I did not know how to do certain things.

Adobe Photoshop CC 2019^[8]

It is one of the main programs used in the video game industry, used mainly in the design process. From the concept art to the creation of the textures, Photoshop is the tool that most of the game studies chose to use.

In my personal case, I have been using photoshop close to 7 years, so I am quite familiarized with it. I have used it for the background design, character design and animations.

3ds Max 2019^[9]

Real powerful 3D program which lets you create almost everything you can think of. We learnt how to use it in the degree. I have mostly used it to build the levels, ensuring that every item will be in the level and the perspective is the correct one

Git Hub^[10]

It is one of the most used version control platforms. It is true that I have developed this project alone, but this tool allows me to save back ups in case something happens.

Trello^[11]

Project managing software that helps the user to track which things are pending to be done, the one he is doing and the ones which are already done. Really helpful in order to organise my workflow.

Microsoft Word 2016

It is the text processor used to write this memory, one of the most used worldwide and that we are all familiarized with.

Lucidchart

Tool used to make diagrams and mental maps. Used in this document to make the images that help understanding the way the levels work.

1.6 Planification

The planification can be seen in this chart below, where it has been written all the tasks that had to be done and the time that they will take.

Tasks	Estimated time
Story and world creation	10 hours
Character creation	10 hours
Character design	15 hours
Background design	100 hours
Puzzle design	15 hours
Animations	45 hours
Implementation in Unity	60 hours
Testing and polishing	15 hours
Writing the final memory	40 hours

As it can be seen, the approximate sum of hours is around 300. This was the initial planning and the final result has been pretty similar to what it was thought in first place.

2 Game Design Document

2.1 Plot

You are at your workplace, yesterday you had a sleepless night. You are really tired but you still try to work, try to fill out your papers... but your eyes begin to close, you know you can not sleep at work, but your body does not care about it and you finally start to close your eyes. When you are almost asleep, you hear a soft voice shouting: NOOOoooo... But it is too late, you are already asleep. When you open your eyes, you see nothing, just darkness around you. Suddenly, a light appears revealing an old man staring at you, frowning. Alde is his name and he explains to you that he is your inner voice in charge of guiding your actions so you choose the correct ones, but now he is trapped with you in your dream. Not only that, but his clock, the one he uses to control the time in order to be able to be anywhere whenever he wants, has just broken. To be able to come back to the real world, you will need to find the clock pieces and repair it. It seems easy, you say, but Alde explains to you that the different pieces have been lost in different eras.

Alde also tells you that the clock can identify in which era every piece is and that you can travel there. You agree to help him and a vortex appears, you both come close to it and get sucked. Everything is blurry for a couple of seconds, when you open your eyes, you feel the heat around you. The place seems familiar to you... you are... in an Egyptian temple!. From here, you will have to find the different pieces and restore the clock... good luck.

This is the context in which the game situates the players. They will have to solve the first puzzle in order to get the first piece. The level works as a tutorial, with a quite simple puzzle and the introduction on the UI and the different mechanics. Once the first piece is collected, the game will show another scene with the clue of the next place. In that moment, the players will have to guess where they have to go, once they get there, the game will show the next puzzle game.

2.2 Target platforms

This project is mainly focused on the development of a game for a smartphone. As Android^[12] is the most extended OS, it will be the chosen one.

Another reason why I have chosen Android, is due to the low cost of publication in the play store. All of this added to the fact that Unity offers great support for Android apps, has made Android the chosen platform.

2.3 Target audience

The game is not aimed for a specific target, as mentioned above. The characteristics of this

game make it easily played by people from different ages. The only requirements that the players have to have is being able to see and understand the information in the screen, so the range of ages could vary from 4 to 80.

Also, the players do not need much previous experience with video games because the mechanics are easy to understand and quite intuitive.

2.4 Main game flow

When the players start the game, the play button appears. Once this button is pressed, the intro will play and they will be introduced to the game world.

After the introduction, the gameplay will start. Here we find 2 type of activities in which the players can be in:

1. The players have to solve a puzzle to find the object needed to continue.
2. The players will have to find the real world location of the next event and arrive there.

In the first one, the players will see a scene in his smartphone, and they will have to tap on the screen in order to progress. Tapping objects opens a dialog menu which allows them to do certain actions.

Once the players have solved all the puzzles, the searched object will appear and the game will start the second type of activity.

For this one, on the screen will just appear the clue to guide the players to the correct location and a button that, once clicked, will trigger the script to check if the players are or are not near the beacon.

If the players are inside the range of the beacon, the next screen will appear, returning to the first type of activity.

This loop continues until the players have successfully completed all the levels and so finishing the story.

2.5 Mechanics

Since this game is oriented to the smartphone market, the mechanics will involve the interaction with the touch screen, using most of the times a "tap". The main mechanic will be the interaction with the different objects. They will be able to pick them by tapping and selecting the given option, also they will be able to use them by selecting , and then tapping where they want to use them.

Another mechanic will involve walking. Once the puzzle screen is completed, the players will have to move to the next location.

3 Artistic design

From the beginning, the main focus of the project was the artistic section, and this is the task that has taken most of the developing time.

The aim was to create a beautiful game that may remind those old graphic adventures such as monkey island 2^[13] or Broken Sword: shadow of the templars^[14]. To achieve this artistic level, the main focus was the creation of rich backgrounds that are not only pretty, but also make the player feel that that place could really exist.

In the following sections, the most important points and features of the artistic design as well as how they have been done will be explained.

3.1 Colour schemes

In this project, every one of the 3 different levels have a specific colour palette^[15] for them, separating one from the other and helping to create that feeling of uniqueness.

If we look to the first level, we can see that the predominant colour is a light brown, really similar to the tone of the sand, making you link it automatically to a sandy environment. Other key features of that scene are the central statue and the font below it. The first one uses dark colours. This fulfills two functions:

- The first one is to separate it from the background, making it important for the player subconsciously.
- The second one again helps to associate the statue to the culture it belongs to. Egyptians used black to represent Anubis, as it was the god related to the death and the lord of the necropolis. The black came from the color of the rotting bodies and the fertile land. It was a symbol of resurrection.

The font is the only blue tone in the scene. When the players see that water surrounded by sand, it will remind them of that oasis in the middle of the desert.

With all of these elements, it will take the players just a glare to realise they are in the time of the Egyptians.

On the second level, the key color is grey. It is all around the stone walls and the armor. When we see stone, we automatically think in old constructions, we associate the stone to those old castles and walls that were built hundreds and hundreds of years ago. Achieving that the players instantly link it to the medieval era.

But the grey is not the only color that helps to locate the players, in the second level the red plays a really important role. It is normally used to represent the luxury and richness of the materials, the players can find it on the carpet and on the armour's cloak.

3.2 Creation process

The first step was the planning of the level. For this, a brainstorm helped to decide about the time and place where it would happen. Once this was decided, the preparation of the puzzles began. This will be explained in more detail in future sections.

For the creation of the artistic part, different techniques were used. These techniques have been polished and practiced for years, from the use of 3D modeling to create the basic shape of the level, through the drawing and composition of the scenes and ending with the texturing, in all the steps the quality has been the main focus, creating welcoming and interesting landscapes.

3.2.1 Thumbnail Design

Before starting to model or even drawing the backgrounds, the first step was to test different options to see which elements worked and which did not.

