IT UNIVERSITY OF CPH

Group Report

Reverie

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Game World Design (Spring 2020) | *KGGAWOD1KU*

Introduction

Reverie is a game set in a mindspace taking the shape of a symbolic garden-maze where the player controls Marisa Fernandes, a portuguese landscape architect, as she revisits her life in the final moments of her consciousness. The game uses minimalist storytelling, combined with an expressive art style and adaptive music piece that creates an emotional experience that attempts to imagine the emotions at the end of one's life.

Group Composition

- Helena Maria Campos Ruão Cunha Rua is a game/communication designer from Porto, Portugal. She previously studied Communication Design at Faculdade de Belas Artes do Porto. For this project, she focused on being the art director and game designer; worked directly with Francesco to develop the shader, modelled and animated 3D objects, and gave voice to the main character of our project.
- Francesco Frassineti is a game and tool programmer from Imola (Bologna), Italy. He previously studied Computer Engineering at Università di Bologna. His responsibilities were working as the project manager (starting from late April), shaders, implementing the audio extensions for the editor, miscellaneous programming and helping designers to better interface with the technical aspects of the project.
- Jonas Kjølleberg Lundbye is a game and narrative designer from Stavanger, Norway. His responsibilities were primarily narrative design and writing, as well as general game design. Originally also level design, but this role ended up having less weight and focus than expected. Primarily did the writing and collaborated with Helena in selecting props.
- Fabio Murru is a game programmer from Cagliari, Italy. He previously studied Computer Science at University of Cagliari. His responsibilities in the project

were implementing the portal/teleport system, the monologue system and miscellaneous programming.

- Aske Zidore Christensen is a game designer and composer from Copenhagen, Denmark. He previously studied Composition at the Music Conservatory in Copenhagen with a special focus on interactive forms. For this project his main responsibilities were the auditive concept of the game, being both music and sound design, as well as environmental visual design.
- Erik Ingman Carter was the original project manager of the group until late April.

Design Approach and Discussion

From Idea to Game (Project Development)

In this section we will go through the development process of the game; starting from early discussions, to iterations on a finalized idea.

There was early agreement amongst the team, that the project was to be something slightly experimental and leaning towards the abstract. More importantly, it should be something driven first and foremost by emotion, rather than plot. Of course the project should still have a plot, but the idea was to make something where plot was not necessarily a strong driving force for the narrative, but rather a frame. Furthermore the story-world should be appropriately abstract as well. From this consensus several ideas were brainstormed. Several ideas seemed appealing to the team, with one issue usually being the difference. While a good idea was of course a priority, it also seemed important that the idea chosen should offer various creative challenges and possibilities for the whole team. This meant some ideas were scrapped, not for lack of quality, but simply, for the reason that it provided too little to work with in for example the art or narrative department.

It was also agreed early on that the game should be a ‘walking-simulator’. Partly this was for practical reasons as it allowed the team to spend less time tuning mechanics

and interactions, and more on tuning the sensory aspects. There were discussions throughout the process of adding simple puzzle mechanics, however these discussions never became a priority. It was important to the team that if anything was there, it was in service of everything else, not the other way around and the simple mechanic of walking around exploring a space seemed optimal. An early build of the game had a jump button, that the team agreed to remove, as it didn't need to be there, and was not servicing anything in the game.

From the narrative point-of-view, interest was expressed in creating a space that was unbound by time. This led to the idea that ended up dictating the way forward. The pitch that could be said to directly inform the project was the concept of being a haunted house from the point-of-view of the ghost; with players walking around in a house and being in an disorienting time-frame, as rooms would change position in time everytime the player entered, with both memories of the protagonist, as well as life after the protagonist's life unfolding in the house. This idea was somewhat taken forward, but quickly became heavily modified due the ghost, being an unfavourable angle by some members of the team. However, the concept of memories seen from beyond the grave, became a concept which carried forward with the project. Notably though, the original core idea of being unbound by time, was mostly lost going forward, with the memories and death taking more focus. This feedback was then iterated upon, for the next pitch, which was presented with a brief prototype created

in Twine (image 1).

