



Universitat Jaume I de Castellón

Design and Development of Video games Degree

Technical Report of the Final Degree Project

Interactive experience of memory disorders

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Abstract

Actually, there are a lot of games genres and some of them are not necessarily aiming to be played by *gamers*, but whoever who wants to have an experience or spend a nice time. So, there are games whose objective is to tell something to the player or make people aware of a certain concept or situation.

The game developed for this project is *Keep Mind*, which is an interactive experience in which the player will control a character with some memory disorders. The player must explore the environment to know about the house, who the character is and also know some information about themselves. The audience target is people with an age above 15 because the game contains topics about a few family problems because of the memory disorder of the principal character, and the storytelling could be complicated for those young players, due that the game is mainly narrative.

In the game, while the player walks around the house, it is possible to interact with some objects with the aim of know about the story as the will experience some mental problems, like blackouts^[1]. After that, the player should find out what happened in those *gaps* to continue the line of the story.

Keep Mind is made with Unity 3D, and the game is developed to be played on PC because nowadays most of the people have one and also it is a very common platform to play games.

Key words— Video games, memory problems, interactive experience, Unity.

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Chapter 1

Technical Proposal

Abstract

This document presents the technical proposal for the development of the Final Degree Project. The aim is to create a video game that will be an interactive experience for the player in which they put themselves in the shoes of someone with memory disorders. The player must move through the environment without initially knowing what is happening around them nor where they are, so they have to find some clues that help them to place them in the actual situation. The intention is not to make the game fun, but place the player in the situation that a person with blackouts could experiment, adding to the game an aspect of awareness-raising about these problems. The game will be developed in Unity with 3D graphics and a minimalist style.

1.1 Key words

Video games; serious game; memory disorders; disease.

1.2 Introduction and personal motivation

Since the concept of Serious Game^[2] is known, a lot of games have been developed with an edutainment aim that has fit in the society very well and the video game industry got into a new field whose aim was not just to make people have fun.

A Serious Game does not mean that the game is educational and targeted to children or teenagers, but it also can be targeted to an adult audience and with the aim of telling something or make people aware of a certain concept or situation.

For this project, the kind of video game that is described is oriented to an adult audience, and it will be an interactive experience where the player will put in the shoes of a person who has some memory disorders. The player must manage the situation and follow the clues they find, with the purpose of *remember* who he is, why he is in that place and other information.

A memory disorder that the game will show are the blackouts. A blackout is a period in which the person can not access a certain memory (it can be a recent or distant event).

The main objective of the game is to make the player aware that these types of diseases exist and the possibility of appreciating in an unconventional way some of the symptoms that these disorders can cause to the people who suffer them.

Talking about gameplay and mechanics, the game could be similar to *Gone Home*^[3], but with a different graphic style, far away to be the hyper-realism design of the mentioned game.

Entering in technical aspects, the video game is going to be developed in Unity with 3D graphics and using a minimalist style, since the intention of the game is to convey a message and have an unusual experience of the video game industry, taking as its strong point its mechanics and not focusing on showing a realistic style of characters or environments.

Regarding the story, the character will appear in a house that both the player and the character himself do not know. The player will have to investigate through the level in order to know what that place is and who he is. There may be temporary jumps during the gameplay so that we will have to know what has happened in that blackout. All this to get to know who our character is and why we are in that place.

1.3 Related Subjects

- VJ1216 - 3D Design

Since the game will have 3D models, this subject is one of the most important, due that we learned to use the tools to model characters and objects in 3D for a game, applying a lot of modifiers to learn about them.

- VJ1218 - Narrative Hypermedia and Video Game Analysis

Due that the storytelling of the game is a very important part, this subject needs to be mentioned, where we learned to make a story and some ways to communicate it to the player.

- VJ1222 - Conceptual Video Game Design

This has its part in the design of the complete game, and also in the way to do the Game Design Document. The design of the level was also an important part that needs to be perfectly done.

- VJ1227 - Game Engines

Finally, this subject is the most relevant, because we used Unity on this subject for the first time, and we had to create a game on it, so that was very useful to practice and to understand how Unity works.

1.4 Objectives

- Develop a game that makes people aware of the memory disorders.

This has to be an important part of the game, creating a mechanic that can show in some way a few symptoms of those memory problems.

- Have a complete, playable and entertaining demo of the game.
It is necessary to have a complete demo that the players can play, so they can see what the game is about. Also, that demo needs to be entertaining to not bore them, and make them feel comfortable playing the game.
- Show the serious part of the game without making the game boring.
Since it is a serious game, that part of the game must be the main one, but that does not mean that the game has to be boring, so the idea is to balance both parts.
- Show a free-flowing game, without having breaks and in a correct FPS rate.
The game has to be playable in a correct FPS rate to make the gameplay nice. Also, it is very important that the game has no bugs or breaks during the gameplay.
- Show a minimalist and striking artistic style with simple shapes.
The intention is not to show a very realistic game, but the game should be visually attractive, so it will be applied some effects and materials that make the game look better in a visual way.

1.5 Tasks and planning

Table 1.1 shows the tasks to do detailed and with the estimated time that each one is going to take. However, here it is a short list of those tasks.

1. Investigate about different memory disorders.
2. Do a Game Design Document^[4].
3. Design and model the scenarios that take part in the game.
4. Program the game.
5. Search music and appropriated sounds for the game and implement them.
6. Testing and evaluate the game.
7. Write the Technical Report and the rest of the documentation.

1.6 Expected Results

As a final result after doing the Final Degree Project, it is expected to have a serious game developed with a short-medium duration. Also, that the game is an interactive experience where the player can see some symptoms of the memory disorders written in this document. The game will have an informative aim since it is a serious game, but without losing the entertaining part completely.

Table 1.1: Planning of the tasks to do

Task to do	Time
Investigate about different memory disorders	6 h
Go to the course about the technical proposal	10 h
Do the Technical Proposal	8 h
Create a good and consistent story	10 h
Design characters, levels, scenarios and objects	12 h
Make a draft of characters, levels, scenarios and objects	12 h
Model the scenarios of the game	20 h
Model the objects that take part in the game	22 h
Put a texture in the elements of the game	12 h
Design and do the main menu	6 h
Implement the main menu	4 h
Program the movement of the player	6 h
Program the camera	6 h
Program the interaction of the player with the environment	20 h
Program the transition of the scenes	8 h
Program a correct illumination	8 h
Test the game to find errors	10 h
Solve the bugs and make the game free-flowing	10 h
Implement the models in the game	10 h
Create a gameplay correct and without errors	10 h
Design the Head Up Display	3 h
Do the Head Up Display	3 h
Implement the Head Up Display	3 h
Write the texts that will appear in the game	6 h
Implement the texts in the game	3 h
Search for sound effects	10 h
Implement the sound of the game	6 h
Search for music	8 h
Implement the music of the game	2 h
Do the Technical Report	40 h
Prepare the presentation of the Technical Report	8 h

1.7 Tools

- For the drafts, it will be used drawing tools like Photoshop^[5] or Illustrator^[6].
- For the models of the environment and objects of the game, it will be used tools like 3D Max^[7], Maya^[8] or Mudbox^[9] depend on the purpose.
- For the complete implementation of the game, it will be used the game engine Unity^[10] with the programming language C#^[11].
- For the search of sounds and music, it will be used different websites oriented to that purpose. Some of these webs are freeSFX^[12], freesound^[13], Bensound^[14], Incompetech^[15] and Jamendo^[16].

Chapter 2

Related Work

Before the development of this game, there are a few things that can be taken into account for this game.

2.1 Inspiration

The First Person games are becoming more popular lately, and it was such a great idea trying to experiment with these mechanics in a game that tells a story to the player and it is not a shooter, as the majority of First Person games out there.

One of the inspiration for this kind of game was *Gone Home*, explained in a better way later, in Section 3.6.

2.2 Experience

The idea to do a lineal story was something that I personally worked in a previous game, *Tied to Life*, whose complete gameplay is in Figure 2.1 and in the link below.

Tied to Life Gameplay: <https://youtu.be/XgHKb8xjsYE>

This game was also designed in Unity 3D and it is the most recent experience working in this environment. That game was not developed completely by myself, but with a team, so I decided to make another 3D game with the innovation of introducing the memory disorders, which is something that I have always been interested in.



Figure 2.1: Complete Gameplay of the game *Tied to Life*.

Chapter 3

Game Design Document

Keep Mind



GAME DESIGN DOCUMENT

This document constitutes the Game Design Document of the game *Keep Mind*, an interactive experience about memory disorders.

Written by:
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3.1 Overview

Keep Mind is an interactive experience in First Person in which the player will control a character with some memory disorders. They must explore the environment where they will be placed to know about the house they are, who they are and also know some information about themselves.

While the player walks around the house, they can interact with some objects with the aim of know about the story as the will experience some mental problems, like blackouts. After that, they should find out what happened in those *gaps* to continue the line of the story.

3.2 Theme and Genre

The main theme of the game is a short serious game to make the people aware of memory disorders and make people ask themselves what if a close family member has those kinds of disorders. At the same time, the game tells a story of a character with those mental problems, so it is an incentive to keep playing until the end.

Due to the exploration part to know about the game story while the player is in an initially unknown house, the game can be adjusted to the genres of adventure and mystery.

3.3 Core Gameplay Mechanics

In this game, the player moves the character while interacts with some objects. Also, sometimes a *buzz* appears to simulate blackouts.

3.3.1 Movement

The player is able to move the character over the environment. They are allowed to walk or run if they want to move faster.

3.3.2 Interacting

The player can interact with the objects that are allowed to, like pieces of paper, computers, doors, etc. They also can make zoom to see an object in detail if they want.

3.3.3 Buzzing

During the game, there are some parts in which a buzz will sound and the screen will turn blurry and then black. This means that the character has a blackout and he will appear in another place a few hours later.

3.4 Targets

The game is intended to be played only on a computer by a teen-adult audience.

3.4.1 Target Audience

Due that this is a serious game and its main topic is the memory disorders, *Keep Mind* will appeal to people with an age above 15. The game contains topics about a few family problems because of the memory disorder of the principal character; this is the reason because it is not recommendable for children.

It is not necessary that the person who is going to play it has a lot of knowledge about video games, the game is easy to play and there is no much skill required.

3.4.2 Target Platform

This game pretends to be available to a lot of people. The easiest way to accomplish that is to put the game on a platform that most of the people have, a computer. Also, using this platform we are able to use a very useful method of distribution with a website where the player can download the game easily and install it on their computer with no problems.

3.5 Monetization

This game will be free-to-play. The intention is not to make money selling it but try to people play it, spent a nice time playing it and make them aware of these memory disorders.

3.6 Influences

One of the games that have influenced me to develop this games is *Gone Home*^[3]. This game was created by *The Fullbright Company* and it is a game completely based on the story over the gameplay.

Gone Home is a game with very realistic and detailed models as we can see in Figure 3.1. In *Keep Mind*, we will see a different kind of 3D art (explained in the Assets section).