To do this, instead of spending time designing backgrounds and objects that might or might not work, very simple designs were made, thumbnails, in which were included different elements and varied the composition a bit (Figure 2).

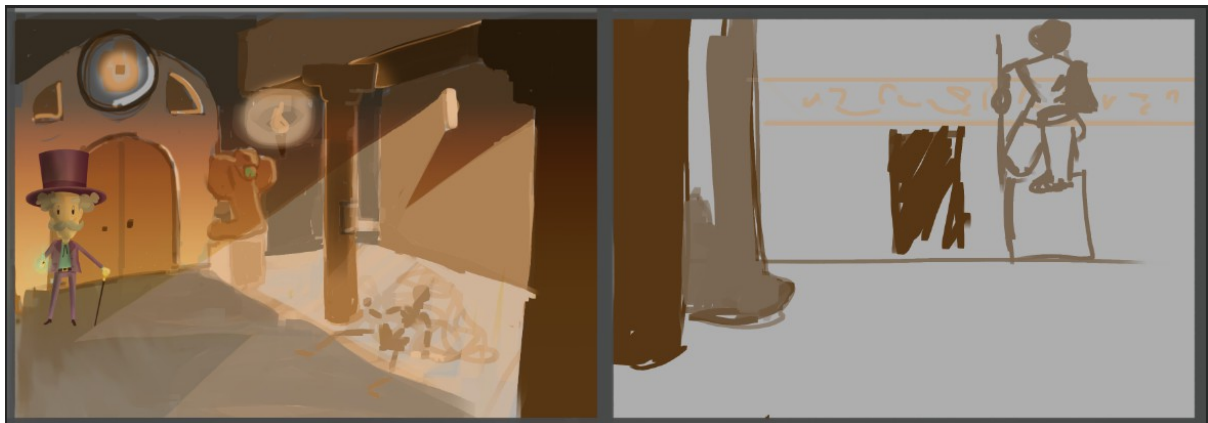


Figure 2: Thumbnails for the first level.

As we can see in the image, these are a couple of the several that were done for the first level. It can be seen how different tests were made with different camera angles and different layouts, although the key elements of the puzzle remained from one to another. At first, the invariable elements were going to be the statue and the door, but when making the thumbnail on the left, it was decided to replace the door with a larger statue that would therefore attract the player's attention. It also helped me to make clear the lighting, which would come from the right in some small windows, and the presence of a skeleton, which I later decided to involve in the puzzle.

This process was also used with the rest of the levels, which allowed the artist to realize which elements fitted and which didn't, investing little time and resources. Thanks to this, it was possible to do several iterations getting levels that work very well both artistically and playably.

3.2.2 3D Modelling

In this work, 3D has been one of the fundamental tools when making the composition of the different elements of the level, allowing to make tests with different objects easily and getting the perspective of the scenes to be correct.

It all started by establishing the basic shape of the room and the angle at which the camera would be. Once this was done, the previously made thumbnail was used, which contained the elements that had to appear.

As the different objects were placed, it was possible to see if they really worked, therefore allowing the proper changes to be done. As the scene created in 3D was going to serve only as a template, it hardly had any detail, it was made up of basic geometric shapes (Figure 3).

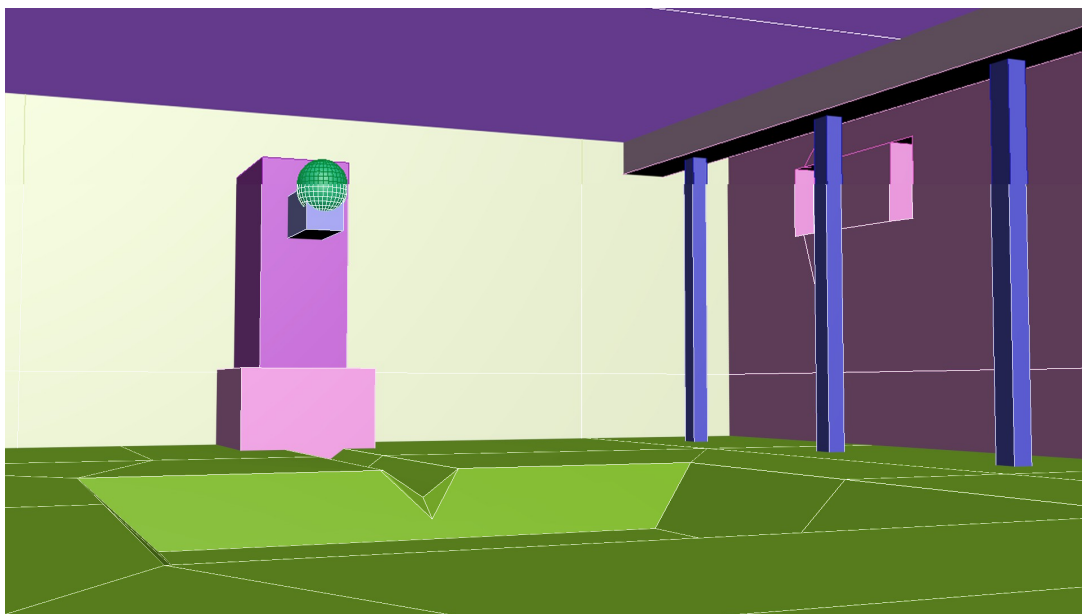


Figure 3: 3D model for the Egyptian temple.

As it can be seen in the first image, the 3D model was used mainly to place the columns and the statue correctly together with the fountain. The rest of the elements until reaching the final design were added little by little.

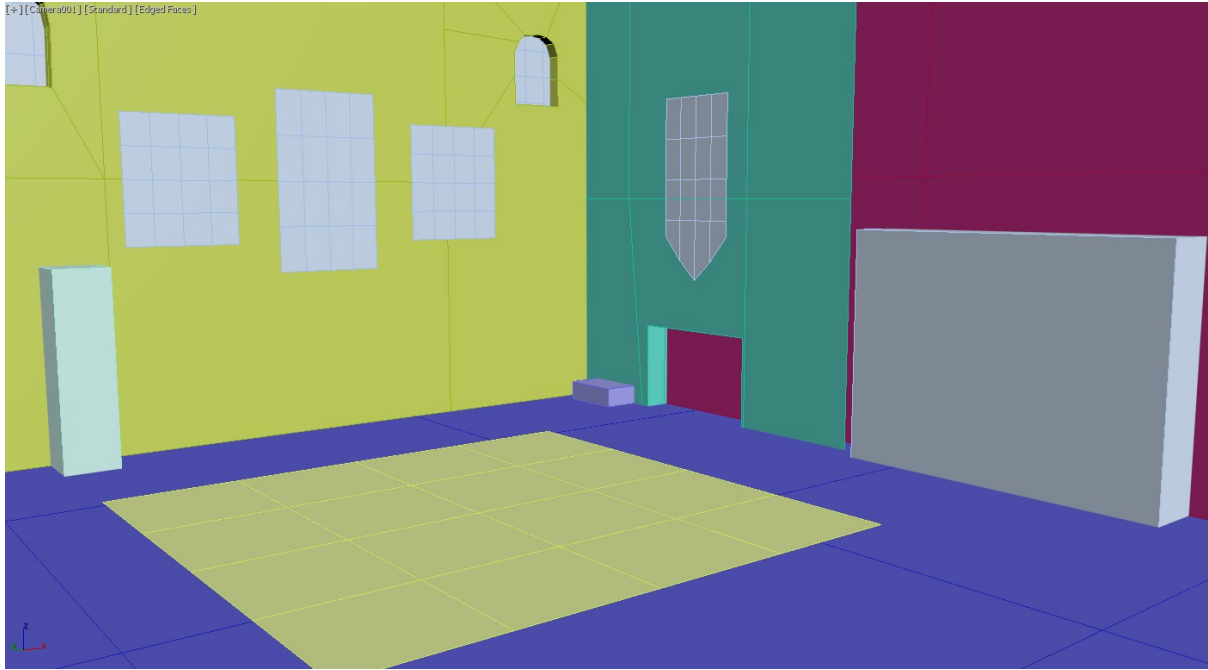


Figure 4: 3D model for the Castle.