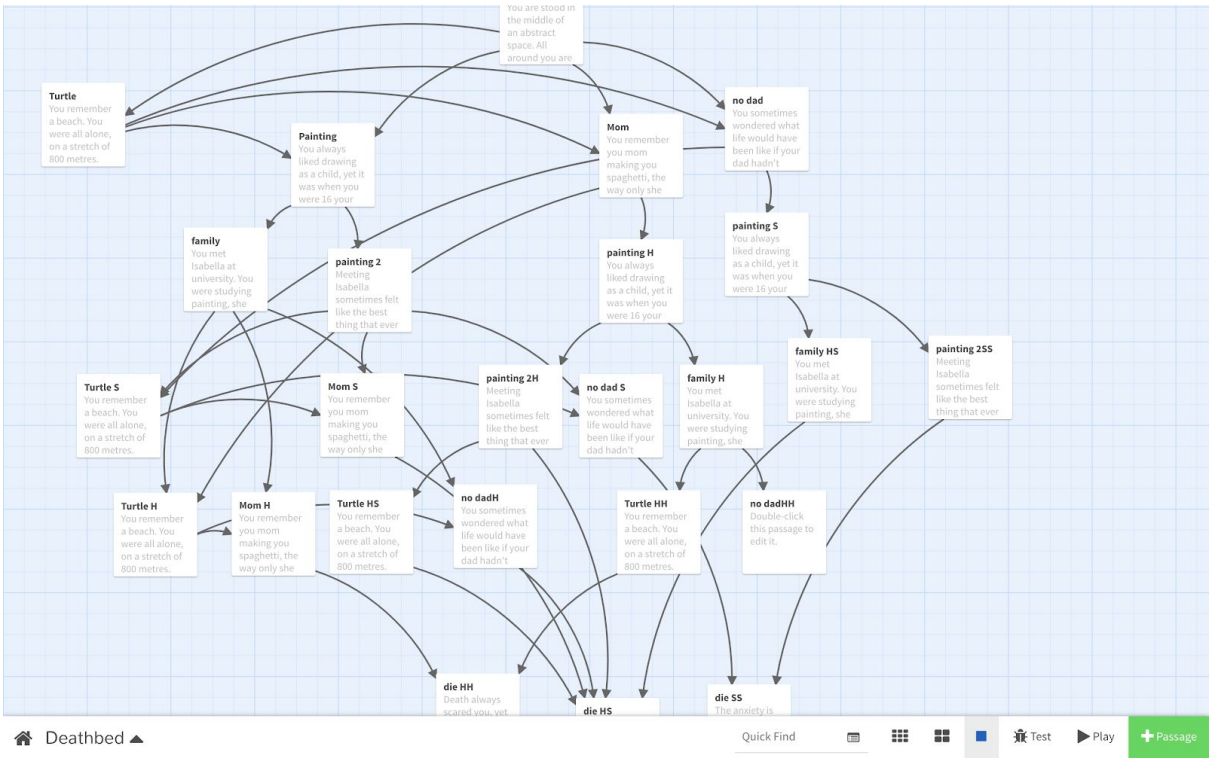

image. 1, early Twine prototype.

The core concept of this pitch was free exploration of fragments of memories, some good some bad or in-between. It would not be about making the choices for a life, but accepting the choices made. There would be light branching depending on whether players chose to focus more on positives and negatives, but there would be no influence over the memories themselves. The team decided to go further with this idea, but with some changes early on. One issue that was discussed frequently was the idea that the memories according to this pitch would be large painted as ‘good’ or ‘bad’, with many of the team members being more interested in retaining a sense of emotional ambiguity. This was agreed upon as the more interesting challenge, and therefore going forward it became a goal to build each memory around a plurality of emotions.

With a rough concept in place, discussions turned to visuals; what did death look like? Image 2 shows the first mood board presented during this stage of development. The object of this mood board was to find objects that bordered

between abstract and figurative. The idea at this stage would be for the game to have a hub that was a sort of ‘non-space’, representing the dying, fading mind, with the memories blossoming out of thin air almost around it.