3.7 The Elevator Pitch

"*Keep Mind* is a game in which you control a person who has some memory disorders. The whole game takes place in a house, where you appear and you don't know anything about it nor who you are. You must walk over the house to try to find out who are you, where are you and some other things about the story. Also, sometimes the character will



Figure 3.1: Example of one room in *Gone Home*.

have blackouts and then you'll have to know what happened during that time to continue knowing about the whole story. It's intended to be a serious game more than a funny game, to make people aware of those memory disorders."

3.8 Project Description (Brief)

The game to develop is an interactive experience about memory disorders, made in Unity^[10], with a minimalist 3D design and mostly based on the story that the video game tells, along with some mechanics to complete the experience.

3.9 Project Description (Detailed)

In this game, I want to make the player feel (in a certain way) what a person with memory disorder can experiment but add a story to make the game entertaining and aiming to play it.

The reason why the game is done in Unity is that I think it is the best rendering engine to develop this kind of game and also by its general way to use it. The programming language Unity uses is C#, in which I feel very comfortable. In addition, it is the game engine I am most used to.

All the models needed for the game will be done using 3DS Max^[7]. I have no needed to use another one because there are not organic models to realize, and 3DS Max is very useful to make usual objects. Again, it is the 3D modeling program that I am most used to.

The reason of use a minimalist model is to try to not overwhelm the player with a lot of visual art and focus on the story and the gameplay.

This game can be played by people who want to play a kind of different game, with an interesting story and in a very short time.

3.10 What sets this project apart?

Most of the serious games that are in the game industry are directed for kids since they are educational games. *Keep Mind* is a serious game that focuses on a teen-adult audience because the objective of it is to make people aware of memory disorders, to try they ask themselves about it think about that. Also, the player can see by themselves how an experience like that would be like (in a visual way).

3.11 Core Gameplay Mechanics (Detailed)

The mechanics are designed for making the player get used to them quickly and easily. There is no needed to make the gameplay mechanics only for highly skilled players.

3.11.1 Movement

The movement of the player is done with the keys WASD, where the W is for 'go forward', the A is for 'go left', the S is for 'go backward', and the D is for 'go right'. This constitutes a free control of the player on the floor, there is no needed to jump. The player can run too, to allow them to move around the house quickly; this is don keeping pressed the key Shift while walking.

3.11.2 Interacting

To interact with the objects that the player is able to interact with, they will use the Left Click of the mouse. This action does different things depends on the object the player interacted. Some example of those actions can be read a paper, access to a computer or open a door.

Also, the player can make zoom in whatever they want to see something that is far or more detailed, keeping clicked the Right Click of the mouse.

3.11.3 Buzzing

This is a mechanic that the player does not control. As explained, this mechanic is designed for simulating the blackouts that the character has.

When the player reaches a point in the game where there is a blackout, the screen will turn blurry and then black while it sounds a buzz. After that, the screen will return to normal, but the player will be in another part of the house and a few hours later in the time. So they will have to know what happened during that blackout and see if something changed.

3.12 Story and Gameplay

When someone plays a game, first impressions are really important and make the game comfortable to play at first sight. Indeed, although it is a video game, it is intended to be played by any kind of person, not necessarily a *gamer*.

3.12.1 Story (Brief)

We put ourselves in a man's shoes who has some memory disorders and is in an unknown house. We will have to find out what that place is, who he is and more about him while we experience some mental problems.

3.12.2 Story (Detailed)

Here it will be described the whole story, from beginning to end, including the characters' names.

The main character, which the player control, is Matthew Cranston. The game starts with Matt placed in a room and with no information at all of who owns that house nor who is the player. Once the player moves the character, they are able to interact with some objects of the room. One of them is the computer and it requires User and Password, that are in a notebook in the wardrobe, which contains phone numbers, a few Users and Passwords and another kind of information.

After accessing the computer, we can know a bit more about Matt. He has an ex-wife and a daughter called Lisa and Emily respectively. We have a message application which we will use a few times. If we look it, we can see a message from Lisa telling the player to pick her daughter up after school and bring her to her house.

After seeing a few things, the player will be able to get out that room. Right after going out, the character will have a blackout and he will be in the kitchen 2 hours later and we have new messages.

When we enter the room, we will notice that the bed is unmade, so we can guess that the character was kind of sleeping. There is a new message from Lisa. It says he forgot to pick Emily up from school and she should not have asked him to do that. At this point, we know that there is something wrong with Matt about his mind.

Also, next to the computer, there is a key; it is from Emily's room. When we enter there, we will find a few boxes with personal things in them. One of those things is Emily's diary. There is some personal stuff in there, like her frustration about the memory disorder of her father. She also tells that there is something wrong about the relationship of her parents.

Once we get out the room, we will receive another message. It is from Lisa and it says that she is going to come to the house to take more boxes for complete the move. At this point, we realized that his ex-wife and his daughter were living there with him until now, and now they are moving. After leaving the computer, the character will have another blackout.

When Matt recovers, he will be in the living room, a few hours later. His ex-wife will have already left the house and now the door of the big room will be open.

Inside the room, there are a few things to interact with. The computer has a User and a Password which the player will find in the notebook they found at the beginning of the game. In the computer, there are messages from his ex-wife to her mother talking about the disorders of the character, the frustration about living with him and his recent alcoholism due to his impotence to do something about the mental disorders. There is also a letter of Matt's resignation in his work. Furthermore, there are some notes about the decision of sleep apart and about the moving.

From the room, we will see a bath in which the player will find a medicine chest locked. Right then, the computer will play a notification reminder the character to taking a medication that is in the medicine chest and also, the combination of the lock.

Once the player opens the medication chest, there will be some pills and a diary inside it. The character will take the diary and the player can read a self-reflection about his memory disorders. After that, he will take the pills and there will happen a blackout again.

When the character wakes, it will be a new day and the game is ended.

3.12.3 Gameplay (Brief)

The player can move around the house where they are trying to find out what is happening and where they are. To accomplish this, they are able to interact with some objects in the game in an easy way. The gameplay is easy to learn and comfortable to play it.

3.12.4 Gameplay (Detailed)

As explained, this game is based on the exploration of the house to find out more about the story of the character. Move around the house is a useful way to let the player free to investigate whatever they want.

To lead the player at the beginning of the game and after a blackout, some sentences will appear in the appear like "You have a new message." or "This is Emily's room key.". Those guides are aimed to help the player to continue the game with no problem.

The intention of the Buzz in the blackouts is to try to make the player a bit strange and uncomfortable, but not irritating. It is supposed that those blackouts are annoying and frustrating for the character, and also for the player.

3.13 Assets Needed

The game is in 3D, so it will be necessary to do the models of the complete game. But also, a Head-Up Display is needed, so it will be designed a HUD in 2D to make the gameplay better for the player.

3.13.1 2D

As mentioned, the HUD is the main part of the 2D assets, but it will be generated some Lightning Maps to make the game well-looking and more optimized.

3.13.1.1 HUD

The first HUD to do is the main menu, the screen that will appear before starting the game. It is a screen with some choices like "Play", "Options" and "Exit". So we can guess that the game will not have saved the actual game, the player must complete it in a row.

Inside the game, there are a few things in 2D to do, like the screen of the two computers that are inside the house. All the interface inside them will be made in 2D.

During the gameplay, the player must investigate to know about the Passwords and Users or the story, so there is not some kind of Item menu to see what the player has found, they will have to find it again.

3.13.1.2 Maps

Unity is able to generate Lightning maps to not rendering the lights and shadows during the game, with the aim to make the game more optimized and increase the number of fps in the game. That is why this will be done.

3.13.2 3D

The 3D part of the game contains most of the assets to model. These assets, as mentioned before, will be simple and not realistic. The aim of the game is not to stand out among everything else. So that, the design of the models will be similar to those shown in [Figure 3.2](#).

3.13.2.1 Characters

The game is in First Person and there is only one character controllable. Furthermore, the whole story happens at the same place and the character does not see another person during the game. So that, there will be no character 3D model in the game.

3.13.2.2 Environments

The scene where all take place is the house, which will have to be modeled, whose drawing can be seen in [Figure 3.3](#).

Also, some stuff around the house is needed to create an appropriate ambient, like tables, beds, doors, desks, etcetera.

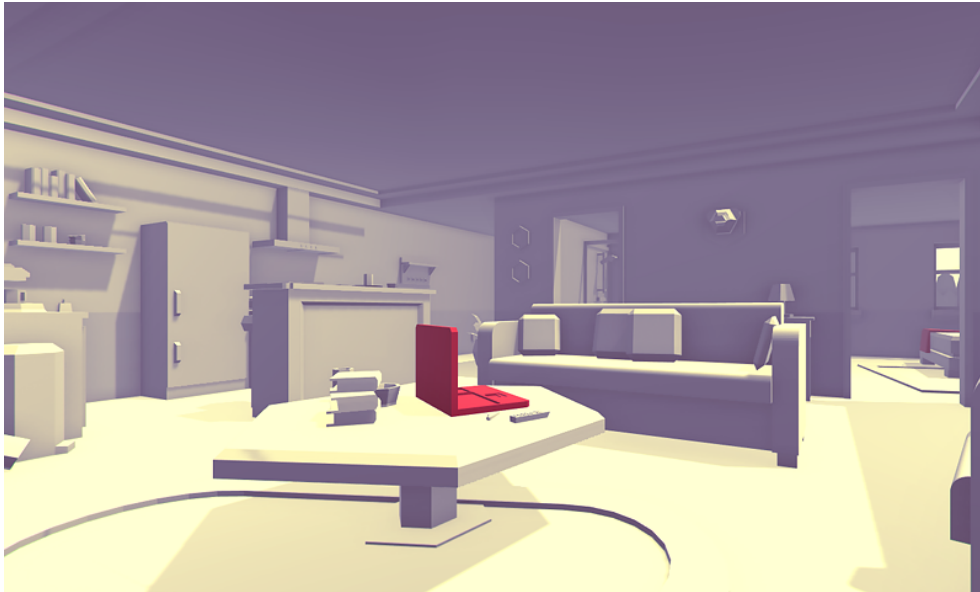


Figure 3.2: Example of the model design of the game.

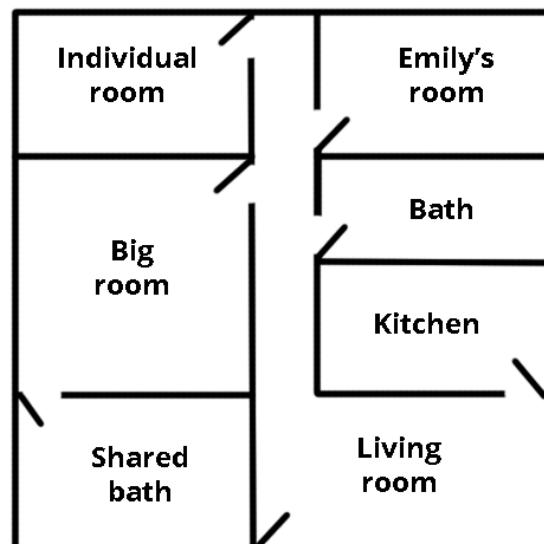


Figure 3.3: Drawing of the house.

3.13.2.3 Objects

In addition to the stuff of the house, there are other objects in the game, like the computer, the notebook, the boxes of the moving, the medication chest, the wardrobe, etcetera; all the objects that are not part of the house.