In this other image (Figure 4), we observe a similar situation. Modeling was used to establish the main composition, ensure that the raised puzzle fits into the background and check once more that the perspective is maintained throughout the image.

3.2.3 Background Design

This has been one of the sections that has taken the most time on this project. It is an essential part of the game that the scenarios feel good while guiding the player through the puzzles. Once the thumbnails were created and the 3D models ready, the modeling render was taken to photoshop, where the artist began to design the different elements. On objects that had some geometry, it was drawn on top, creating the final shapes and designs. On the other hand, in places where there was no geometry, different objects were tested until one worked properly.

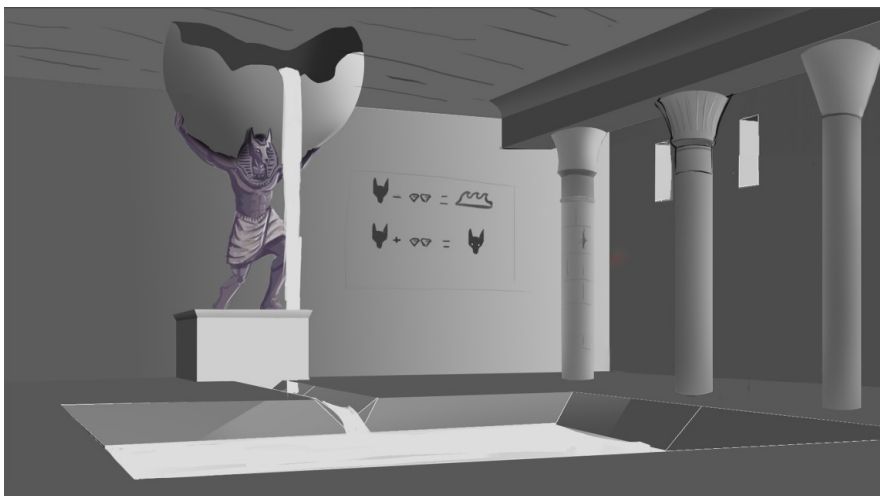


Figure 5: Progress of the temple, establishing the lights and contrast.

Little by little the designing was progressing, adding different elements, as can be seen in the image (Figure 5). The backgrounds were made in black and white, firstly to make sure that the contrast of the image worked and was correct, and secondly because it allowed the artist to modify the color in the future thanks to the Photoshop layer modes.

Once the drawing phase was completed and the values settled, the texturization process began, first applying a base color and then using reference images in order to imitate them by mixing different types of brushes.

An important factor when creating the backgrounds was the division of these into different layers, so that when setting up the scene in Unity, everything worked as it should. The second level will be used as an example to explain this concept more clearly:

Here the final result can be seen, but this is a static image, it does not have animations and the elements within it do not vary (Figure 6).



Figure 6: Image of the final result of the castle.

If the image is decomposed into different elements, it can be observed the potential problems: Using Alde as an example, he is exposed to the light of the fireplace, giving him the orange tint that is in the scene. In the same way, he has an animation that is in a constant loop. His watch levitates wrapped in magic. This forces us to have a hierarchy of layers: Alde must be below the layer that contains the lighting of the fire.

In the same way, the layer that contains the darkness varies by making the shelf descend. Since there is no shelf, the light illuminates more of the wall than before (Figure 7).



Figure 7: before and after the shelf goes down.

This adds a degree of difficulty when planning the scene, thinking which elements will be visible at a certain moment, which ones will not, and which ones have to be above others.

The way these problems were solved was through animations. In the case of darkness, it is a 1-frame animation. When the player performs the action to lower the shelf, the animation changes to the next one which is again a 1-frame animation, showing the wall more illuminated.



Figure 8: Image of the layer used to simulate darkness and how it varies.

In the previous image (Figure 8), it can be seen the layer used to make that feel of darkness. It was a layer with an 80% of opacity, allowing to see the images below it but darkening them. The things that are rounded are the ones which change from one to another. For example, when the players pick the sword, the game will trigger the next animation, which is the same layer of darkness, but without the sword highlight.

This process is used on numerous occasions throughout the game, providing a layer of realism that, as mentioned above, favors the veracity of the environment and helps the player feel part of the story.

When it came to making the designs, the main focus was to create scenes completely different from each other, not only with the puzzles, but visually. For this different types of lighting, tones and composition were used.

In the case of the first level, the chosen design was a temple of worship to Anubis, in which the Egyptians made offerings to him.

To capture this, piles of coins and jewelry can be found, as well as vessels, all in perfect condition. It also can be found what remains of the last person who tried to storm the temple. In this way, without explicitly telling where we are, the players can get an idea simply by observing the scene (Figure 9).



Figure 9: image of the final result of the Egyptian temple.

In this scene the warm tones are the ones that are most present, highlighting the reddish color of the columns. In terms of composition, if the rules of thirds are applied, it is seen that both the statue and the skeleton occupy the entire left part, capturing the players' attention to that area. Another factor that helps guide the players is the contrast between the statue and the background, being the former the darkest point of the whole scene.

Once the players have inspected the statue, they will continue to scroll the image following the rays of light. This will take them to the clue to solve the puzzle, located in the middle of the scene. Finally, this visual tour will end in Alde. Without realizing it, the players will have seen the key elements to solve the puzzle.

On the other hand, in the second level, in terms of tones it has nothing to do with the previous one. In this second scene cold ones predominate, gray being the most repeated color. In this level, the players are largely guided by light, with most of the scene submerged in darkness. This way, they will look first at the armor, since it is fully illuminated.

While solving the puzzle, a part of the level that the players would have barely paid attention to, the shelf, it will change its position adding some light to the level, and unveiling the final puzzle.

Finally, for the 3rd level, cold tones are used, but not as in the second one. In this one, blues

are the predominant ones, mainly because that color is the one related with the technology and future, being this the mood it is aimed at. The button that the players have to press is red, which is the complementary color of green, creating that contrast and focusing the player on it (Figure 10).



Figure 10: image of the final result of Camera room.

3.2.4 Animations

Animation has been another fundamental part in this project as it brings great visual appeal and dynamism to the scene. As it has been taken the old graphic adventures as a reference, all the animations are made based on frames.

When it comes to animations, there are several options. it can be used as a system of "bones"^[16] to which each part of the 2D image is linked to, in such a way that when moving it, the animation is calculated by interpolating the positions.

Another way to animate, and the one chosen for this project, is frame by frame animation or as it is called: Traditional Animation^[17]. In this type of animation, the sensation of movement is achieved with the succession of images, frames (Figure 11).