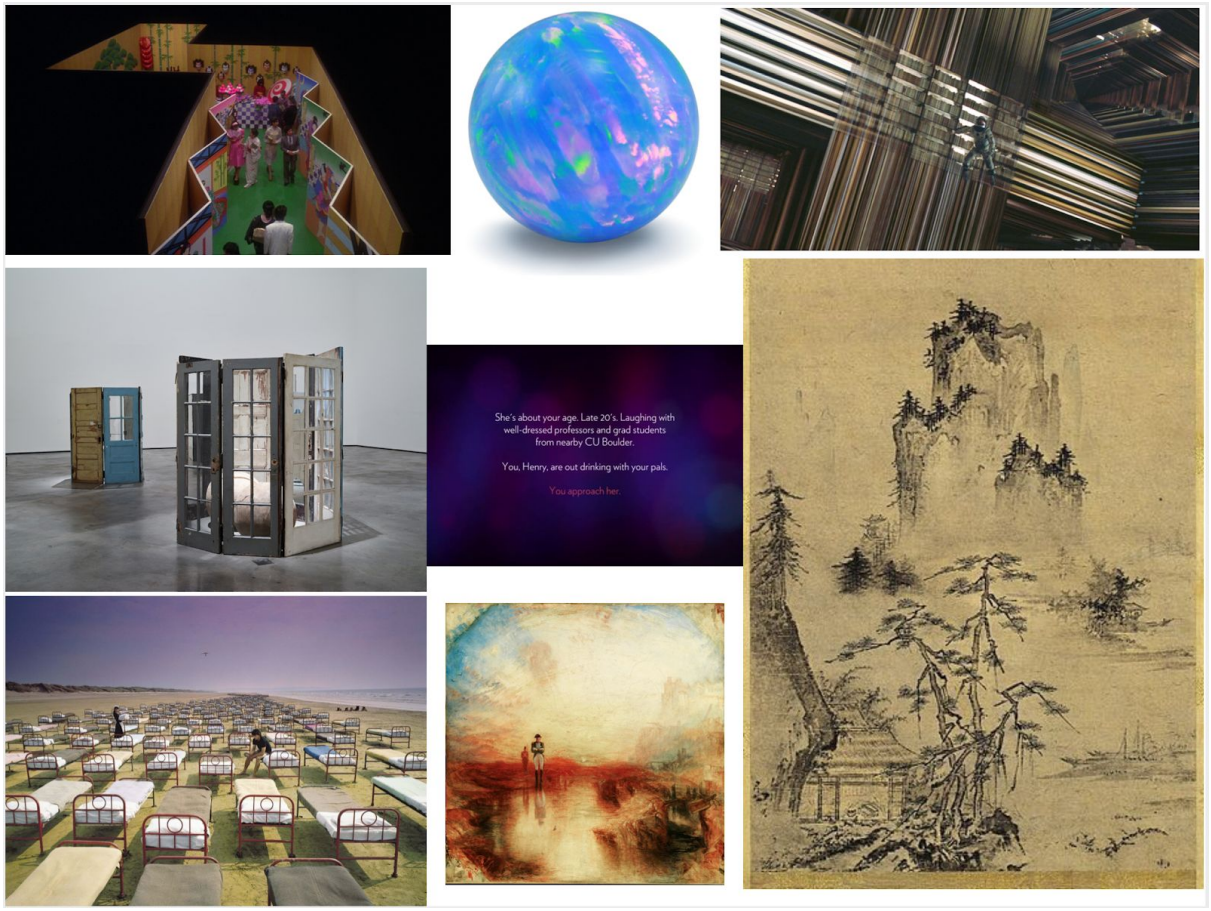

Image 2. moodboard

The visual presentation of all this became one of the most discussed issues by the team for a long time. While there was broad consensus surrounding the core concept of alternating between an open hub and specific memories, the abstraction of the concept lead to issues of getting everyone on the same page with how to represent it. One key inspiration during this phase, that lead the process forward was the film *Mirror* (1975) by Soviet filmmaker Andrei Tarkovsky. The film was an obvious source of inspiration as it is seen from the point-of-view of a dying poet. The film is known for experimental storytelling as dreams, memories and dying musings meld together non-chronologically and without much distinction. The sequence that most

notably provided some key inspiration is the very ending of the film[1] which tries to capture the moment of dying or at least, the loss of consciousness. The scene fully erases the distinction between memories and dreams, past and present, as it contains images both of the protagonist's mother as young and as old. The end of the scene shows the surreal paradox of the protagonist as a child, walking hand in hand with his mother as old. The camera follows them across a field with the symbolic sunset in the background, until the camera suddenly separates from the figures. As they continue on in the field, the camera slips into a dark forest, with the outline of the trees providing increased empty space in the screen (image 3). The way this scene depicted a consciousness slipping, whilst desperately trying to hold on to one final moment, gave the team a creative spark.

Image 3

First of all the motif of the field became a leading idea of how to present the non-space. This started an ongoing trend by the team of moving away from thinking

[1] https://www.youtube.com/watch?v=uU22autbqAo&t

it as a non-space, allowing it to be something more figurative and potentially symbolic, rather than just abstract. At this point the decision was also made that memories should not be as fragmented as originally thought, due to struggles with how to get enough storytelling out of the memories if they were too fragmented. Thus a decision was also made that the memories should be distinctly separated from the hub, as opposed to be placed within it. This led to the use of non-euclidean portals between the hub and the memories. Not only would this allow to create the memories as separate spaces, but it would also simultaneously help develop a sense of seamlessly flowing between the spaces. This was of course important to have some sense of memories flowing together. The idea here was to use small treehouses placed around the field as entrances into the memories. Inspired further by *Mirror*, the treehouses were supposed to slowly always be moving away from each other, to symbolize the consciousness slipping, making each memory harder to recall the one before.

During the narrative development of this phase, the treehouses were supposed to be all derived from one specific treehouse. In memories it would be told how this treehouse was a place of safety during moments of trauma. When out in the non-space the idea was to have this trauma hinted at or even directly represented, justifying the constant retreat into the treehouses. Yet things never fully clicked at this stage, as the non-space/field never fully seemed to make sense creatively. It felt somewhat at odds with the project, as it never fully seemed to thematically cohere. Out of this uncertainty rose the final conceptual iteration of the game with the idea of the mannerist garden maze. Once this was decided, most of the project began falling into place. For example the decision to make a shader that simulated the look and textures of mannerist prints and etchings, whilst the music would take inspiration in late renaissance harpsichord pieces. It is crucial to elaborate here on the concept of the ‘maze’ as well as mannerism, to see why it clicked so well with the conceptual goal of the game.

Mazes/labyrinths are today associated perhaps more as a form of leisure activity, something kids get a kick from running around in. Yet, their function originally was

anything but. Take for example one of the most famous labyrinths: the labyrinth of Knossos. The name might not be immediately recognizable, but the mythology surrounding it is. It is the supposed site where archetypal hero Theseus went into the labyrinth and defeated the horrid minotaur. Outside of mythology the existence of the labyrinth as an actual place is disputed among historians.[2] In fact fact it is suggested it may be either a site or act[3] used in coming-of-age rituals, with young adults/children emerging afterwards as an adult. The labyrinth was in this case seen as a symbol of the underworld – as death – with the reemergence being a rebirth.[4] Hence there is this concept of mazes as a symbolic underworld/hell/afterlife, which helped inform the decision of the maze as the central hub in *Reverie*. As opposed to the classic greek labyrinth, there is of course no way out of the labyrinth (unless you count the memories, but they of course just lead back in), but of course in the game death is something final and therefore has no rebirth.

The term *Mannerism* is often hotly debated among art historians as it has never really been properly defined, largely due to many dismissing it as a black sheep in the classical art history canon. For the purposes here, John Shearman's book on topic shall be used as reference. Shearman notes the peculiarity of the term when trying to define it. Referring mostly to a brief period in the mid to late 1500s italian art scene, the term gets it from the Italian word *Maniera,* meaning 'style'.[5] This is of course a very vague way to describe a whole branch of art, but it is surprisingly apt. Characteristics of mannerism are a move away from functionalism, with style becoming excess. It was a chance for artists to show off their artistry, without worrying about realism and functionalism; art for arts sake. Usually associated with painting and sculpture (for example late-era Michelangelo), mannerism also became prevalent in architecture and of course garden design. Looking at what

[2] Kern, Hermann. "The Cretan Labyrinth; The Ancient Labyrinth" from *Through the Labyrinth. Designs and Meanings over 5.000 Years* , P. 47

[3] In translations of Homer Hermann Kern notes the original word used is "choros" which has a double meaning of both 'dance movement' or 'dance surface' - Ibid; p. 47.