3.13.3 Text

All the story that is told in the game, will be read through notes, messages, diaries and on the screen. Despite the fact that the notebook and some note must be modeled in 3D and they contain the text written in them, a text will be displayed on the screen to make the note easy to read.

In addition to that, the text that helps the player move forward must be written too.

3.13.4 Sounds

In a game, the sounds are very important to create a good atmosphere and to give feedback to the player.

3.13.4.1 Ambient

It will be used a soft music for playing it in the background, with the aim to not have a complete silence during the game. Also, there will be other background sounds like wind, rain or similar.

3.13.4.2 Effects

These sound effects are mainly based on giving feedback to the player, like sounds of footsteps, opening/closing doors, taking an object, etcetera.

3.13.5 Code

The script needed for the game is very diverse and is classified by the function that will have in the game.

3.13.5.1 Character

For the character, it is necessary to implement his movement, his ability to interact with objects, the movement of the camera along with him. Also, the coordination of the sound of his footsteps and his *colliders* to make him a physical character.

3.13.5.2 Environment

The environment has to have *colliders* too, so the player can only access the rooms through doors. The game structure also must be programmed in order to avoid the player access rooms before it is planned in the gameplay. All the blackouts must be planned and realized by scripting. When this happens, there are some changes that will take place, like some changes in the environment or the position of the player.

3.13.5.3 Interacting

Interacting with an object must be controlled by code, so the player is only allowed to interact with some specific objects which do a certain action. The feedback that these objects provide to the player must be the appropriate to make them feels fine with their actions.

3.13.6 Animation

The animations of the game will be aim to make the player comfortable with their actions.

3.13.6.1 Character

As explained before, the character does not appear on the screen, so he will not have any kind of visual animation. However, their walking must be nice, so the camera moves a little bit up and down to make the walk nice.

3.13.6.2 Ambient

Due to the fact that we are in a house and the only thing alive is the character, there only a few animations to see in the game, like doors, the objects the player interact with and the mechanic Buzzing.

3.14 Schedule

The game is intended to be developed in the next 3 months. The way to proceed will be starting to model the house with no objects to have a space to put my character (a camera) and program the movement and the interaction with objects.

Once this works with no problems, it was the moment to model the objects the character will interact with. After that, it is necessary to generate the game structure, introducing the mechanic of blackouts.

When this mechanic works correctly and the structure of the game is done, it will be time to model the rest of the objects.

Then, it will be time to draw the HUD, write all the texts and implement all of this in the game to create a nice experience.

The last step will include sounds, like background music and program the feedback effects.

But finally, it completely necessary to make a phase of testing and evaluation to check if the game has no bugs or breaks, and it can run on most PCs without need too many requirements.

Chapter 4

Project Development

Note: most of the pictures were taken after finishing the development of the game to show the best result of each part. The sections about an important change of the visual aspects of the game will show a 'before and after' application of that process.

4.1 Investigating about memory disorders

To tackle this project, the very first and most important thing to do was to search for information about the different memory disorders that can affect the human being. It was necessary to analyze each one of them to guess if it was applicable to a video game and if it has some symptoms that the player could experiment.

The main problem with these memory problems was that it is impossible to make the player *to forget* something like it happens with the amnesia or similar. So the task to find a mental disorder that could be simulated in a video game, and the blackouts were one of these diseases.

Using the blackouts^[1] as a memory disorder and a mechanic in the video game was feasible; the player should not forget anything, because the player and the character would not live a certain moment, so the player feels the same strange feeling that the character, it means that something happened but no one knows what it is.

Once the concept that was going to be applied in the game, the next step was to re-order all the ideas and write them in a Game Design Document.

4.2 Doing the Game Design Document

Before start developing the game itself, it was needed to write a Game Design Document to clarify all the aspects of the game with all the details, and follow that document to develop the game. This document is the one in Section 3, and it fits the game completely.

4.3 Modeling and designing

After writing the Technical Proposal and the Game Design Document, for which it was necessary to do a lot of research on memory disorders and develop the whole story of the game, the next step was to start modeling the house.

4.3.1 The House

The only scenario in which the game is placed is the house. All the gameplay and story happens in there. So, the first process to begin was to developing some drawings of the house, which can be seen in Figure 4.1 (also mentioned in Section 3.13.2.2).

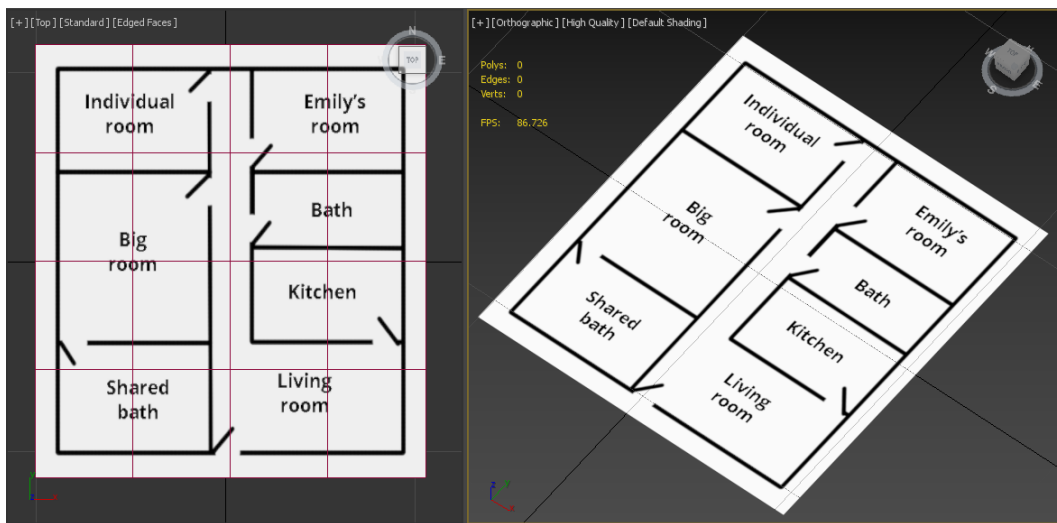


Figure 4.1: Plane with the drawing of the house in 3DS Max.

Once the drawings were created, the next step was to model the house, and it was used 3DS Max for that task.

Using the drawings as a reference (placed in the bottom of the scene), it is started to build the walls of the complete house, leaving a space to place the doors later, but adding a top construction above the door space, so the doors do not reach the ceiling of the house. This model is shown in Figure 4.2.

The model of the door was the next one to do, so taking in account the gap left before for it, the door was created with a few details and a symmetry modifier, and the result is shown in Figure 4.3.

With one door model was enough, because the doors must be placed in Unity as a separate object to interact with.

Note: the rest of the 3D art will be explained and showed in Section 5, and only mentioned and linked in this section.

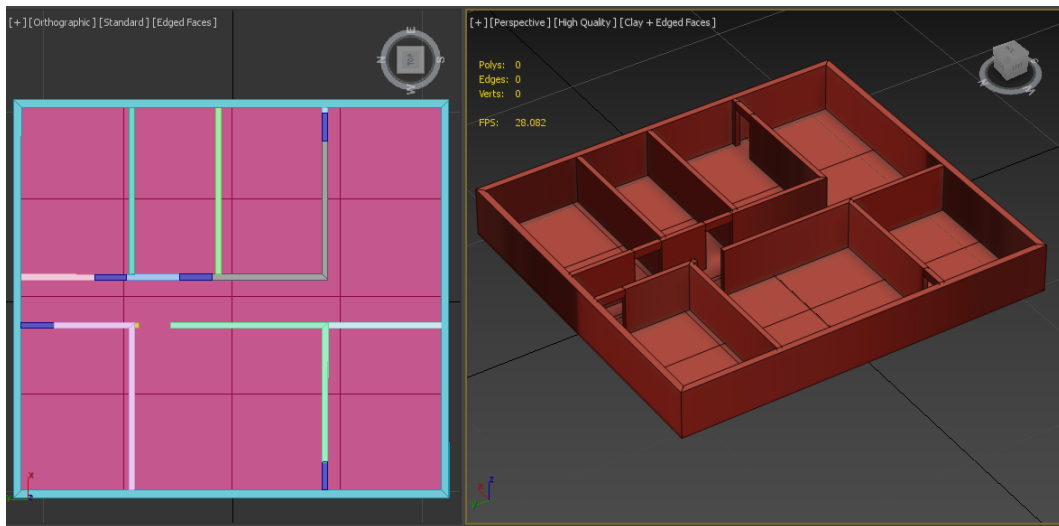


Figure 4.2: Model of the house in 3DS Max.

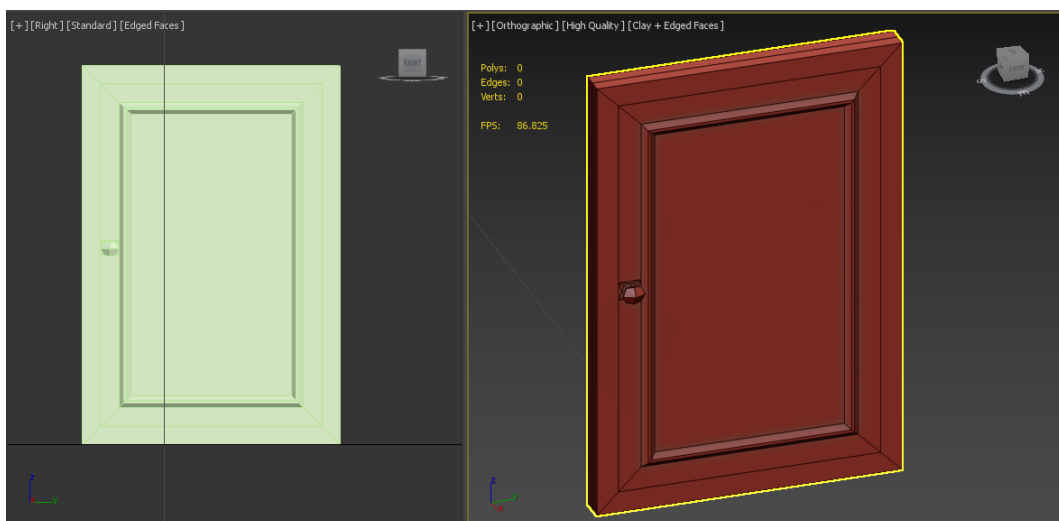


Figure 4.3: Model of the door in 3DS Max.

4.3.2 Furniture of the house

The Matt's room has 3 objects, the desk explained before and showed in Section 5.1.1, the bed showed in Section 5.2.1 and the wardrobe showed in Section 5.1.2. The Emily's room only has a few objects and these are one bed, and a few boxes showed in Section 5.2.3. And Lisa's room has another PC and a big bed. The living room has a sofa and a little table that can be seen in Section 5.2.2.

The furniture of the kitchen is composed of different types of models. The table and chairs that are shown in Section 5.2.6 are as normal as the others ones (modeled completely in 3DS Max), but not the other ones.

The objects shown in Section 5.2.7 were got from Turbosquid^[17]. It is a website where there are a lot of objects modeled and the people can get them free.

However, it was necessary to make a few modification in 3DS Max to reduce the polygons and change a few problems of the geometry (normals, duplicated vertexes and edges, etc.).