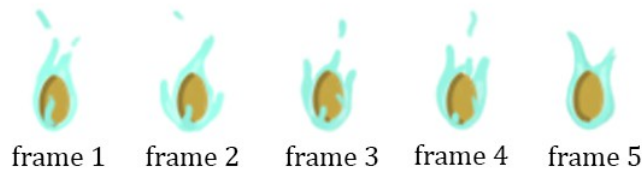


Figure 11: different frames from the watch animation, used in the second level.

This is the style of old animations, when the technology was not yet that advanced and there was no interpolation hardware or software available.

This style is characterized by being much more expensive than the previous one mentioned since each second of animation usually has between 8 to 24 images, depending on the fluidity that is sought and the time available. In addition, it must be taken into account that in order for the animations to look good, the so-called "principles of animation"^[18] are used, which are a series of techniques used to bring realism to the animations (Figure 12).

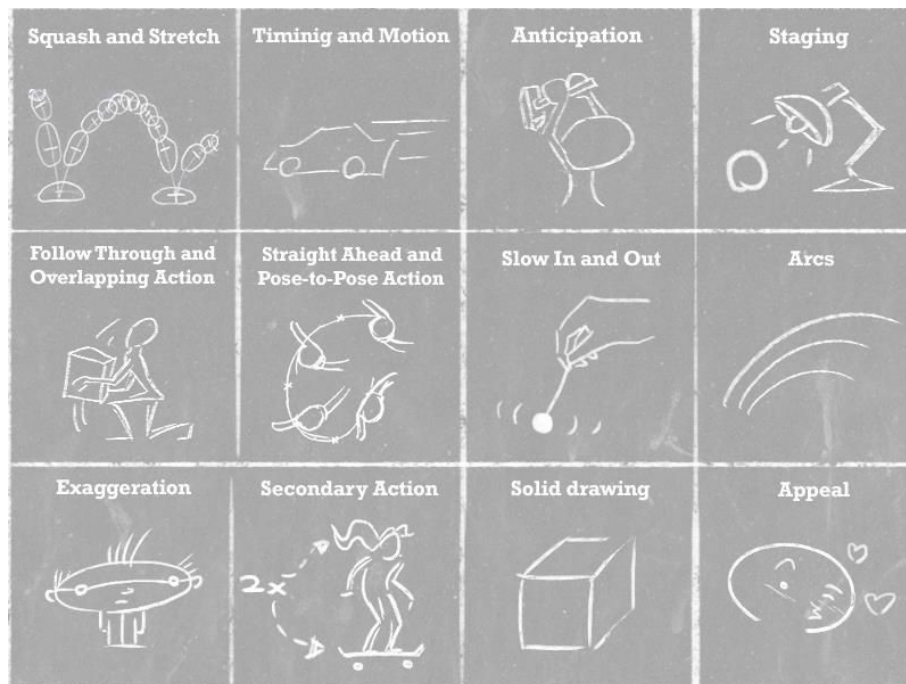


Figure 12: Graphic of the 12 principles of animation.

Normally in these types of animations, the most experienced animators usually make the keyframes, which are the frames that have the greatest weight in the animation, and other animators are in charge of the inbetweens which are the intermediate frames between the keyframes, responsible for bringing fluidity to the animation (Figure 13).

For example, if there is a movement animation, the keyframes could be the initial, middle and final position, and the inbetweens would be the images that would be responsible for merging one image with another, achieving a sensation of movement.

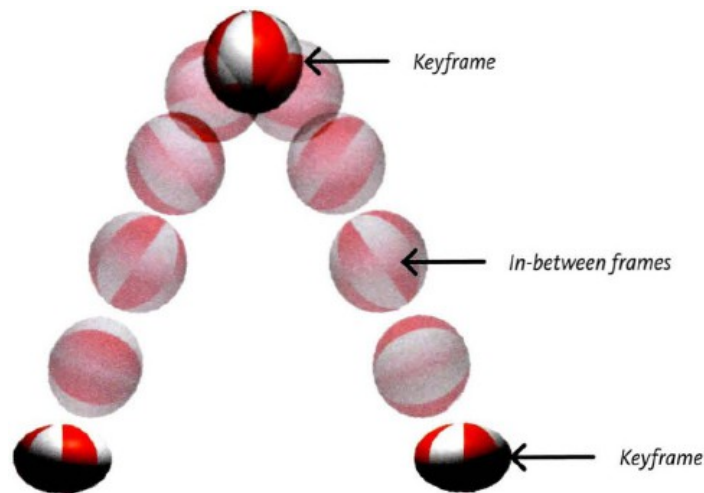


Figure 13: Example of the different parts of an animation.

Taking all this into account, we can go on to talk about the animations of this project. Most of them are around 7-8 frames and are designed to be cyclical^[19], that is, to repeat themselves over and over again without noticing when they start or end (Figure 14).

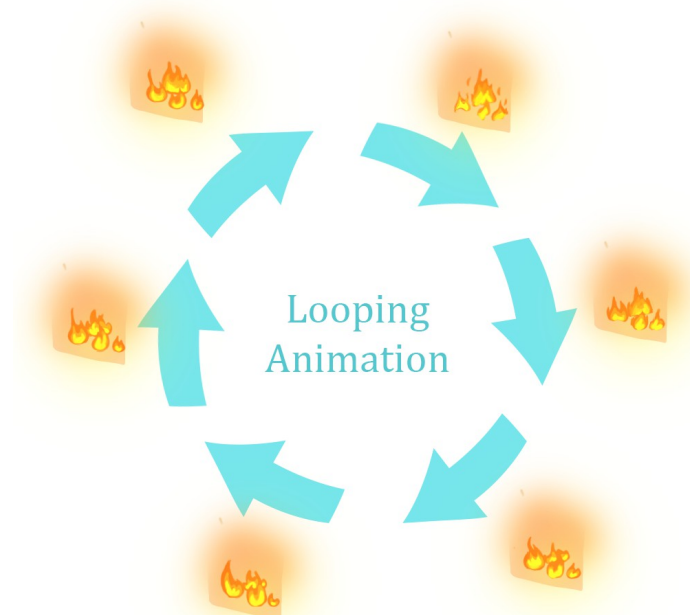


Figure 14: Different images that compose the looping fire animation.

This, which may be simple at first glance, is somewhat more complex than it seems, since the starting point and the end must be the same, the animator has to think about what movements you are going to perform and make it fit.

This type of animation can be found in the waterfall of the first level, in the torches, bonfires or in the fire around the magic clock.

Although cyclicals are the most common animation in this project, they are not the only ones. It can be seen in the first level, for example, how the skeleton opens its fist, or how the gems are

placed on the statue causing the fountain to dry. All these animations are intended to be played only once (Figure 15).

To do them, The techniques explained above were used, firstly placing the starting point and the end of the animation, then drawing the intermediate frame to those two and kept repeating the process until the animation looked fluid.



Figure 15: Keyframes and Inbetweens used for the skeleton hand.

One of the animations in which the principles of the animation are best seen is in the library when it goes down into the floor. In the first place it is seen the use of anticipation, the library before going down, it goes up during one frame, it stays in that position for another frame and the descent begins.

It is also seen the use of timing, the library does not go down at the beginning at the same speed as at the end, an acceleration is observed.

Finally, the use of squash and stretch is observed, both at the beginning when it rises, it is compressed on the sides making it thinner, and during the descent, where it stretches to give that sensation of speed (Figure 16).