[4] Doob, Penelope Reed. *Mazes in Medieval Art and Architecture.* P. 126

[5] Shearman, John. *Mannerism.* p. 17.

characteristics were prevalent in these gardens fit nicely with the conceptual philosophy agreed upon by the team early in the development. They were notable by their lack of system and symmetry, not built around a specific core or centre, but instead around several smaller places of interest.[6] Walking through the garden, there would be no specific destination within the garden, and frequent dead-ends and extravagant spiraling shapes. They also popularized grottos such as the one in Sacro Bosco (image 4), working as strange mysterious departures from the garden space.

Image 4, grotto entrance at Sacro Bosco

The combination of the maze as a symbol of the afterlife – or transition there-to – as well as the experiences of the mannerist garden as a mysterious, somewhat illogical space clicked well with the ambiguous, emotion-driven space needed. The grottos also originally provided a fascinating setting for the entrance to memories. The team decided against this eventually though as creating the grotto entrances eventually seemed to a too time-consuming task for the project.

[6] Ibid; p. 125

The final major development of the project was finding an ending to the game. While a few things had been discussed, one important constraint set the done for the ending. Namely, that time was extremely limited and it was therefore agreed that if an ending was to be made, it should be one that required no new assets or sound-clips. This was very limiting, but at the same time it provided an interesting challenge. It was suggested that a fourth portal could be available upon the completion of the three memories, that would bring the player-character to a final space, a death-scene.

The end product was inspired by a scene in the surreal science-fiction movie *Under the Skin* (2013) by Jonathan Glazer. The context of scene was unimportant, but rather the audio-visual experience of the scene (image 5). The scene sees a man sinking down into a completely black and silent space. It was the suggested to fill this space only with the slowly rising object that had previously been interacted with. This was a simplified evolution of the idea of the treehouses moving away. It was the last fragments of the memories moving out of reach until everything eventually went fully black and silent with just complete nothingness.

Image 5.

Playtesting

Reverie went through sessions of play testing in order to evaluate the direction of the project. These sessions were aimed to receive feedback about all the possible aspects of the player experience. These included the artistic direction, the narrative, level design and sound design.

Prototype 1

The first prototype sessions were conducted on the last week of April and our main goal was to get a better understanding of the aspects of our game that needed to be kept, improved and/or scrapped. The project was still at a very early stage: as a group, we had already agreed on the maze idea with portals that allowed the player to access the main character's memories, but we still needed to test our core ideas. The first prototype consisted of a demo of the maze and one memory only (the moving van). A first iteration of the mannerist shader and of the monologue and portal systems was included as well.

As expected, the main criticism that we had to face were problems with the maze: many people pointed out that it was too big and lacked references. Placeholder assets confused people who did not understand the meaning of them. In order to address this criticism, we introduced prop-bleeding as way to fill the maze with assets that made sense and to gently introduce the content of a memory before crossing its portal.

We also wanted to include interactable objects in the dead ends of the maze, but due to time constraints, that has not been possible.

People praised the sound design inside of the van as it conveyed the idea of being in a moving vehicle even without the extra visual cues that we used to strengthen this idea. Though, there were concerns about the breathing sound: in general, it was too intense and conveyed a sense of anxiety. Also, we were reminded to fade it out during monologues. Both concerns were immediately addressed for the future iterations. Lastly, the volume of the music changed too quickly when the player exited a memory. This was addressed by Francesco by adding temporal smoothing

to the audio extensions system and by Aske by iterating on the spatial mixing of the single instruments to make it sound more ambient.
On the technical side, players pointed out problems with the portal system.
Lastly, people pointed out that Helena's portuguese accent was very noticeable and didn't make the main character sound Irish at all. At the time, we didn't expected Helena's voice lines to be anything but placeholder, but people really liked the way she delivered the sentences, so we decided to use her voice for the whole game. The main character has then been reworked to be of portuguese nationality to address the believability issue.

Final Playtesting

We had another playtesting session in early July, a week before the submission deadline. Reverie was already completed at the time, but there were still some technical problems with the monologue system that had to be investigated and solved: sometimes the system did not realize that a monologue had completed, thus making it impossible to interact with other objects afterward. The playtesters were informed and didn't mind this problem.
Play testers pointed out that they felt the delay of playing the first monologue after entering a memory was too high. We originally applied some delay in order not to overwhelm the players with sudden messages as soon as they enter new areas, but the value we chose was too high which caused players not to realize that the monologues they were hearing were triggered by entering the specific memory. Many thought the monologue was triggered by an object they tried to interact with, thus causing confusion.
Since the previous prototype, two extra memories (the garden and cruise) and the ending scene were added. The cruise scene is the one that produced the most mixed-feelings: some play testers really appreciated it, while others found it to be incomplete, like something important was missing. In the ending scene, we represented the main character's death by displaying her memories and her consciousness fading away from her. People didn't always understand we were trying to represent death: some people thought it was a representation of Alzheimer as they saw the objects from the memories to move away. We realized we never told

players that the main character is about to die and the play testing session proved that the ending scene is not enough to make people realize it.
On a positive note, a play tester cried after finishing the game. Specifically, she has found the story to be very credible and she praised Helena's voice acting by saying that it added believability. She felt like it was a compressed movie where the player becomes close with the main character through her memories.
Everyone enjoyed the music and sound design, and expressed that it fits the environment and narrative well.
Players had no problem starting the game: they went straight inside a memory and started clicking objects in an intuitive manner without the need of being told so. This was not the case for the first prototype, so that means that the new use of sightlines, prop-bleeding and the placement of the first portal helped players getting started without getting immediately lost, thus improving the experience.

Project Management Structure and Approach

Tools and Approach

In this section we write about the tools that we decided to use to work on the project.