4.3.3 Feedback HUD

The game does not have a first part that can be considered *Tutorial*. Instead of that, as the player starts the game and goes ahead into it, some text will appear at the bottom of the screen explaining the controls. There are a few examples in Figures 4.4, 4.5 y 4.6.

Also, there is also some text that has the aim to be part of the feedback to make the player experience even better. There are a few examples in Figures 4.7, 4.8 y 4.9.

4.3.4 Storytelling

The story of the game, described down to the last detail in Section 3.12.2 is told in the game through the Personal computers and the Emily's Diary. Each object is accessible later in the story.

This method of storytelling is known as *Lore*^[18], and it is used by a lot of actual games. It means that the story is told in the background of the game and the player has to found it and read it; so it is not an obligation of the player to read the story, but they are not going to understand the purpose of the game.

4.3.4.1 The notebook

The notebook, which is shown in Section 5.1.3, has the information needed to access the two Personal Computers that are inside the house. The text that can be read on it is an image that is applied to the object as a texture, so the object looks like that way, showing the text to be read for the player.

It has a few users and a few passwords, and they have a connection to them that the player has to figure it out to know what user matches with each password.

Use 'WASD' to move

Figure 4.4: Example 1 of a controls text.

Use the mouse to look around

Figure 4.5: Example 2 of a controls text.

Press 'Space' to interact

Figure 4.6: Example 3 of a controls text.

Lisa's room is unlocked

Figure 4.7: Example 1 of a feedback text.

You have a new message

Figure 4.8: Example 2 of a feedback text.

Emily's room is unlocked

Figure 4.9: Example 3 of a feedback text.

4.3.4.2 Matt's PC

The Matt's Personal Computer has the e-mails that he has received. An example of one of these e-mails is shown in Figure 4.10. The interface of the PC had to be drawn, and all the information that is inside of it had to be written.

In those e-mails, it can be seen some problems about the relationship with his wife and a few medical problems told by his doctor.

How the PC works is explained in Section 4.4.7.



Figure 4.10: Example of In-box Mails of Matt's PC in Unity.

4.3.4.3 Lisa's PC

The Lisa's Personal Computer has the e-mail that she has sent. An example of one of these e-mails is shown in Figure 4.11. The interface of the PC had to be drawn, and all the information that is inside of it had to be written, as explained before with Matt's PC.

In those e-mails, she talks with a friend, her mother and Matt's Doctor. It can be appreciated that she feels more frustrated when the memory disorders of Matt become stronger and they affect Matt's life.

How the PC works is explained in Section 4.4.7.

4.3.4.4 Emily's Diary

The Emily's Diary is an object that is shown in Section 5.1.4. The text that can be read on it is an image that is applied to the object as a texture, similar to the notebook.

Emily, who is the only daughter of the family, show her frustration with the situation that they are living in the house. This part of the story is shown from the point of view of a teenager that does not understand very well what is happening.



Figure 4.11: Example of Sent Mails of Lisa's PC in Unity.

4.3.4.5 Matt's Diary

The Matt's Diary is the last element that tells the story in the game. It is shown in Section 5.1.5 and it shows the point of view of Matt, who is the one with memory disorders. It is like self-reflection that the character writes because he is in a very frustrating situation.

4.3.5 Lightning

In Unity, there are a few types of lights that can be used, and in this video game, it is used the Point lights. This kind of light simulates a bulb at the top of any room, so there is one light for each room in the house. Those lights have also some properties that can be modified and the lights of the game have a certain property that depends on the size of the room.

It is also possible to determine if the lights are going to be Real-time (this means that each light creates their own shadow polygons for each object) or Baked (this creates a Lightning Map for the Static Objects of the game, but it does not apply shadows in the Non-Static ones).

Once this is clarified, all the lights in the game are baked, so it was created a Lightning Map for the Static Objects. This method has a problem and it is that all the non-static objects are not going to have or cast shadows.

4.3.5.1 Problems and solutions

First of all, the lights were configured to be Real-time and that produces an insane amount of polygons, so the FPS of the game were too low (10-20 fps). This was solved changing the Real-time property of the lights to Baked and creating a Lightning Map for the scene. But this brought another problem, so all the non-static objects were completely

non-shadowed. The solution to this was more complicated and it is completely explained in Section 4.3.7.

4.3.6 Materials

The models of the game have no texture applied to them, so to modify the visual aspect of all these objects it was used the materials of Unity. The reason to not apply textures to the objects was to make the game smoother and give the game a soft visual aspect, without overwhelming the player. Also, the intention of the game is not to look very beautiful, but tell the story to the player, and show the memory disorders applied to the game.

Each object has its own material, and it is created only for that object, so that makes the material configuration very flexible and customized. Another function of these materials is to difference the interactive objects, which are the red ones, with a glance.

4.3.7 Post Processing

In order to improve the visual aspect of the game, and trying to keep the FPS rate at a very stable number, it was used the Post Processing Stack^[19] asset, from the Unity Store. This asset is a pack of effects that combine a complete set of image effects into a single post-process pipeline. The stack also includes a collection of monitors and debug views to help you set up your effects correctly and debug problems in the output.

Figures 4.12 and 4.13 show the before and after of applying this effect in the game.



Figure 4.12: Capture of the game **before** having applied Post Processing.

As it can be seen, the visual improvement is very notable. There are a lot of functions and properties that can be configured in this asset, but here it is explained the ones that have been applied in the game and its application.



Figure 4.13: Capture of the game **after** having applied Post Processing.

4.3.7.1 Anti-aliasing

Anti-aliasing is the process of reducing jagged edges. It adds interpolation to smooth out stair-step like lines. There is a possibility of choice between a Normal or High quality of anti-aliasing.

The Normal method works fine and it does not take too much performance, so this is the one that is applied to the game.

Figure 4.14 shows a comparison of applying or not this property. It can be appreciated in the edges of the objects, which are smoother once this is applied.

4.3.7.2 Ambient Occlusion

Ambient Occlusion applies shadows where two surfaces intersect, this is based on that in those places light would have a hard time escaping from. The technique that Post Processing uses is called SSAO, Screen Space Ambient Occlusion.

It is possible to configure the intensity of the shadows and the number of ambient occlusion samples for each pixel on the screen, so this determines the smoothness of the rendering. The game has an intensity a little bit higher than normal and a normal number of samples, due that this increase the graphic power needed.

This effect is the most visual and important, and really make a huge difference in the visual aspect. This solved the problem mentioned in Section 4.3.5.1 about the shadows of the non-static objects.

Figure 4.15 shows a comparison of applying or not this property. This is easier to see since before having applied, there are no shadows in some objects.



Figure 4.14: Comparison of the Anti-aliasing.



Figure 4.15: Comparison of the Ambient Occlusion.

4.3.7.3 Motion blur

Motion Blur applies a little blur when the camera moves, so the sensation of movement is more realistic. It is possible to configure the sample count of blur that this feature is going to render.

It has been applied to the game but with a low samples count to not make the blur overwhelming for the player.

4.3.7.4 Color Grading

This effect allows controlling the overall look of the image in terms of exposure color and contrast. It also fixes the color light problems that the scene has, like some surface brighter than other ones.

It is possible to configure a cold or hot illumination or a apply a neutral one. In this case, due that the game happens inside of a house, it was applied a neutral one and the color fixed property.

Figure 4.16 shows a comparison of applying or not this property. This effect can be appreciated looking the walls and the ceiling; the color is more brighter after apply the effect, and the scene is not too much dark.



Figure 4.16: Comparison of the Color Grading.

4.3.7.5 Vignette

A vignette can be used to darken the edges and corners of an image, and it can be used to add a dramatic effect.

It is possible to configure the color of the vignette, the center and the smoothness, the size and the shape.

In the game *Keep Mind*, it was used a black vignette, whose center is the center of the screen, a normal smoothness to not overload the graphic card and the normal shape, which means that is like an ellipse. The intention was to add a little bit of vignette at the corners and edges.

Figure 4.17 shows a comparison of applying or not this property. This effect can be seen in the ceiling and the corners of the sight; they are a little bit darker but the effect is very soft.



Figure 4.17: Comparison of the Vignette.

4.3.8 Exhibition video

To do the trailer of the game, it was necessary to use a tool for editing multimedia content, and in this case, it was used the program Filmora^[20]. It allows editing the project in very different ways once the user has some practice.

Some of these editions are using filters, syncing sounds with the video, coordinating animations, using titles with effects, etc.

Figure 4.18 shows a screenshot of the interface of the program, in this case, the project of the trailer done, which can be seen in Section 6.4.1.

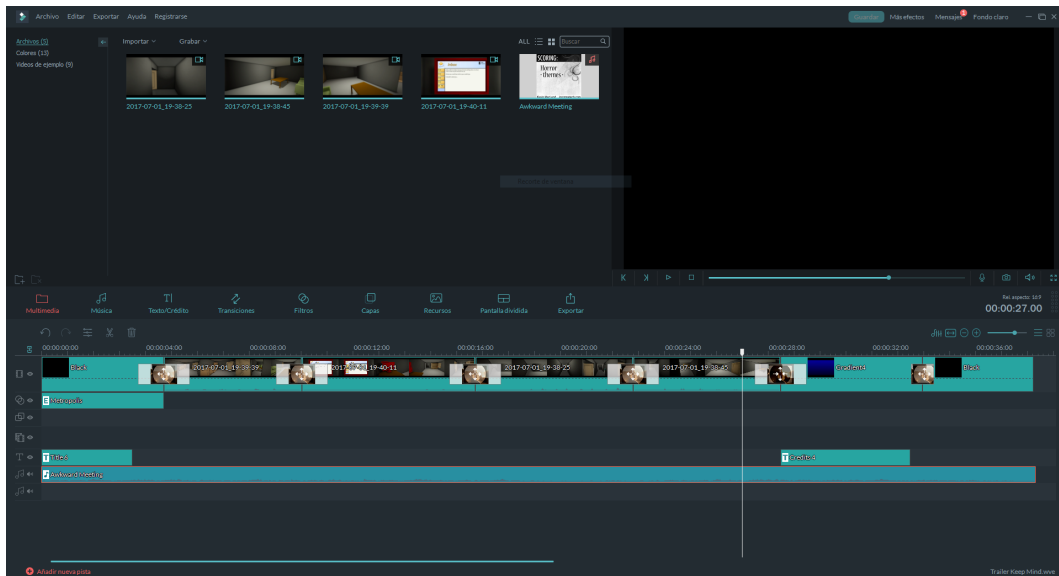


Figure 4.18: Screenshot of the project to do the trailer.

4.4 Programming

In the next sections, it is described all the task that took part for the development of the game referring to the programming.

4.4.1 Moving the player

Once the model of the house was done and the next step in the development was to make the movement of the player in that interactive environment, it was necessary to create a Unity project (synchronized with Git Hub) and place the house into it, collocating all the doors in their right place. The aim was to create the First Person Controller in this environment and test the movement of the player.

Unity has a lot of tools that can be very useful in a video game and one of that is a First Person Controller, which can be found in the Standard Assets^[21] package of the Unity Asset Store^[22].