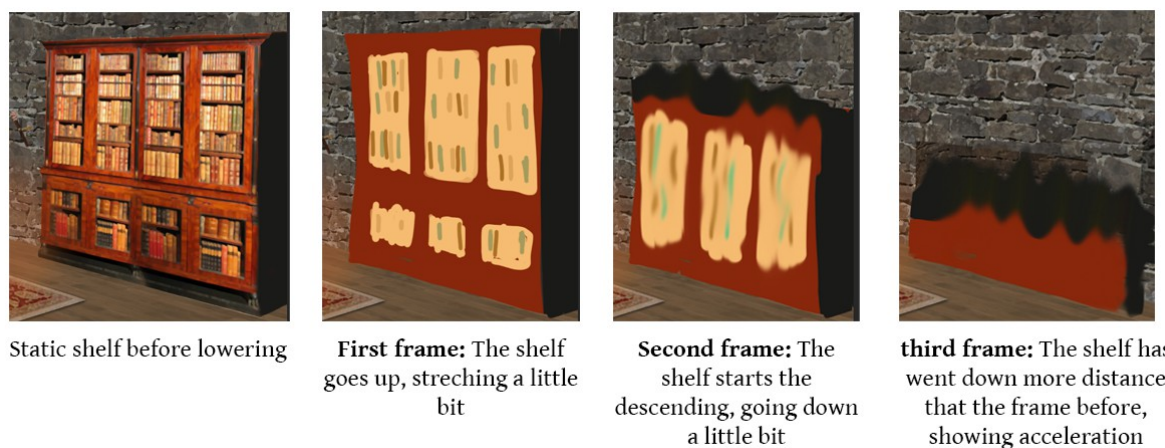


Figure 16: Image that breaks down the animation of the shelf.

All this, although it happens quickly and for a few frames, brings richness and realism to the movement of the shelf.

These concepts and techniques were also used in the initial and transition animations between levels.

3.3 Final thoughts

As a final point to this section, I would like to add that a fundamental part when carrying out this work has been all the experience gained throughout my career and my years drawing, these techniques and concepts are difficult to add because they are things that I have so internalized that I use them without being conscious, but without all the work previously done, I could not have gotten to do the work that I have done^[20].

4 Level Design

4.1 General process

When designing the different levels, it was very helpful to adapt some escape room layouts to the digital environment.

From the design point of view, this game offers the challenge of having to place the different elements that will be part of the puzzle in a given, non-expandable space, in such a way that the puzzle is affordable, but that solving it is not trivial.

With this in mind, the first thing that had to be done was to think about the different challenges that should be in each of the levels. For example, the first level was designed in a more introductory way, to teach the players that they can pick up items and use them from inventory.

In the second level the mechanic of modifying the lights was introduced, allowing the players to see things that were invisible at first. Finally, at the third level, it seemed like a good idea having the player to translate a message using binary language. These are roughly the mechanics that it was thought to introduce. Now we will talk about the creative process required to adapt them to the game.

4.2 Creation process for each level

In the case of the first level, the theme was going to be Egyptian. Taking this into account and knowing that it would serve as an introductory level, the following concepts were considered.

First of all, it was thought of having a big door in the center of the room, and a statue from which a sphere had fallen. When returning the ball to the statue, the door would open.

On paper the idea worked, however, the door took up too much space for its function: to open and reveal one of the missing pieces. For this reason, It was finally changed for the idea of having a statue that was part of the fountain from which the jewels had been removed from its eyes (Figure 17). When these are returned, the fountain will stop emanating water, thus revealing the lost piece. Finally, a skeleton was added, holding the gems in his fist, contributing to the history of the scene. The aforementioned would have tried to steal the jewels, being trapped and finally perishing in that place.

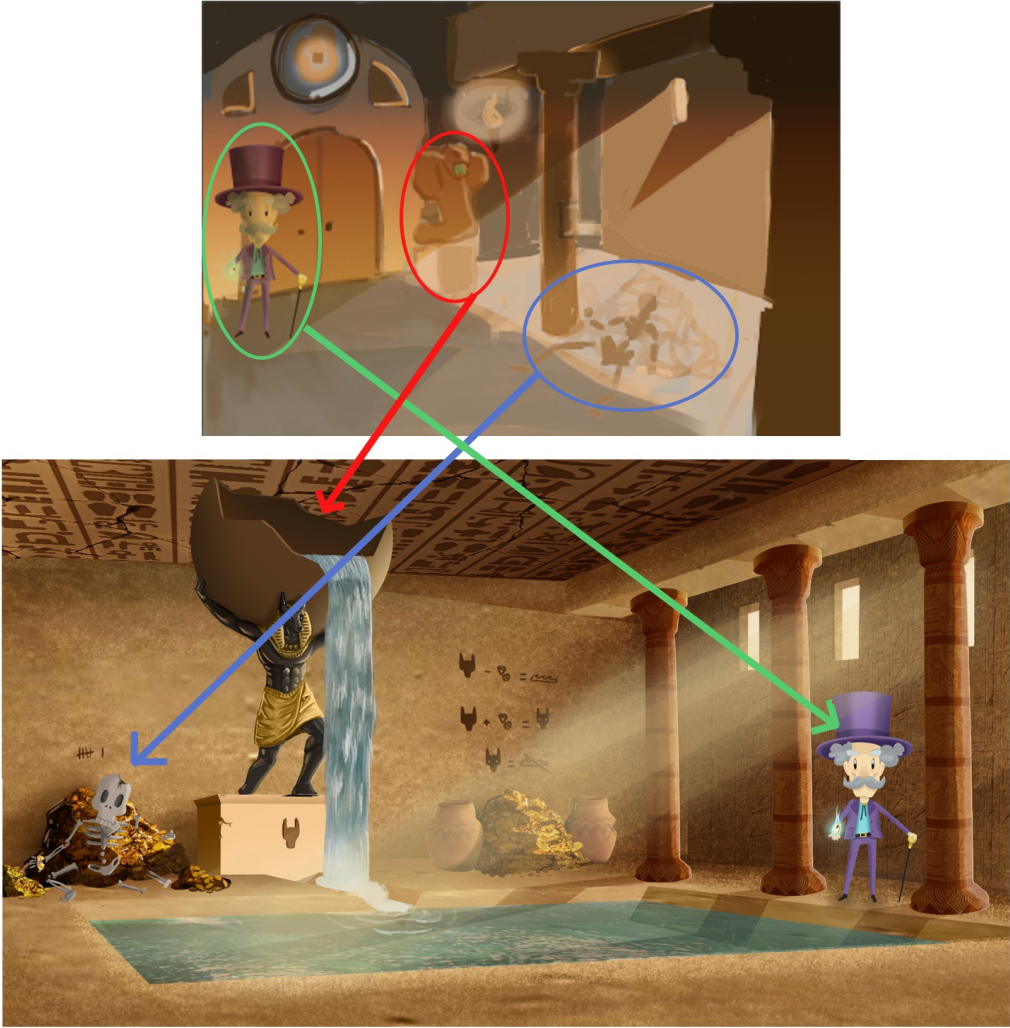


Figure 17: Image that compares the thumbnail with the final piece.

This design seemed to work much better and it was the one that finally ended up being used. Finally, some marks on the wall were added (Figure 18), guiding the players and explaining through symbols that if the jewels were returned to the statue, the water would stop coming out, with this, when finding the diamonds, the players would know that they should use them on the statue.