Microsoft Teams

Following Erik Carter's advice, we chose Microsoft Teams as our main communication tool. Teams integrates many different collaboration options into a single workspace thus removing the overhead of moving from application to application. On top of that, since none of us used Teams for personal or work projects, that allowed for a better separation between our study, personal and work lives. We used it to have instant group messages, 1-1 chats, video calls, and threaded conversations in custom channels. We also used it to share files is an easy and organized way.

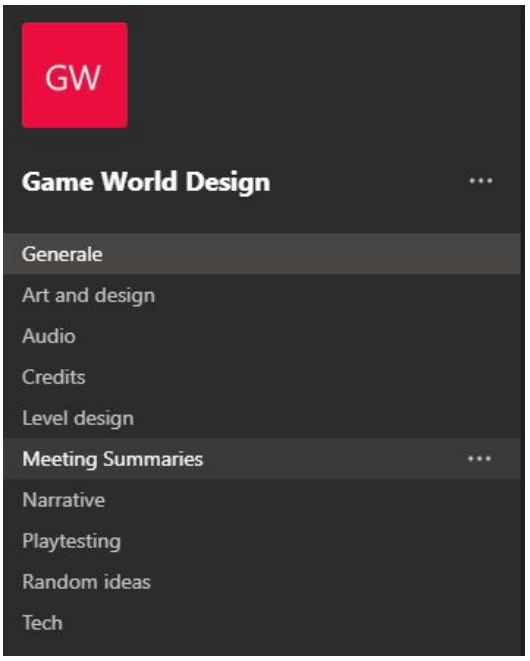

Image 6: Our group's Microsoft Team channels setup

Trello

We used Trello as our software of choice for our Kanban board. As in standard Kanban, we separated tasks in "To Do", "In-Progress", "Testing" and "Done". The Kanban board greatly helped us to visualize the work distribution and progress.

Google Sheets

Google Sheets has been used to keep track of the 3D assets and the voicelines.
For each 3D asset, we specified whether we wanted to rely on external models or whether Helena would make it in Blender.
For each voiceline we stored information about the filename, which memory it belonged to, the text and its status.

Challenges and the Lockdown

One of the biggest challenges of working together as a group was that it was hard for us to consistently be available at specific time slot to be able to regularly meet together in group meetings (both in person and virtually, respectively before and after the lockdown). This happened because we took different electives, worked at different hours, had meetings for other group projects for most of the semester and we also needed to find a balance with private life. This led us to have meetings approximately every 10 days and to heavily rely on asynchronous group

communication for decision making and 1-1 calls or sub-team meetings to discuss about the implementations of specific aspects of the game. Even before the lockdown, most of our individual work was done on our personal laptops at home so the Covid-19 situation didn't affect much our individual workflow. Though, our group interactions were affected as the time necessary to receive feedback on ideas and implementation greatly increased as those casual interactions that we had before could not happen anymore. Also, some team members did not have access to computers that could run our project in Unity, so we relied on screenshots and videos to communicate to them. If the Game Lab at ITU were open, that would not have been a problem since they could have used its computers.

Implementation of Game Elements

Narrative

The specificity of the narrative came around fairly late in the process. The frame was of course in place early on, but like discussed in the process section, the overall intended experience was main-priority and so first challenge became what sort of story-telling would best compliment the intended experience. It was not until halfway into the project that it was decided to use a voice-over. In fact, during much of the process this was actively decided not to. However the alternatives seemed problematic, as having it being pure text seemed it would break up the atmosphere too much. Eventually it was agreed that the storytelling would be done by combining voiceover with specific objects, with the intention of them complementing each other. This in itself was a big challenge, as it was a balance to be found in finding objects that could serve a) a storytelling purpose, b) work well with a voice-line, c) be within scope to make. That balance isn't hit, though there are some good examples of it working very well. For example the book about Denmark in the memory set in the moving van, provides very different information than the accompanying voice-line, without feeling like it does not belong together.

This then hit a broader question of making things feed into the narrative. As discussed in the development, the team wanted something driven by emotion more than story. So while there is much story to be told, it was always meant to be minimal and feed into the emotional experience primarily. One important lesson helped solve the writing in this regard. In discussion with guest lecturer Hannah Nicklin, the topic of how to do storytelling that was specific yet brief and minimal, a very good piece of advice was given. She noted that even if the amount of information is going to minimal, it is easier to get to this point by internally writing a lot of information (characters sheets, background information, etc.) and then working backwards from that, as opposed to aiming for the minimal first. This seems now perhaps obvious almost, but was a great piece of advice that really helped the narrative to get going.

Portal System

The portal system is an important element of Reverie that allows the simulation of non-euclidean spaces, linking two separated locations.
It is composed of 3 main elements:

- Portal
- Spawn point
- Secondary Camera

To achieve the right effect for the portal we needed to calculate which position the player would have been in if the two spaces where really connected; to do so we calculated the position and rotation offset of the player from the portal and applied that to the secondary camera based on the spawn point.
After calculating the right position for the camera, we used a RenderTexture on the portal to project the camera image on a plane, using a shader to take only the right part of the image based on the World Position of the portal.
Lastly a script attached to the portal teleports the player to the position of the secondary camera, this allows a smooth transition between the scenes.

Monologue System

As already mentioned we decided to make use of voice-overs in the game, with that we also decided to show subtitles at screen. To do so we needed a system to be able to manage the audio clips for the monologues and to synchronize them with the text of subtitles.
To ease the process and allow an easier writing of the subtitles for the designers we implemented mid-text tags that gives the possibility to divide the text in sentences and define the exact position of the sentence in the audio track.