So, the movement of the player is made with this asset, creating a prefab of the First Person Controller class. This FPS movement is very customizable because you can change if the player jumps or not (suppressed in this game), the velocity of walking and running, the bouncing of the camera with each step, and also the step sound of the player.

Once placed the FPS controller in the scene inside the house and after customizing the parameters of it, the ceiling of the house must be added, but in a way that allows see the

house and work in the game with Unity through the Editor easily. There was a way to do this and it was with a plane whose normal vectors were directed to the downside (looking inside the house). Figure 4.19 shows how the game looked like from the developer view (up) and player view (down).

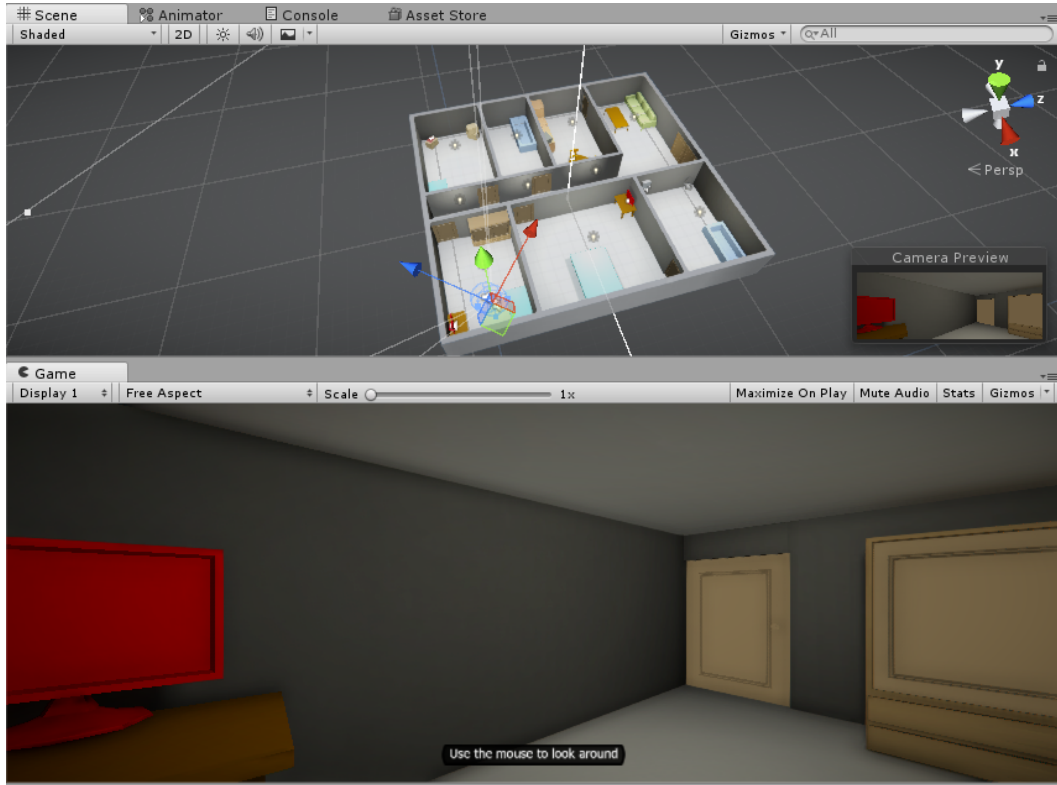


Figure 4.19: Editor and Game View in Unity.

4.4.2 Interacting with doors

One of the first mechanics to develop was the interaction with doors inside the house (open and close). The code which manages this interaction is called *DoorBehaviour*, and it consists in applying a *Lerping* function (interpolates the initial and final position to make a smooth movement) to the door if the player interacts with it, opening and closing the door.

The storyline of the game is completely lineal, so the player must do certain implicit tasks to *unlock* the storyline and keep going through the game. These restrictions are mostly controlled by the doors, which are locked until the player reach a certain point in the story.

4.4.3 Interacting with the desk

The desk, whose model is shown in Section 5.1.1, is one of the most important interactive objects because there are two of them in the game. One is Matt's and the other one is Lisa's, and they are the main tool to tell the player the story through the e-mails that the

player can read introducing the correct user and password in the PC (it will be explained later).

The idea was that the player looked directly to the screen of the PC when they interact with it, so they were able to see the content with no problem. So, to achieve this, when the player interacts with the PC, the camera makes a smooth move to reallocate in front of the PC and the Login Window appears. When the player is in this situation, they can not move the character until leaving the computer. All of this is controlled by code and this moment can be seen in Figure 4.20. If the player finished looking the PC, the camera does a smooth movement backward to restore the position before the interaction and the player can move the character again.

The screen of the computer is a GUI object controlled by a script which checks if the credentials introduced are the correct ones and, if they are, shows the content that the PC contains. Once the player can see the information inside the PC, they do not have to Log In again, the PC remembers the credentials. The player is also able to navigate through the screens to see the different information that the PC contains.

The script that manages all the behavior of the PC is made by multiple functions and with the aim to be reusable, so the other PC that is in the house can use the same script with a few changes in the GUI that shows the information and credentials. Creating the PC in that way allows to extend the story through multiple PCs inside the house in a very easy way, and an external programmer can even introduce new information without modifying any script, just using the Unity Editor thanks to the global script created for the computer.

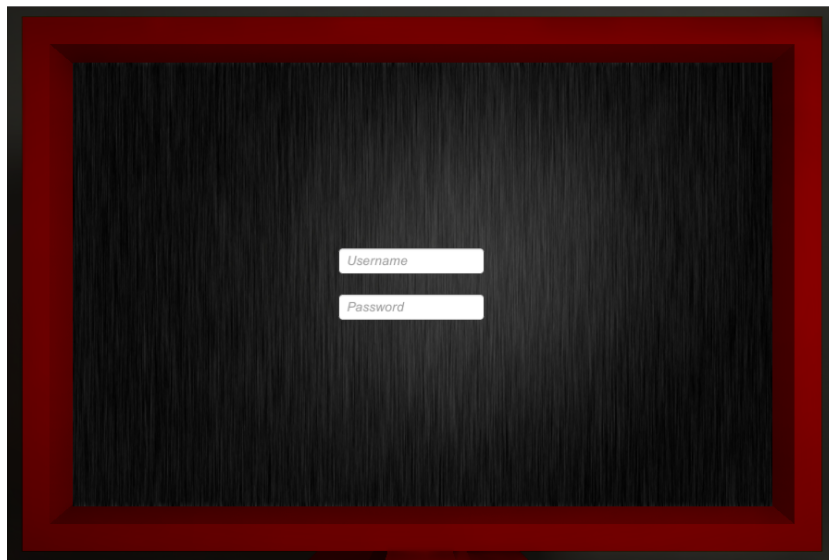


Figure 4.20: Screen of the PC in Unity.

4.4.4 Interacting with the wardrobe

The wardrobe, whose model is shown in Section 5.1.2, has a similar mechanic to the doors, so the player is able to open the wardrobe to see what is inside. The addition of this script is to create a simultaneous function that moves the two doors at the same time, one opening in each direction.

4.4.5 Interacting with the objects

Some of the objects give some useful information to the player, and they are able to grab them. This mechanic consists in taking the object to take a closer look, and then drop it in the same spot.

To detect if the object can be held, it is used a Raycast^[23] mechanic that detect which object is in front of the player and if it is possible to pick it up or not (these objects has the tag *Object* in Unity). Picking this object means that the object is positioned at a point where the player can see with no problem. After having taken the object, the object can be placed in the original place, due that the script stores their default position.

This script has the objective to be applicable to every interactive object without modifying the script to optimize the development of the game, so that is why this script is made in this way.

The interactive objects that follow this mechanic are shown in Section 5.1, like the Notebook, the Diary, the key, the pills, etc.

4.4.6 Buzzing mechanic

The next step in the development of the game was to develop the Buzzing mechanic, which is one of the most important in this game.

This mechanic is used to simulate the *blackouts* that the character has, and they happen at certain moments of the gameplay and it is a gap in which the player is *lost* and do not remember anything. Also, some changes take place during this time.

The intention was to develop a *disgusting* situation for the player, so the first task was to search a high pitch sound. Once that was done, it was needed to add a method that makes the player *unconscious*, and the way this was done was using a black fade in and out while the whistle is ringing. After that, the player is positioned in another place and some things change.

The Buzz script is applied to a collider that is positioned in a certain spot of the house. When the player triggers it, the script is called to do the buzzing.

First of all, the player controller is locked to avoid the player moves anyway. So then the sound, the fade and the reposition are managed by code.

All the actions that the Buzzing mechanic script does are listed below.

- The sound starts ringing from a volume value of 0 and it is increasing until its maximum level and it keeps ringing a few seconds to get that disgusting feeling in the player. Then, the sound decreases until it does not sound.
- The fade is controlled with its alpha component (the transparency of an object) and this value increases simultaneously with volume value of the whistle sound. At the same time as the character is *recovering* his conscious, he is able to see again.

- The reposition is the component that changes with each buzz. This position is got through a `GameObject` that is given to the script in the Unity Editor. Each buzz has a tag that identifies itself, so the script can manage only its components without modifying the other buzz ones.

So the sound starts at the same time as the fade. When the sound reaches its maximum value, the fade is static and completely black. After a few seconds, they both start to decrease until they are gone. Right then, the player is in another place of the house, it is been a few hours and some things (doors or messages) have changed.

Once all the process is completed, the collider of that buzz is deactivated and it can not be used again. Also, the next collider or buzz gets ready to be called when the player reaches that point of the story.

As the other scripts mentioned before, this is done to be reusable, so it is easy to program the next buzzing that the game has with a few modification in the Unity Editor, with no need of changing the script.

4.4.7 Screens manager

The PCs are composed of a List of images, and each one is like a window that shows a certain information. These images work showing the images in the GUI of Unity and managing them by code. Whenever there is new information, the list of images that the PC shows changes to another one with more e-mails. This behavior is controlled by a script.

The Lisa's PC works like Matt's one, but due that this list of images does not change in the game, it is only the same list of sent e-mails and the player can navigate through them.

4.4.8 Game structure

The structure of the game is managed by a script. The game has a linear story, it means that the player is not able to change the facts that happen in the storytelling, so they have to keep forward through the game to unlock certain things that allow them to know about the story.

As mentioned, the game structure is managed by script, and that means that some things in the game change as the player do reach a certain point in the story. The intention of the game is to tell the story to the player and adding a free aspect in the gameplay can make the player misses something.

Doing this in this way, it was easy to keep the control of the gameplay and know the exact place in the script if there was an error.

When the player finishes the game, there a final self-reflection wrote by the character.

The game has to be played with patience and reading all the information that is included in the game to get the complete story of the game.

4.4.9 Game flow

The Unity project is composed of three scenes: the main menu, the game itself, and the final scene.

The main menu is a scene where it is included a *Play* button and an *Exit* button, it can be seen in Figure 4.21, so the player can start the game or quit it without having to use the command Alt + F4. This scene also has the Logo of the game and the name, *Keep Mind*.



Figure 4.21: Main menu scene of the game.

Once the player has started the game, they have to complete the game until the end. And after that, there is a scene showed in Figure 4.22 that it is static until the player clicks or do something and the game go back to the main menu scene.