Figure 18: wall hieroglyph.

In the case of the second level, as mentioned before, the idea was to play with the lighting, creating a level with a dim lighting that, when completely turned off, would reveal the solution to the puzzle. One key item that was added from the beginning of the level, was a chest and a padlock, which had the missing piece inside, and that the combination would be only visible when the lights were turned off.

To make the level a little less trivial, It was decided to add a library that covered the hiding place of the chest, and an armor that was missing the sword. This way, what was learned in the previous level would be applied to this one, putting the sword in the armor, but at the same time it was expanded with the second puzzle, that of the trunk.

Finally, to guide the players in what to do, a note was placed on top of the chest with the clue that the players must turn off the lights. Also added a bucket of water, with which to put out the fire. To make the bucket more noticeable, an animation was added to it, in such a way that it was implied that the castle had leaks and that this cube was the one that collected the water (Figure 19).



Figure 19: Image that shows a couple of frames of the bucket animation.

Last but not least, the third level was going to be set in a more current era, closing the circle of the journey in time, therefore, the idea of setting the player in a control room, full of monitors, and playing with the binary language was the chosen one.

As it was assumed that it would be very easy for the players to solve it if the code was visible since the beginning, a button was added. When pressed, the monitors would stop containing images of the cameras and would show a message in binary. The central screen would ask the players a password. To obtain it, they will have to use the binary code translator, located in one of the pictures on the wall, which when clicked, would expand to show the numbers from 0 to 9 as well as their translation.

This did not make the level much more complex, but achieved that the player did not know exactly what to do, forcing them to explore.

Once the password is correctly given, it will tell the player where to look and there the necessary piece will be found.

In all the levels, one of the main goals was to surprise the players, not showing them exactly what to do, but letting them explore a little and letting them follow the path of their actions, finding out the way to the solution by themselves.

5 Implementation

5.1 General implementation

Once all the art was done for the level, it was taken to unity and organized by layers, setting every element as it was supposed to be.

Having done this, the cyclical animations were implemented, these ones are continuously playing.

With that, the base scene was finished.

All levels have a system to detect the clicks made by the players, called the click manager, and depending on where they press, one of the following actions occurs:

- The state of a variable is updated
- The conversation system is triggered
- A menu is activated

Taking the first level as an example, when the players click on the skeleton, the action menu opens (Figure 20). If they click on the given option, the jewels variable is updated by triggering the animation.



Figure 20: Image that exemplifies how the interaction with the environment works.

Once the click manager was implemented, the rest of the animations were added, including the conditions that activated them. Then the HUD and the player's inventory was implemented, in this, when an object is taken, it appears on the inventory, allowing the players to use it (Figure 21). The interaction with the objects in the HUD works in the same way as with those in the scene, once they are clicked, a menu opens that allows them to be used. Internally, when the players choose to use the object, a variable changes state and, depending on the players' next click, one of the following actions will occur:

- If the players click on the target, the action that should happen will happen and the item will disappear from the inventory.
- If the players click anywhere other than the target, the variable returns to its previous value.

This way, if the players fail, they will have to reuse the item from inventory.



Figure 21: Image that shows how to use the items from the inventory.

Once the click system, the HUD, the inventory, the animations and their triggers were implemented, the only thing left to do was to introduce the conversation system, which is triggered at the start of the level, providing the players with useful information, and in certain circumstances, guiding them in case they do not know how to solve the puzzle.

To accomplish this, when the players select an object and clicks outside the target, Alde makes a comment (Figure 21). This cycle repeats itself, showing increasingly clearer clues.

Finally, the change of scenes was implemented once the player got the lost piece, starting the transition animation between levels.



Figure 22: Example of clues given to the player if the item is not used where it is supposed to.

This order of implementation was repeated between the different levels, since the mechanics and the structure were similar. The part that varied was the implementation of the puzzles, there each level had its own.

5.2 Specific level implementation

In the case of the first level, as already mentioned, it serves as an introduction and its implementation is simpler than the other levels. When the players choose the option to take the skeleton jewels, the variables are modified so that the skeleton animation occurs and the jewels are added to the inventory. Hence, once they are selected, a boolean variable changes its state to true. If the players click on the statue while the variable is true, the jewels disappear from the inventory and the animation variables are modified. Thus appearing the searched object (Figure 23).

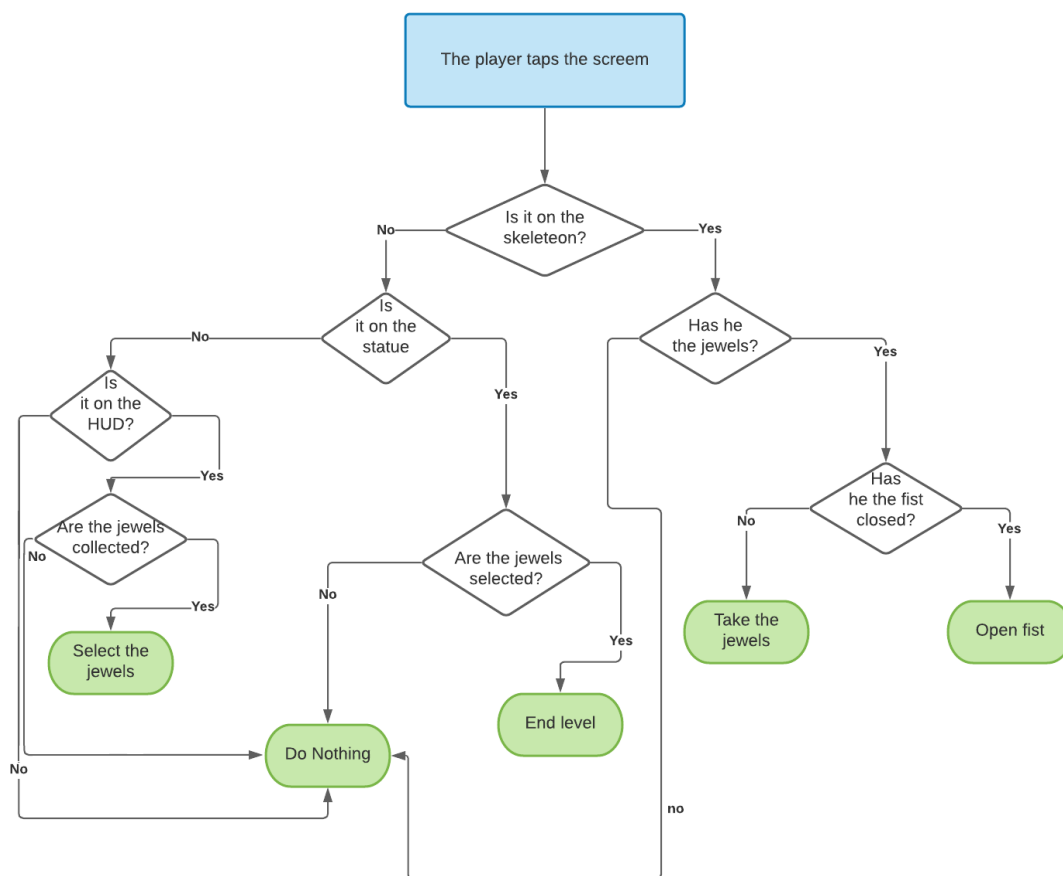


Figure 23: Diagram from the first level.