The Monologue system has two main components: the monologues and the monologue manager. The monologues are ScriptableObjects that contain a reference to the audio clip and the text of the subtitles and can easily be created through the editor interface.
The monologue manager is the core of the system its main purpose is to receive Monologues, to parse the subtitle tags and to reproduce the audio clips; we also implemented functionality to handle multiple monologues, pause/resume the audio and to be able to execute actions at the end of a precise sentence or the whole monologue.

3D Workflow

Since the main character and the art director of this project are both portuguese, inspiration for the 3D models was taken from the surroundings, by looking at the quotidian life. This personal approach aided the creation of an intimate world and structured the workflow: often starting with photographs or scans, followed by minimal sketching on paper to better understand how it could be modelled. This last step was sometimes skipped, which enhanced the raw appearance of those models. Most of these 3D models are sketches and need more attention: this happens as the style iterates and starts coming together halfway through the development.
For the lemon tree and small rosebush, real leaves were scanned and subsequently applied as a texture to create the foliage (*Image 7.*). Most of the textures were

outsourced from websites that offer open source options, including textures.com and cc0textures.com.

Image 7.

Some textures had to be designed from scratch, like the one for the Motion Sickness Relief pills (*Image 8.*).

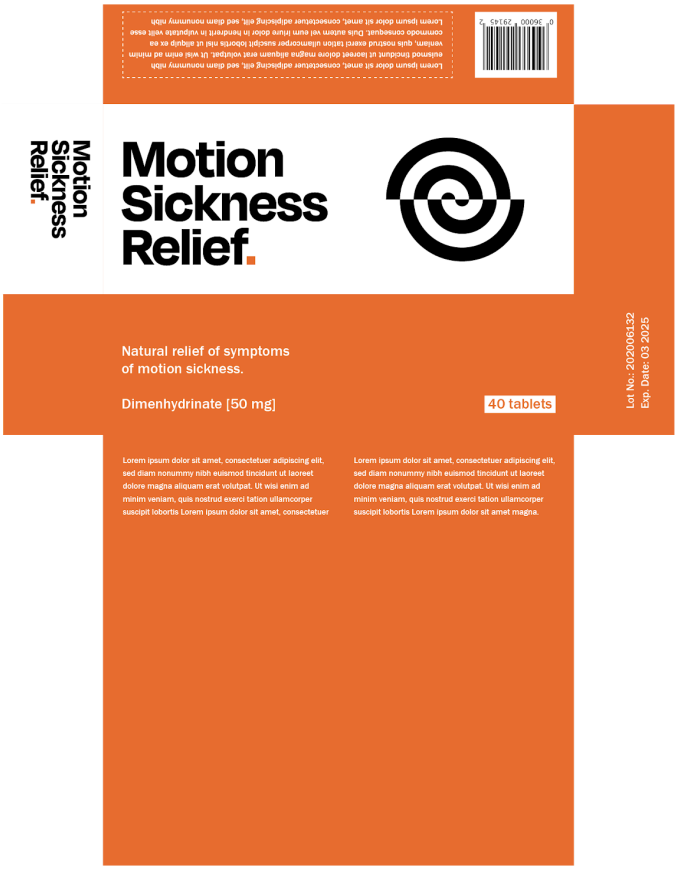

Image 8.

Not all models were created by the group, as it would be very time consuming. These outsourced models are placeholders that helped build the prototype, ideally replaceable in the near future. We resorted to Unity Asset Store to find a bicycle, the bushes that enclose the maze, a backpack, some cardboard boxes, a bedside table with a lamp, and some statues. Due to the shader being visually heavy, the world was equalized, so even if the outsourced models had a different style or mesh density they wouldn't stand out.

Shaders

In order to achieve the mannerist print inspired look of our game and other special effects, we heavily relied on custom shaders realized with *Shadergraph*, Unity's visual solution to create Shaders with no code. *Shadergraph* is a node-based tool that easily allows the developer to see a preview of each operation that makes the shader, therefore making it very easy to debug, edit and expand.

The shaders we made include:

- The mannerist shaders
- The skybox
- The portal shader

Before proceeding with the implementation and the research on methods to achieve the desired effects, we took some images of mannerist prints as a reference (e.g.: image 9).

Image 9: Mannerist Print used as the reference image for the mannerist shader

Starting from those images, we identified the main elements that we wanted to have in our visual style: we decided that it was important for the game to have a specific color palette to apply to most objects and that cross-hatchings had to be visible. This allowed us to uniquely characterize the game world. Also, it allowed us to use fast to make, simple models and to seamlessly integrate external assets that would have otherwise looked out of place.

The implementation of the cross-hatching shaders was mostly based on Praun et Al (2001, August). Real-time hatching where the authors proposed a real-time system for non photorealistic rendering of hatching strokes over arbitrary surfaces. The main idea is to associate the intensity of the lighting on the rendered surface to specific textures, called Tonal Art Maps (see *Image 10.*). The darker the lighting, the denser the strokes. Since there is only a finite number of Tonal Art Maps, when the lighting

value intensity falls between two thresholds, the resulting texture is calculated by appropriately interpolating the 2 closest consecutive tonal art maps. These tonal maps used in our project were taken from Kyle Halladay's blogpost where the author further iterated on the work of Praun et Al (2001).