Figure 4.22: End scene of the game.

The intention of this game flow is to make the game playable by multiple players, so when one of them finishes the game, the next one can test the game right after the previous one without close the game or restart it, and this makes the game re-playable.

4.4.10 Pause menu

The game has a Pause menu, and the player is able to pause the game during the gameplay in the game. This menu has two buttons, as can be seen in Figure 4.23.

- **Resume:** it resumes the game to the exact point before having pausing the game.
- **Exit:** it quits the application, and the game closes.



Figure 4.23: Pause scene of the game.

The pause is managed by a script and it does the following actions:

- **Pausing the game.**
 - Show and unlock the Cursor, so the player is able to move it to select one of the buttons.
 - Set the variable *Time.timeScale* to the value 0; this means that all the events of the game will stop until that variable is set back to 1.
 - Show a black screen with opacity, so it seems that game got a bit dark.
 - Activate and show the two buttons of the pause menu.
 - Pause the music of the game, but not stop it, so it can be resume at the same point of the track.
 - Disable the First Person Controller, so the player can not move or do anything.
- **Resuming the game.**
 - Hide and lock the cursor.
 - Set back the variable *Time.timeScale* to the value 1, so all the events restore their previous state.
 - Hide the black screen with opacity.
 - Deactivate and hide the two buttons of the pause menu.
 - Resume the music of the game.
 - Enable the First Person Controller, so the player can move again with normality.

4.5 Searching for the sounds

There are two types of sounds in the game: those whose purpose is to be a feedback tool for the player and the ambient music of the game to make the experience nicer.

4.5.1 Feedback effects

Most of the sound has the aim to be part of the feedback for the player, so when the player makes an action, they really feel that the action is working. For example, when opening and closing doors, the gameplay feels more comfortable if that door makes a sound when it opens and closes.

Another sounds that are part of the feedback are the footsteps of the player when he is walking or running, a soft sound that it can be heard when the player takes and drops an object, a little *click* that sounds when the player is navigating on the PC, etc.

Also, one of the most important sounds is the Buzzing sound of the Buzz mechanic explained in Section 4.4.6. This sound is a very high-frequency sound, and it is disgusting to hear, but this is the intention of that sound, make feel the player uncomfortable and make them feels something is going wrong.

4.5.2 Music

In the game, there are three different tracks of music: one for the main menu, one for the game, and another one for the end scene.

The music of the menu is a very relaxed music and soft to be heard for the player. The music of the menu has some kind of effects that makes the player feels a little bit uncomfortable but without overwhelming them. And the music of the end scene has a sad face and it is more peaceful than the game music, but without abandoning the uncomfortable feeling.

Note: all of these kinds of music are Royalty Free and can be used wherever the user wants and without any legal problems.

Chapter 5

Game Art

The art of the game is based on Low Poly objects. All of them are been created with the aim to not increase the FPS of the game and to make a nice aesthetic for the game.

The lack of textures in the game was not a thing for the game; the intention is not to develop a realistic game and make the art more important that the game itself, so it is not a priority in this game. Instead of that, it has been used the Post Processing explained in Section 4.3.7 to make the game look better visually.

The 3D objects modeled for the game can be classified into two sections: the interactive and static ones.

5.1 Interactive objects

Most of the interactive objects have a red color that the player can recognize at the very moment they see them. The interaction with this objects is completely necessary to follow the story and proceed with the game.

5.1.1 Desk

The Desk object showed in Figure 5.1 is composed of two elements, the table and the computer. The computer is a screen made using the different modifiers of 3DS Max, like extrude, inset, bevel and similar; and the table was created by double symmetry after creating one table leg, resulting in the four table legs and the complete table.

5.1.2 Wardrobe

The Wardrobe object showed in Figure 5.2 is composed of three objects, one of them is the whole wardrobe that is made with a few modifier applied in an initial box. The drawers were done with extruder mechanic and a smooth was applied to make the knob; and the other two objects are the doors of the wardrobe, made in the same way that the normal doors.



Figure 5.1: Model of the Desk in Unity.

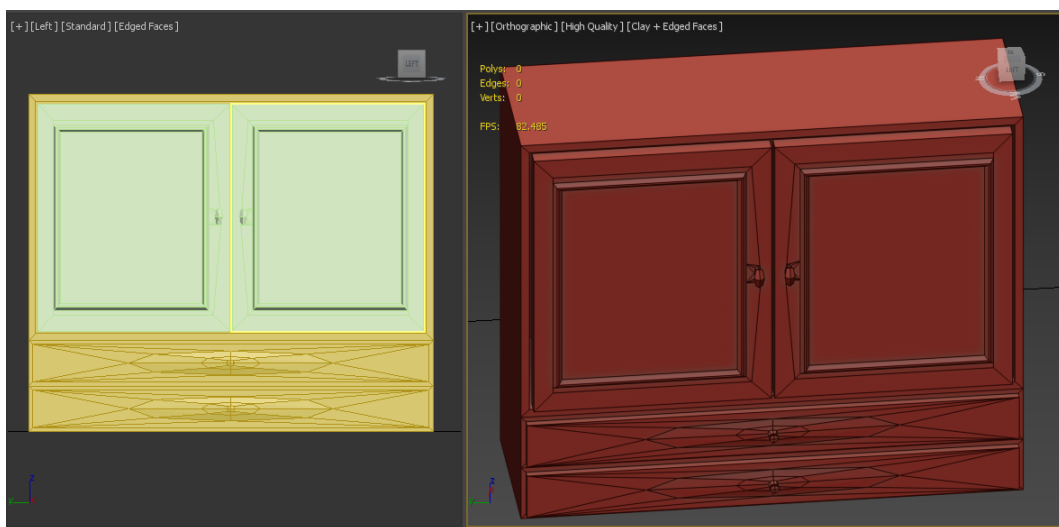


Figure 5.2: Model of the Wardrobe in 3DS Max.

5.1.3 Notebook

The Notebook object showed in Figure 5.3 is composed of two objects. The notebook itself is a box with the correct measures to simulate a book size, and the other object is a render spline.

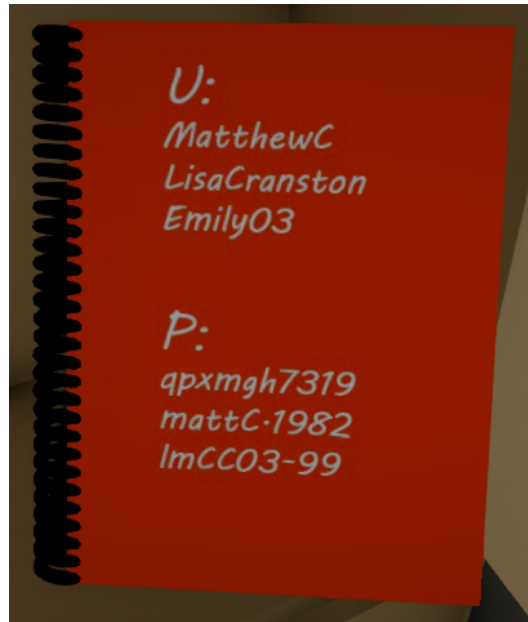


Figure 5.3: Model of the Notebook with information in Unity.

5.1.4 Emily's Diary

The Diary object showed in Figure 5.4 is composed of one object, which is a box that simulates one side of the diary. To this object, it is applied a blend modifier to make it curved and then a symmetry modifier to do the other side of the diary.

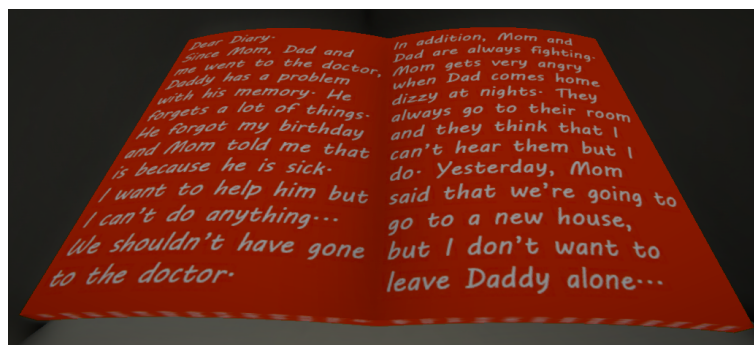


Figure 5.4: Model of the Emily's Diary in Unity.

5.1.5 Matt's Diary

The Diary object showed in Figure 5.5 is composed of two objects. It uses the same model than the notebook explained in Section 5.1.3.

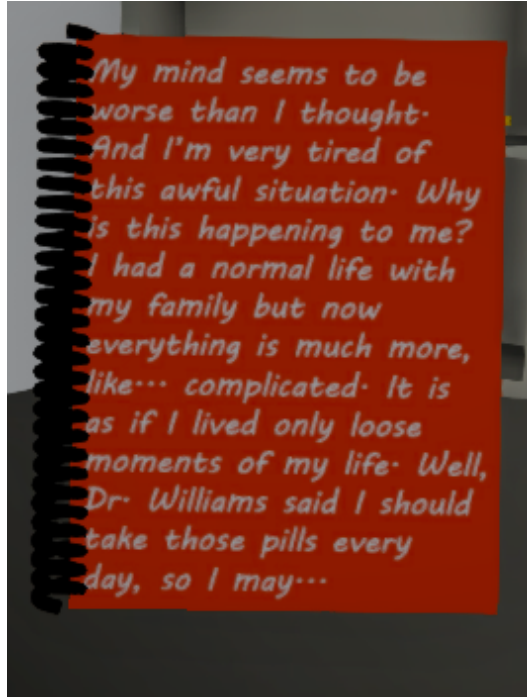


Figure 5.5: Model of the Matt's Diary in Unity.

5.1.6 Pills

The Pills object showed in Figure 5.6 is composed of a few objects, but all of them are repetitions of the same model, one pill. This is done with a box with a few chamfer modifies in its edges.



Figure 5.6: Model of Pills in Unity.

5.2 Static objects

The static objects in the game have the aim to create a correct atmosphere and made the experience of the player better, feeling that they are in a house, with the furniture.

5.2.1 Bed

The Bed object is shown in Figure 5.7 is made in a similar way that the table, with a double symmetry once one of the legs is done.