At the second level, we find that the first part is similar. The players can click on a sword that is on the ground. Doing so opens a menu that allows them to take it, adding it to the inventory and modifying the specified variable.

When the players select the sword and choose to use it on the statue, the animation variables are updated and the sword disappears from the inventory. In turn, the chest appears and the player is allowed to click on the water bucket (so far disabled).

When the players click on the note, an image is superimposed on the screen, which disappears when clicking, in the same way, if they click on the trunk, the image of the padlock will open, with a series of buttons to modify the combination numbers. Below the mentioned padlock there

are two buttons, one to check the combination and another to close the menu, returning to see the room view and deactivating the relevant objects.

In the case of the cube, its use is similar to the inventory objects. When clicking opens the menu that allows it to be used. If the players choose to do so, the variables are modified and if they click on the fire, instead of disappearing the cube, an image of the castle is shown without lights and with the combination, which is deactivated when clicking anywhere.

Finally, when the players enter the combination in the padlock, it is verified, if it is correct, the variables of the animations are modified revealing the inside of the chest. If the combination is incorrect, the padlock numbers are set to 0, allowing you to try again (Figure 24).

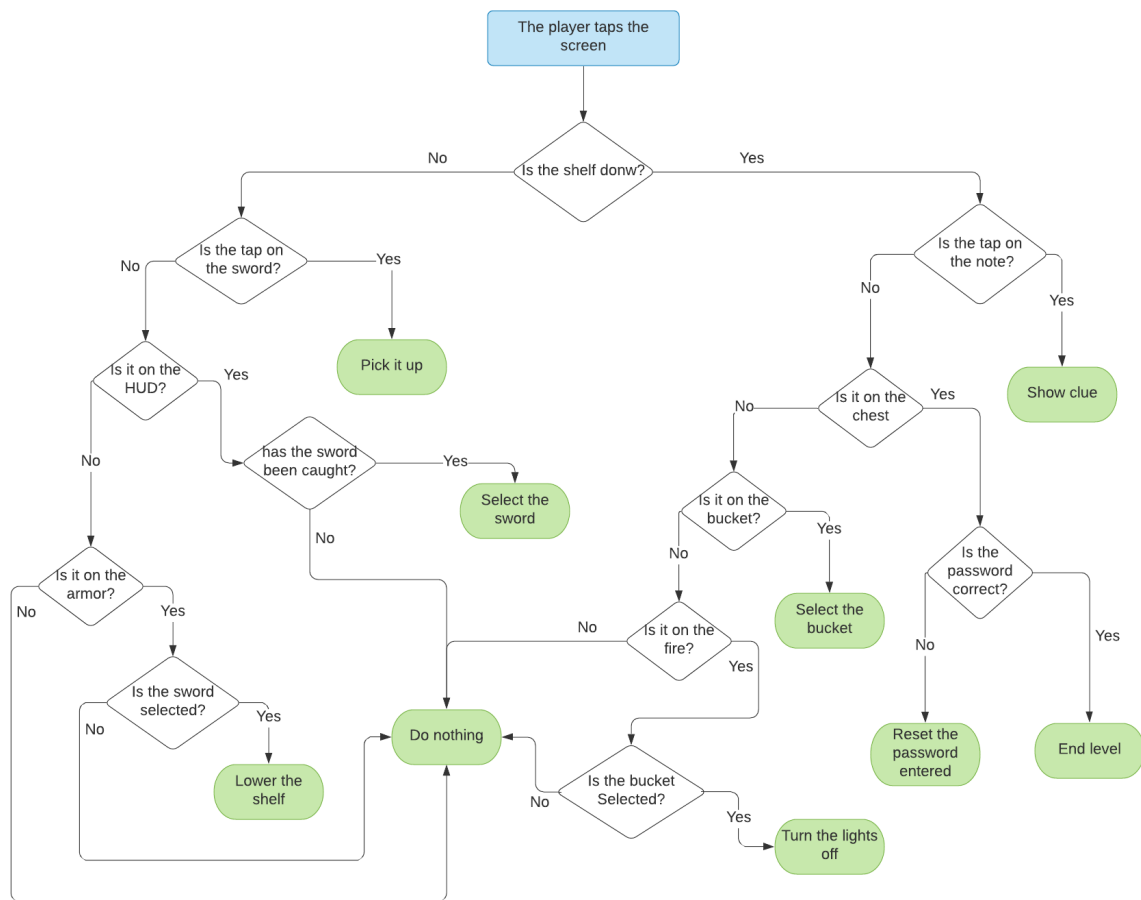


Figure 24: Diagram from the second level.

In the third and last level, the players can click a glowing red button, which will modify the variables of the monitors' animation and start the puzzle, or can click on the frame that shows the binary language. This will remain on the screen until the close button is pressed, which will deactivate the object. The poster which hides the last piece from the magic clock will be disabled until the players have completed the puzzle, preventing it from being accessed by accident. The players will be able to click on the central monitor, which will allow them to enter the password. It will be checked and in the case of being incorrect, it will be deleted. If the password is correct, the animation variables will be changed and the poster will be activated so that they can click it. When this happens, the variable that controls the animation will be modified, revealing the last piece (Figure 25).