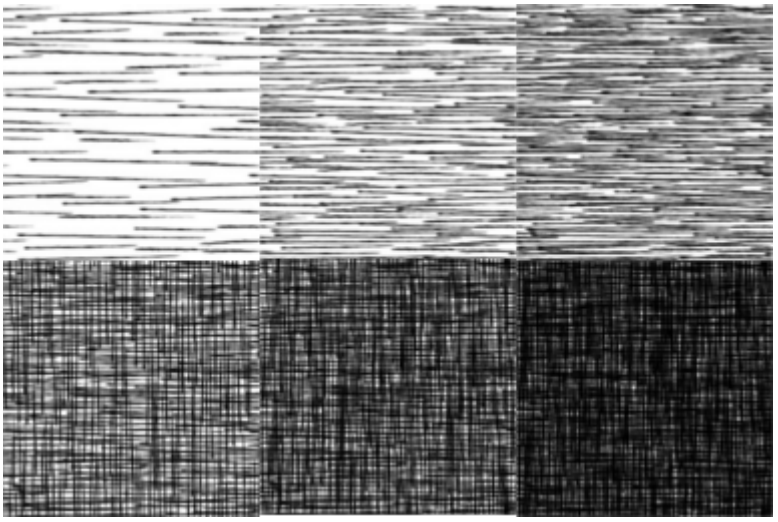

Image 10.

After managing to recreate the strokes using the above mentioned method, we proceed by adding an animation to the strokes to make them look like part of a sketchbook and by tuning the color palette by mapping different lighting values to different colors sampled from gradients. Lastly, we made different versions of the hatching shaders to better suit the different kind of objects that we had:

- Hatching_Gradient_PBR: Used on most objects, it's the original monochromatic version of the shader.
- Hatching_Gradient_PBR_Color: It's version used on interactable objects. They can have their coloured texture and there's a saturation parameter that allows to dynamically specify the amount of color displayed.
- Hatching_Gradient_PBR_Cutout: Used on static leaves.
- Hatching_Gradient_PBR_Cutout_Wind: Used on leaves and bushes moved by wind
- Hatching_Gradient_PBR_Transparent: Used on transparent objects.

Image 11*:* Original mannerist shader testing scene

Image 12: Objects with *Hatching_Gradient_PBR* and *Hatching_Gradient_PBR_Color* shaders taken from the Van Memory.

Musical concept and implementation

The music in Reverie consists of three musical elements; harpsichord, synth pad and small fragmentary and atmospheric voices. The harpsichord is used as the main instrument as the player moves through the labyrinthine mannerist garden, and is used to support the late Renaissance feel of the maze. The more subtle synthetic

pad is used as the underlying music for the memory scenes, to give more auditive space for the sound design, as well as to contrast the auditive feel of the maze. The fragmentary voices that sings in the background along the way through the maze are small vocal lines taken from the song "Memory" from Andrew Lloyd Webber's *Cats*. The voices are run through an autotune to create a counterpoint to the rigid sound of the harpsichord. At the same time, the vocals are incorporated to give hints to a life that reverberates in the intricate maze.

Midi as conductor

The way the musical elements are controlled in the game is through the use of MIDI. Both as a way to control the tempo of the music, and at the same time as a way to orchestrate the musical elements of the game. This means that there are no pre-recorded audio files in the musical part of the game, but only midi files that call audio samples for each event in the music. This has made it possible to make the music flexible in a different way than if it had been pre-recorded.

This was mainly exploited in two different ways. One way was to link the first person controller speed to the audio clock that controls the speed (bpm) of the midi files. By doing so, the music becomes dynamic and responsive to the player movements, and creates a narrative co-player that musically emphasizes the player's behavior; If the player is standing still, the music does the same. If the player begins to move, the tempo of the music gradually increases until the player stands still again and just as slowly causes the music's tempo to decrease.

Another way the midi is utilized is to orchestrate the three musical elements of the game. The three midi files that controls the three instruments play constantly throughout the whole game, but by enabling and disabling them they can be turned on and off without any noticeable audible effect. By orchestrating the music in this way it is possible to change the musical expression, without having to make crossfades to other audio files, and at the same time maintaining the tempo the player has set at the time an instrument becomes disabled or enabled. This feature

is used in our prototype every time the player moves in and out of the portals between the memories and the maze.

Sound design

The sound design of Reverie consists of several elements, but the overall ones are: environmental sounds, object sounds, breath sounds, footstep sounds, parametric zones and audio triggers. These elements figure in both the game's hub (the mannerist maze), as well as in the memories.

The environmental sounds are those that are constant and implemented as static 3d audio zones, being either the wind in the maze, the rumbling car sounds in the moving memory, the cabin room tone and moving water sounds in the ship scene or the crickets and the suburban neighbour sounds from the garden memory. These can only be interacted with by moving through the audio zones, but are sounds that are looped and playing constantly.
The object sounds are those that are connected to objects in the game world. These are represented eg. by the cars driving by or the truck door in the moving memory, that either moves in the game world or can be interacted with by behaviour.
The sound of the protagonist breathing has three different modes; idle mode, walking mode, and monologue mode, and are controlled by the actions of first person controller. All of the three modes play at the same time, but are turned up and down, and crossfaded in between depending on whether the player is moving, standing or talking.
The same applies to the footstep controller, which, like the breath controller, is controlled by whether the first person controller is moving or standing still. But besides this, the sound of the material the player is walking on, is controlled with collider triggers, so that with each change in ground material colliders are set up.

Audio Extensions

Sound design is an important part in *Reverie* and the default Unity audio system was extended to get more control out of it in a way that did not require code on the designer's part.

Parametric Zones

Parametric zones are the first example of editor extensions that we implemented: they allow the designer to define areas where a certain parameter in the audio mixer assumes a desired value *end_value* when the player enters them. An audio zone is represented by 2 spheres of different radii. When the player position falls inside the inner radius, the parameter is completely changed to *end_value*. When the position falls outside the outer radius, the audio zone does not contribute to change the parameter at all. When the player position falls in between the inner and the outer radius, the parameter is smoothly blended between the original value and the *end_value*. For example, this system was used in the maze to dynamically increase the reverb of the harpsichord when the player gets close to portals so that we could obtain an effect of suspension when preparing the transition from one memory to the other (see *image 13*).