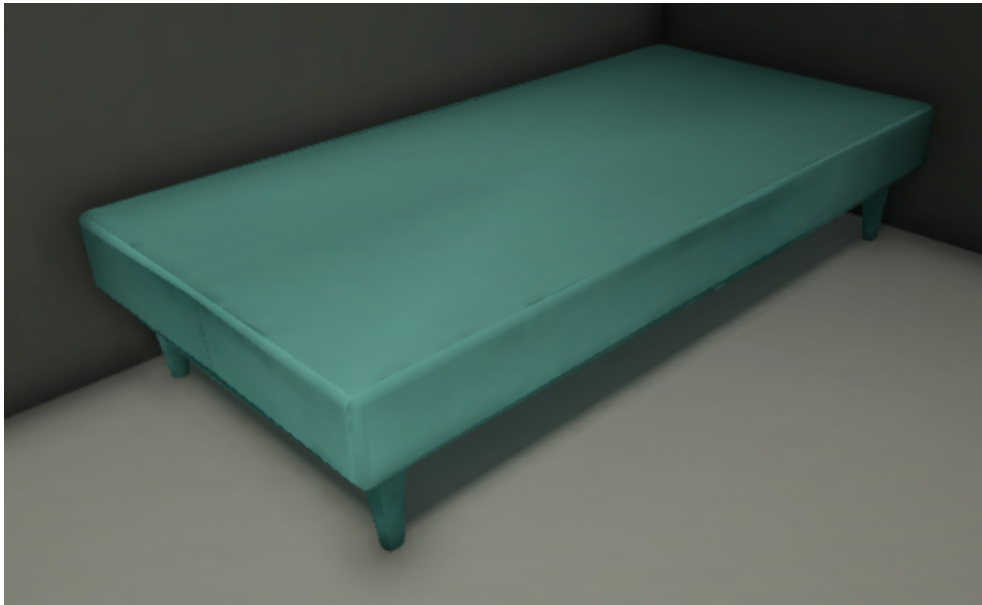


Figure 5.7: Model of the Bed in Unity.

5.2.2 Sofa and table

The objects showed in Figure 5.8 are two different ones. The table is an extension of the Desk Table explained in Section 5.1.1. The sofa is a more complicated model. The sofa, without pillows, is made from a box applying extrude, inset, bevel, symmetry and chamfer modifiers. The pillows are made from a box with a chamfer modifier to make them a bit smooth, and then they are been duplicated and placed to make the complete sofa.

5.2.3 Boxes

The Boxes object shown in Figure 5.9 are composed of two simple objects. They are two boxes but one of them is modified with extruding to simulate the top of the box.



Figure 5.8: Model of the Sofa and little Table in Unity.

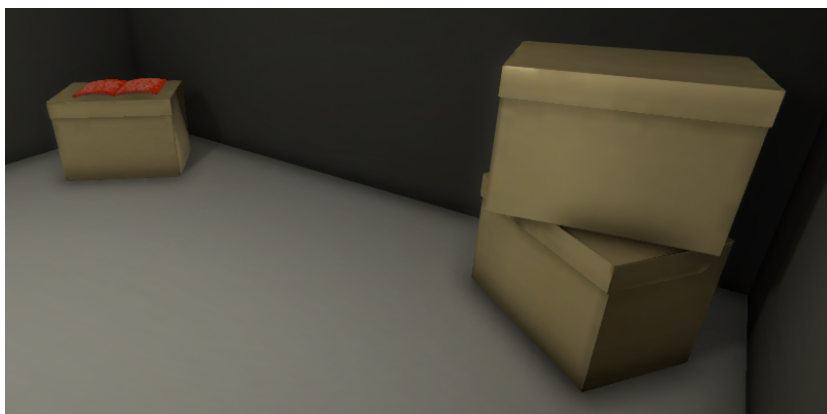


Figure 5.9: Model of the Boxes in Unity.

5.2.4 WC and tub

The objects shown in Figure 5.10 and in Figure 5.11 are part of the bathroom. The tub is a box with extrude, inset and bevel modifiers, very simple. The WC is more complicated; it was made from a cylinder and a few modifiers combined with a soft smooth. One of the parts of the WC top was also made with a cylinder, but the other one was made with a torus with an FFD modifier.

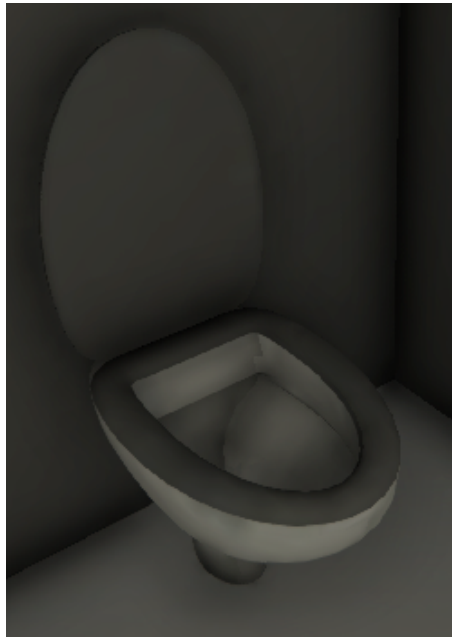


Figure 5.10: Model of the WC in Unity.

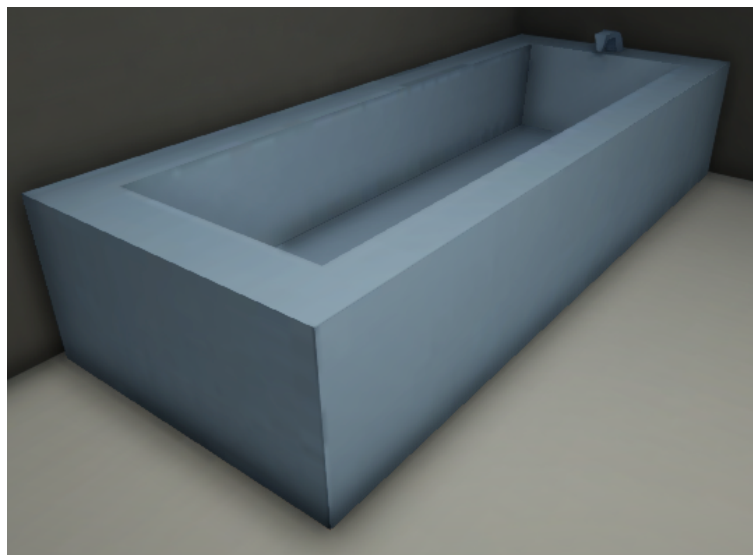


Figure 5.11: Model of the Tub in Unity.

5.2.5 Medicine chest

The Medicine Chest object showed in Figure 5.12 is composed of two objects. One of them is a extruded box with a few slices on the sides to make the shelves. And the door is a very simple box with the same measures of the other box.



Figure 5.12: Model of the Medicine Chest in Unity.

5.2.6 Kitchen table and chairs

The objects showed in Figure 5.13 are part of the Kitchen. The table is a similar version of the Desk Table explained in Section 5.1.1, but using a cylinder instead of a box. The chairs were made with symmetry in a similar way that the tables explained in the previous sections.



Figure 5.13: Model of the Kitchen Table and Chairs in Unity.

5.2.7 Kitchen furniture

The objects showed in Figure 5.14 are also part of the Kitchen. These objects are the only ones that I have not modeled by myself. They are been downloaded from Turbosquid^[17].



Figure 5.14: Model of the Kitchen Furniture in Unity.

Chapter 6

Results

This section consists of all the final results of the Project itself after all the development described in this document.

Those results can be presented in a few different sections.

6.1 Technical Proposal

The document that describes the intended work to do for this final degree project, which is the Section 1 of this document. This was written before starting to create the game, it is the beginning of the project and since that moment, the project has had a few changes that will be commented in Section 8.

6.2 Game Design Document

This document consists of an overall of *Keep Mind's* game design aspects and it is the Section 3 of this document. This was written thinking about the complete development of the game, and as a GDD, the game fits perfectly what it says.

6.3 Technical Report

This is the current document, and it is a technical document that describes all the work done for this final degree project.

6.4 Exhibition & Project Defense

Once the project has finished, the next step is to show it to the public and defend the game in front of an examining board. These two actions are described in the sections bellow.

6.4.1 Exhibition

It consists on a fair where all the students that are developed their Final Degree Project have to show a short video to everybody in the place and explain an overview of the project. So, this video is something similar to a trailer, to show the game.

After all the students have talked and shown their games, the people will be able to play each game during a few hours. This part is a very interesting one because it is possible to see how people react to the game and if it is what it was expected.

The process to do the exhibition video was explained in Section 4.3.8 and it can be seen in Figure 6.1 and in the link below.



Figure 6.1: Trailer of the game *Keep Mind*.

Keep Mind Trailer: <https://youtu.be/99r5LEtwUNs>

6.4.2 Project Defense

The defense of the project will consist of a presentation of 15 minutes, where 10 of them will be a speech talking and explaining the game with the support of slides. The other 5 will consist on showing the game, played in front of the examining board.

The slides that will be used for the defense of the project are done with Google Slides and they are in the next link.

Defense Project Slides: <https://goo.gl/gJaewY>

6.5 The Game

The expected results explained in Section 1.6 and 1.4 have been mostly accomplished. The game has a beginning and an end, and its duration is about 10-15 minutes. The player can experiment a mechanic that is based on blackouts and they must deal with it. Although the game is entertaining to play, the serious part of the game still has an important place in the game. Also, the informative aim is present in the game through the storytelling, and it is up to the player to know about it.

The game works perfectly in a not very powerful PC and with a constant frame rate of 30 frames per second. Also, as explained before, the game is completely re-playable with no need to restart it, which makes it perfect for being shown to a group of people. The game has been tested to find errors, and it works completely perfect with no breaks during the gameplay. And the visual aspect is attractive thanks to the techniques applied with the Post Processing.

Figure 6.2 and the next link are a YouTube video which shows the complete gameplay of the video game, from the beginning to the end. The duration is about 5 minutes because when it was played, it was not by a new player.

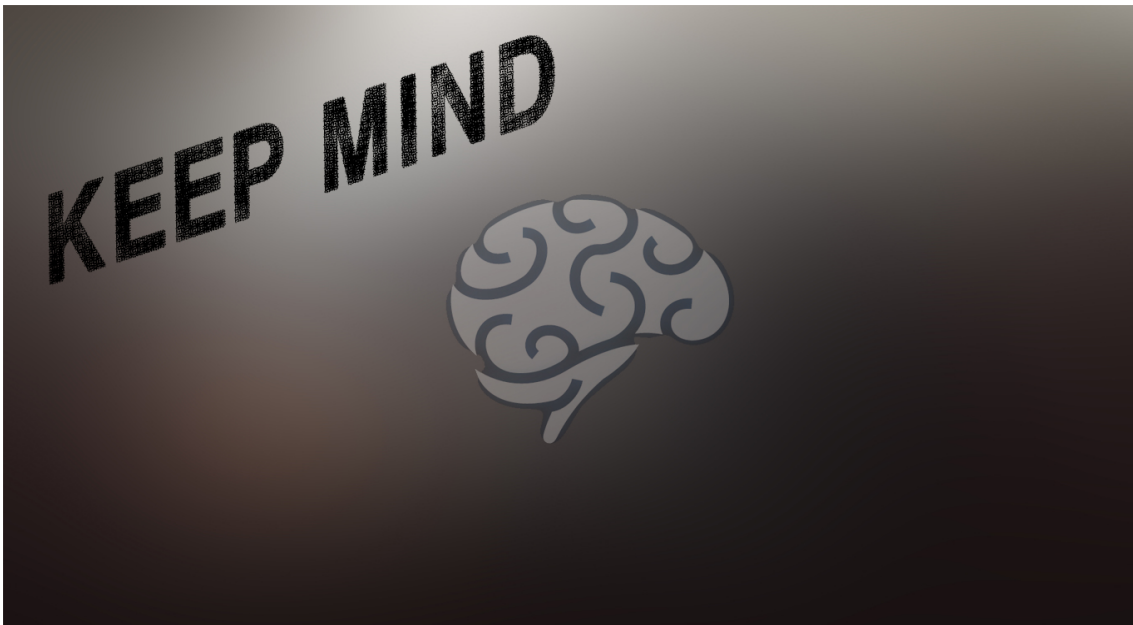


Figure 6.2: Complete Gameplay of the game *Keep Mind*.