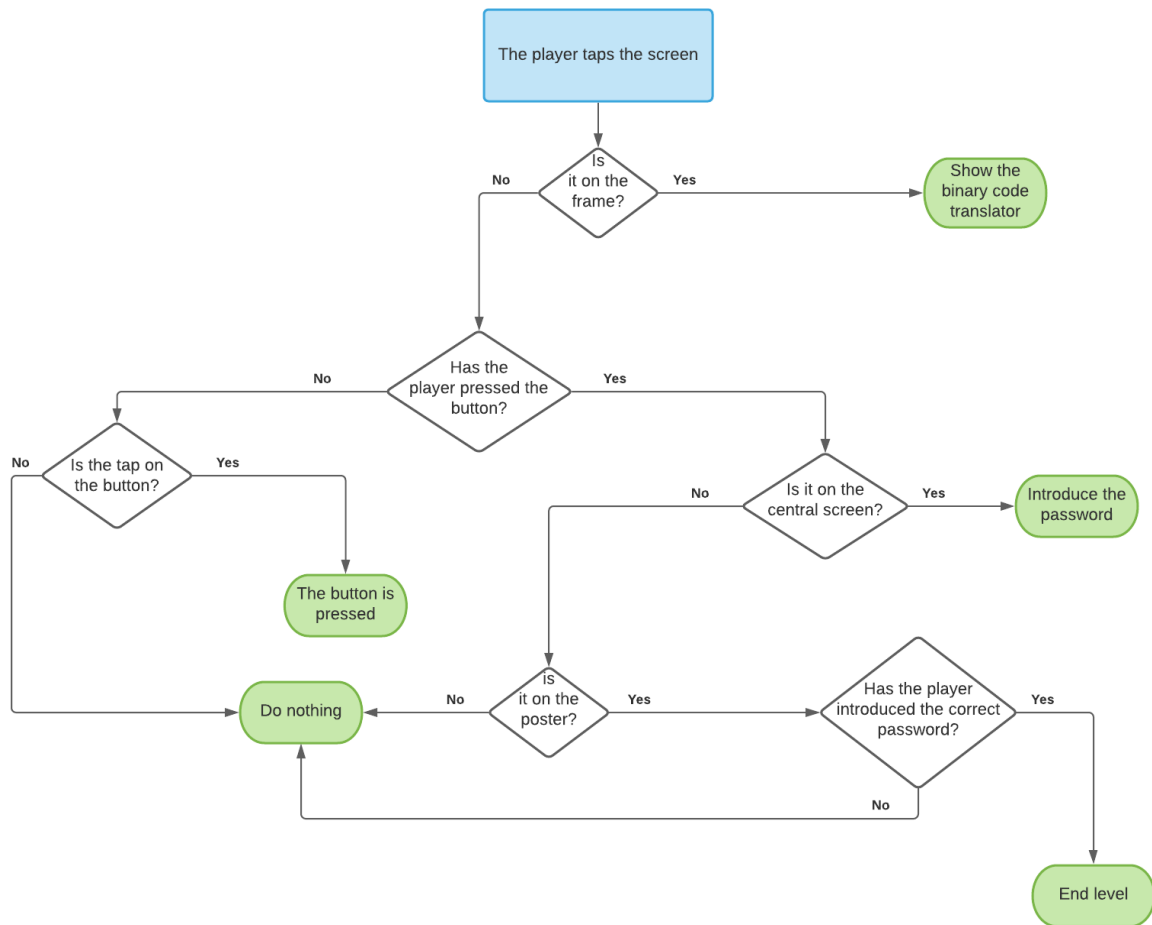


Figure 25: Diagram from the third level.

As mentioned above, this work was more focused on the artistic part. It is the main reason why the implementation can be simpler. However, it does its job well, creating seamless levels that work properly.

6 Results and conclusion

This project presented a great personal challenge, not only was I going to make all the art of a video game, from the conceptual design to the assets that would be used in the game, but I was also in charge of the level design, implementation and story that would unite everything creating a good final product.

I think the end result has been what I was hoping to get, being a simple game to play, but at the same time offering entertainment and not being trivial at all. To all this, the key factor in this project is added: the art. I am very happy with how the different levels have been designed, I think that the animations give it a very good touch, making the scene much richer and more pleasing to the eye.

As a final conclusion I will say that I am quite happy with the result obtained, I believe that I have managed to achieve the goals I had set for myself, learning many things along the way, the main one being the ability to overcome a problem when it arises.

7 Future work

Despite the fact that the initial objectives have been met, the pandemic situation we have experienced led to rethinking some parts of the project, causing one of the main proposals to remain unused, the beacons. Since it was not going to be possible to make a demonstration, both my tutor and I decided to not include them and focus in other parts.

With all this, I will expand my work with the following sections:

- **Implementing the use of beacons:** The project is planned in such a way that it would be possible to add them without having to modify its structure. As mentioned above, the decision to not implement them was due to health alerts that forced us to be confined. As the exact duration it would take was not known, we decided to use the time it would take to implement them to perform other tasks, and leave it for a future expansion.
- **Translating the game into more languages:** Because this project is aimed at gamifying different spaces, this product works perfectly as a tourist activity. In this way, translating the game into the languages most spoken by the people who visit that place would add great value when selling the product.
- **Adding levels:** Although the end result is very satisfactory, adding more levels would increase the duration of the game. I consider that 5 levels would be the optimal amount, so that the player did not finish it quickly but did not end up hating it either.

I hope that the reading of this memory has been satisfactory and that it has made every point clear. The gamification is a process that is growing in popularity and that has a lot of potential if used correctly.

It is largely documented that people tend to learn and retain more information when enjoying it the way it is being taught at them. I strongly think that the gamification has a lot of potential and I really hope that people keep finding ways of using it.

8 Bibliography

1. Unknown. (July 23, 2020) *Puzzle video game*. Wikipedia.
https://en.wikipedia.org/wiki/Puzzle_video_game
2. Ligeró, Raquel. (January 10, 2018). *8 cosas que deberías saber sobre los beacons*.
<https://accent-systems.com/es/blog/8-cosas-que-deberias-saber-sobre-los-beacons/>
3. Unknown. (September 2, 2020). *Teléfonos inteligentes*. Wikipedia.
https://es.wikipedia.org/wiki/Tel%C3%A9fono_inteligente
4. Unknown. (July 25, 2020). *Aventuras gráficas*. Wikipedia.
https://es.wikipedia.org/wiki/Aventura_gr%C3%A1fica
5. Unknown. (October 15, 2018). *What is an escape room?*. The escape room Blog.
<https://theescapegame.com/blog/what-is-an-escape-room/>
6. Unknown. (August 3, 2020). *Gymkhana*. Wikipedia.
<https://en.wikipedia.org/wiki/Gymkhana>
7. Unknown. (September 19, 2020) *Unity (motor de videojuego)*. Wikipedia.
[https://es.wikipedia.org/wiki/Unity_\(motor_de_videojuego\)](https://es.wikipedia.org/wiki/Unity_(motor_de_videojuego))
8. Unknown. (September 10, 2020). *Adobe Photoshop*. Wikipedia.
https://es.wikipedia.org/wiki/Adobe_Photoshop

[Click here to go back at the top](#)

9. Petty, Josh. (2020). *What is 3ds Max & What is it Used For?*. Concept Art Empire
<https://conceptartempire.com/what-is-3ds-max/>

10. Brown, Korbin. (November 13, 2019). *What Is GitHub, and What Is It Used For?*.
How to Geek. <https://www.howtogeek.com/180167/htg-explains-what-is-github-and-what-do-geeks-use-it-for/>

11. Unknown, (October 16, 2017). *¿Qué es Trello?*. Trello
<https://help.trello.com/article/708-what-is-trello>

12. Cervantes, Edgar. (September 1, 2020). *What is Android?*. Android Authority.
<https://www.androidauthority.com/what-is-android-328076/>

13. Unknown, (May 19, 2020). *Monkey Island 2: LeChuck's Revenge*. Wikipedia.
https://es.wikipedia.org/wiki/Monkey_Island_2:_LeChuck%27s_Revenge

14. Unknown, (September 18, 2020). *Broken Sword: The Shadow of the Templars*.
Wikipedia.
https://en.wikipedia.org/wiki/Broken_Sword:_The_Shadow_of_the_Templars

15. Clem, Alex. (May 8, 2019). *What is a Color Scheme: Definitions, Types, and Examples*. Shutterstock. <https://www.shutterstock.com/blog/color-scheme-definitions-types-examples>

16. Unknown. (May 26, 2020). *Skeletal Animation*. Wikipedia.
https://en.wikipedia.org/wiki/Skeletal_animation

[Click here to go back at the top](#)

17. Parnett-Dwyer, Michelle. (July 20, 2015). *Hand-Drawn Animation: From Cartoons to Video Games*. Museum of play.
<https://www.museumofplay.org/blog/chegheads/2015/07/hand-drawn-animation-from-cartoons-to-video-games>

18. Ritchie, James. (July 19, 2017). *The 12 Principles of Animation*. Idea rocket.
<https://idearocketanimation.com/13721-12-principles-of-animation-gifs/>

19. Codrina. (October 18, 2020). *What is a cycle animation?*. Marionette studio.
<https://marionetestudio.com/what-is-a-cycle-animation/>

20. Unknown. *Drawing Shadows and Light: The Basics*. Artist network.
<https://www.artistsnetwork.com/art-techniques/beginner-artist/beginner-drawing-shadows-and-light-the-basics/>

[Click here to go back at the top](#)