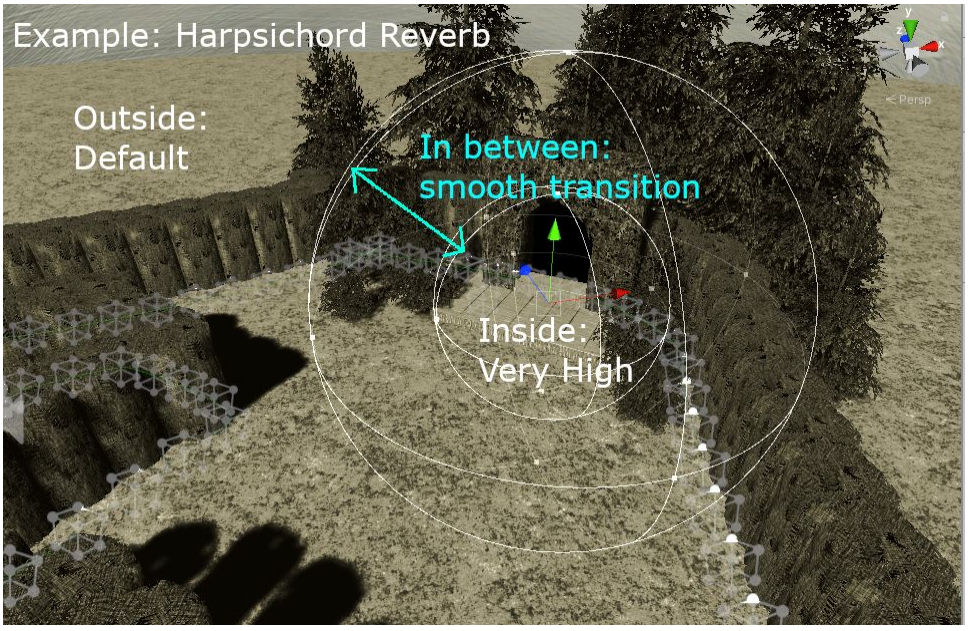

Image 13: Parametric Audio Zone example: The reverb applied to the harpsichord depends on the player's position. This is done by defining specific zones where the desired parameters get overridden.

How the game would have looked going forward

One notable discussion point that never quite became a priority was interaction. Early on there were thoughts of having more interaction, in the forms of for example some light puzzles inside the memories. The way the game has turned out, actual puzzles would probably feel a bit out of place, as it would drag focus away from the experience. However, there are certainly interactions that would be fitting. For example (and this was specifically in discussion at a point) in the memory set in the moving-van, the player could have a bit more involvement by for example opening the boxes to look at the objects inside, as opposed to them already being open upon entry. Or in the garden-memory, there could have been an interaction to water the roses that Marissa recalls taking care of a child. Small interactions like this could have allowed better immersion into the moments.

The second big thing that unfortunately was down-prioritized was the maze. The maze is of course there, but it is more or less empty. The original plan was that there would be small, much briefer stories to find in the maze as well, encouraging exploration of it. Lack of playtesting (partly due to the corona-situation) also sadly made the spatial design of the maze something that never got the attention it should have. Developing the symbolic potential of the maze also surely got lost in this process as ideally this would have been explored more if the maze and gotten the attention intended for it. Finally, the maze was also supposed to contain some slight progression between memories, to reflect the mind slipping (as the movement of the treehouses were meant to do at that stage in development). One idea was to have the bushes grow thicker, making it more and more claustrophobic. There was also discussion of bringing something from each memory back to a specific spot in the maze to mark a game progression and to finally trigger an ending/death upon

completion. All these aspects are surely things that would have been introduced have there been the time and resources for it.

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Appendix

External Assets

Boxes - Player's Town
https://assetstore.unity.com/packages/3d/boxes-63740

Bed collection - Kobra Game Studios
https://assetstore.unity.com/packages/3d/props/furniture/bed-collection-25256

Yughues Hedges - Yughues
https://assetstore.unity.com/packages/3d/vegetation/yughues-hedges-16487#releases

Discobolus Statue - ChamferBox Studio
https://assetstore.unity.com/packages/3d/props/discobolus-statue-107544

Horse statue - ChermandirKun
https://assetstore.unity.com/packages/3d/environments/fantasy/horse-statue-52025

Lion statue - organicpolygons
https://assetstore.unity.com/packages/3d/props/exterior/lion-statue-34247

HQ Lion statue - NOT_Lonely
https://assetstore.unity.com/packages/3d/props/exterior/hq-lion-statue-50736

Nature FX Pack - Rivermill Studios
https://assetstore.unity.com/packages/vfx/particles/nature-fx-pack-45691

Audio Helm - Matt Tytel
https://assetstore.unity.com/packages/tools/audio/audio-helm-live-music-creator-86984

PBR Bicycle - Maksim Bugrimov
https://assetstore.unity.com/packages/3d/environments/industrial/pbr-bicycle-134625

Cozy little house - Total_Marginal
https://assetstore.unity.com/packages/3d/environments/urban/ozy-little-house-79432

Street Lamps - SpaceZeta
https://assetstore.unity.com/packages/3d/props/exterior/street-lamps-165658

Wall TVset - 3d.rina
https://assetstore.unity.com/packages/3d/props/electronics/wall-tvset-8468

WindowsAndDoorsPack01 - Mr Andrew Chapman
https://assetstore.unity.com/packages/3d/props/exterior/windowsanddoorspack01-133820

Path Creator - Sebastian Lague
https://github.com/SebLague/Path-Creator

Backpack - Anonymous
https://free3d.com/it/3d-model/backpack-v1--504550.html