Keep Mind Gameplay: <https://youtu.be/x8kQR110fAM>

Also, Section 5 shows a lot of screenshots of the game.

In addition, here it is a link for downloading the game (click on top right of the page, it takes a few seconds to start downloading the game): <https://goo.gl/te1gm7>

Chapter 7

Testing & Evaluation

This chapter can be divided into two sections. The first one is about testing the game and checking that there is no error or brakes during its gameplay. In another way, the second one consists of an evaluation of its performance and know what requirements the game can support.

7.1 Testing

The game has been tested multiple times in different hardware and conditions, and also by different people, and all of the errors have been solved. Here there are some aspects which took part for the game test.

7.1.1 Verification

This phase consists of checking that the game is totally free of bugs and the game does not produce any break. This testing phase was check completely by me, the developer, running the game multiple times.

Some errors were found at the beginning, most of them due to the differences that Unity uses in their measures, related to negative values of some angles. Other errors were exceptions that were not taken into account before, like trying to climb the bed or the wardrobe, and the were also solved.

7.1.2 Validation

The game has been tested by people who are external to the project itself and after that, they were asked about the purpose of the game to show some memory symptoms and the storytelling of the game. Most of them understood the purpose of the game and the story, other ones explained that the symptoms can be found in the game but they are not totally relevant, however, the story helps to understand the game.

This part of the testing also had a very important function, and it is the related one with the feedback. It was time to know if the player was able to complete the whole game with no indications at all, just playing the game. The results were pretty successful; all the players completed the game and understood the aim of it. The feedback explained in Section 4.3.3 were very useful.

7.2 Evaluation

This section explains the different performance of the game in a few hardware, explaining the different specifications and the obtained results.

7.2.1 Hardware

The game has been tested in 3 very different Laptops to check if all works properly and there is no problem with compatibility or performance.

The personal computers below are the ones used for the testing. The main objective was to see if people who are external of the development of the game was able to complete the game with no problem from the beginning until the end, having no breaks and understanding the history, the mechanics and the story.

Specifications of the Testing Personal computer number 1:

- **Hardware:** Toshiba Laptop
- **Model:** Satellite L850-138
- **Operative System:** Windows 10 Pro
- **Processor:** Intel Core i5 2450M 2.5 GHz
- **RAM Memory:** 8GB RAM DDR3 1333 MHz
- **Graphics Card:** AMD Radeon HD 7670M 1GB DDR3

Specifications of the Testing Personal computer number 2:

- **Hardware:** Asus Laptop
- **Model:** X750JN-TY041H
- **Operative System:** Windows 10 Home
- **Processor:** Intel Core i7-4710HQ 2.5 GHz
- **RAM Memory:** 8GB DDR3 1600MHz
- **Graphics Card:** Nvidia GeForce GT 840M 2GB DDR3

Specifications of the Testing Personal computer number 3:

- **Hardware:** MSI Laptop
- **Model:** GE72VR 7RF-286ES
- **Operative System:** Windows 10 Home
- **Processor:** Intel Core i7-7700HQ 2.6 GHz
- **RAM Memory:** 16GB DDR4 2133MHz
- **Graphics Card:** Nvidia GeForce GTX 1060 6GB GDDR5

The PCs are increasingly higher in specifications, and the game works perfectly in all of them; no breaks, no errors, everybody completed the game and understand the story and the purpose of the game.

The PC with the minimum specifications is the number 1, so it was necessary to test the game in a lower hardware to check which are the minimum requirements for the game. The next hardware where the game was tested was a Tablet with Windows 10. Here are the specifications.

Specifications of the Testing Tablet:

- **Hardware:** HP Tablet
- **Model:** Pavilion x2 10-K020NS
- **Operative System:** Windows 10 Home
- **Processor:** Intel Atom Z3736F 1.33GHz
- **RAM Memory:** 2GB DDR3 1333MHz
- **Graphics Card:** Intel HD Graphics

The specifications of this hardware are pretty lower, and as expected, the game does not work properly. It is possible to play but the FPS rate is about 20 fps and this can not be considered fluent. However, the game starts and it is possible to move the player and interact with objects, which means that the minimum requirements should be a little bit higher than the tablet's where the game has been tested.

So, after all this phase of testing, it is possible to determine that the game can be playable on a mid-range PC with not too much high specifications, and the game can be considered optimized.

Also, it was created a form which aiming was to know how the players felt about the game after playing it.

Link to the form: <https://goo.gl/forms/bNaPGsKrVabeH9DS2>

In addition to the link, here there is the PDF copy of the form.

Keep Mind's experience

This form is done to know about the experience of having played Keep Mind. Thanks for your participation.

*Required

1. How did you feel about the game? *

2. What did you learn about memory disorders? *

3. How do you feel about this disease? *

4. What did you most like about the game? *

5. What did you most dislike about the game? *

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Keep Mind's experience

6. Were the controls easy to understand? *

7. What would yo add to the game?

8. What would you remove from the game?

9. What grade would give to the game? *

Mark only one oval.

1 2 3 4 5

Awful Excellent

10. If you have something to add, here you can do it.

Chapter 8

Project Deviations

At the very beginning of the project, it was written the Technical Proposal, which intended to explain the complete project before having started. Since then, the project took a few deviations and variations, that will be explained in the next section. Also, it is shown the complete schedule of the project, with the time required for each task.

8.1 Project Development

The game is pretty adjusted to what was told in the Technical Proposal, but there is one thing that needs to be mentioned.

It is the previous intention to model some characters. When the GDD was being elaborated, it was more reasonably to not add any characters models to the game. Since the game was in First Person, there was no need to model the character, because the player would not see it. Also, the experience must be for the player and being alone with no Non-Person-Character was better for the experience. The story could be told in another way, and that was done. The experience was totally feasible (and better) if the player was alone in the house the whole game, having no interaction with other characters that could interfere with the story.

8.2 Project Schedule

After all the variations commented in the previous section, the final schedule for the development of the game is presented in Tables 8.1, 8.2, 8.3, 8.4 and 8.5.

Table 8.1: Game Design Tasks Breakdown.

Game Design	
<i>Task Done</i>	<i>Total Hours</i>
Investigation about memory disorders	13
Aesthetic, story, gameplay and mechanics	18
Game Design Document	25
Total	56

Table 8.2: Game Development Tasks Breakdown.

Game Development	
<i>Task Done</i>	<i>Total Hours</i>
Initializing and configuring the project	4
Player movement	2
Doors interaction	2
Desk interaction	6
Wardrobe interaction	1
Objects interaction	6
Buzzing mechanic	12
Screens manager	7
Game structure	11
Storytelling	16
Game flow	7
Feedback HUD	7
Sounds and music	6
Post Processing	6
Total	93

Table 8.3: Game Art Breakdown.

Game Art	
<i>Task Done</i>	<i>Total Hours</i>
The House	9
Furniture of the house	11
Interactive objects	7
Lightning and materials	8
Total	35

Table 8.4: Game Evaluation Tasks Breakdown.

Game Evaluation	
<i>Task Done</i>	<i>Total Hours</i>
Testing the game	11
Evaluating the game	6
Total	17

Table 8.5: Documentation Tasks Breakdown.

Documentation	
<i>Task Done</i>	<i>Total Hours</i>
Classes about the Technical Proposal	8
Technical Proposal	13
Gameplay Video	1
Exhibition Video	5
Project Defense Presentation	6
Project Defense Preparation	3
Technical Proposal	79
Total	115

Chapter 9

Conclusions

This document describing all the details of the *Keep Mind* project includes the design, development and documentation of this game, a First Person and interactive experience in to put the player in the shoes of a person who has some memory disorders and the player must deal with that while is knowing about the character's life and problems.

First, the Technical Proposal of the project was presented, describing the work to be done for this project. In that document, it is possible to read how the initial idea of the game was explained, detailing the tasks to do and an overview of the project itself.

At the moment to face the project development, the previous acquisition of knowledge about memory disorders was very important to think about the way to make the mechanics of the game and how to introduce it in the game and make it a real problem for the character and the player. So, the player and the character know the same about what is happening, and the story helps both of them to understand the situation and fit the problems into the character's life. the player is able to see through the e-mails how Matt's life is breaking bad as his memory disorders become more intense.

In the final game, the impossibility of the player to make a change in the game is similar to what Matt is living; he has to face this disease and he can not change anything or find a cure for that, and that makes the player and the character powerless, just following the path.

Regarding the objectives explained in Section 1.4, all of them have been accomplished with no big deviations. These are the results of that objectives.

- Develop a game that makes people aware of the memory disorders.

The Buzzing mechanic is the main one in the game and it simulates the blackouts of the character. It shows clearly a *gap* in the memory in memory of the character and the player must know what has changed in that time that the character has been unconscious.

- Have a complete, playable and entertaining demo of the game.

The game is playable from the beginning until the end, and it has very easy controls, which make it appropriate for people who do not use to play video games.

- Show the serious part of the game without making the game boring.
The memory disorders are the center of the game so the story and the mechanics revolve around that, but the game is still entertaining to play although the serious part is very relevant.
- Show a free-flowing game, without having breaks and in a correct FPS rate.
After testing the game and solve all the problems, the game can be playable with a frame rate of 30 fps and with no breaks or errors during the gameplay.
- Show a minimalist and striking artistic style with simple shapes.
The art of the game is very soft and it has a nice appearance thanks to the materials of the objects and the use of the Post Processing, so this objective was accomplished greatly.

So finally, as explained, the final result of the game is very close up to the initial idea.

9.1 Future Work

It is possible to find a way to improve or extend this project, and it can be classified in two different ways of an evolution of the project.

9.1.1 Specific

Taking into account the current status of the game, it is easy to add something to the project due to its development phase.

The programming of the game was designed to be as optimized as possible and globally extensible. That means that if it is needed to add more information about the story, more blackouts or more interactive objects in the game, the way to do it is through the Unity Editor, there is no needed to change any script, because all the information can be added without reprogramming the existing code.

All these changes must be placed in the actual level that the game contains, the house. But if for some reason, another level must be added, it is just necessary to model the new scenario and apply the existing mechanics to the proper objects.

9.1.2 General

In another way, if the intention is to extend the game in a more general way, it would be possible to add more mechanics that can simulate other memory disorders, but this means to add new code and re-programming.

Another extension of the game could be made the visual aspect of the game more realistic and make the game nearer to a simulation. This task could take some time to design the new aspect of the game and create it, but once it is created by the artist, adding it to the game is not a big deal, because the code and the assets are properly separated in the Unity project and it is not difficult to change some models.

One addition to the game that was taken into account was the possibility of including an *inventory*, so the player should not take note of the users and passwords or remember them. The reason to not add this was to force the player to remember a complicated thing (as the random users and passwords) or take note of that, make them feel closer to the character, who needs to do that because of his memory problems. So, this feature can be re-evaluated if the game will be shown in a quick way to a large group of people, but right now, it is not an incoming thing.

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