

# **Using a Narrative-Based Role- Playing Game (RPG) as an Interactive Method for Psychogeographic Research**



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A dissertation submitted in partial fulfilment of the requirements of  
Dublin Institute of Technology for the degree of  
M.Sc. in Computer Science (TU059)

**05/02/2024**

## **DECLARATIONS**

I certify that this dissertation which I now submit for examination for the award of MSc in Computing (TU059), is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

This dissertation was prepared according to the regulations for postgraduate study of the Technological University Dublin and has not been submitted in whole or part for an award in any other Institute or University.

The work reported on in this dissertation conforms to the principles and requirements of the Institute's guidelines for ethics in research.

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## **ABSTRACT**

Psychogeography is a research methodology which seeks to represent the complex relationship between an individual and the space that surrounds them. Contemporary research has explored using Geographic Information Systems (GIS) in data psychogeography. However, most visualisations created with these computational tools are static. The potential of interactive gaming technology in psychogeography remains unexplored. Video games, unique for their immersive qualities and ability to engage players in narrative experiences, provide an ideal medium for conducting psychogeography studies within virtual landscapes. The aim of this research is to develop a narrative based Role-player game that can be used as a tool in psychogeography to provoke reflective thoughts and emotions. It will incorporate concepts of presence, immersion, and flow to assess experiences related to being in the game. The research intends to explore whether it is possible to simulate the subjective and sensual experience of space within a virtual landscape.

**Keywords:** Video Games, Digital Art, Psychogeography, Mental Map Mapping, Software Development

## ACKNOWLEDGMENTS

First and foremost, I would like to express my sincere gratitude to my supervisor Damian Gordon for his support. I would also like to extend my thanks to the whole TU059 (MSc in Computing (Software Development)) for such an excellent and useful course. Another special thanks goes to Aidan Forde for sharing his ideas during the development of *Melancholy Reverie* and for his video footage of Derry. I would also like to state my gratefulness to everybody who took the time to participate in the experiment. A particular thanks goes to Ella van Uchelen for her advice along the way. Finally, I would like to thank my family, Geri and Jeremy Choo, for their support.

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# **1. INTRODUCTION**

## **1.1. Project Background**

Psychogeography is a practice-based research methodology that was first developed by the Situationists to investigate the idea that we cannot separate our physical environment from our individual experience. To walk the urban landscape is to map the intangible layers of our subconscious onto the real world. Thus, psychogeography is said to occupy the intersection of ‘the human and physical environment, the relationship of persons with their space’ (Sylaiou, Chountasi & Lagoudi, 2014). It seeks to understand the emotions, senses and thoughts that reside in this landscape.

Psychogeography gained momentum as a movement in the 1960s. It saw poets, artists and writers contributing to a significant body of work, each piece a unique and subjective representation of their experience of the city. In some sense, each piece of work can be considered a new ‘map’ of the city. It cannot be used to navigate the city - it does not show the geographical location of one thing in relation to another - but the artist’s personal and existential landscape.

The aim of this research is to develop a narrative based psychogeographic game from a first-person view of the world. Open world games encourage you to enact and think through your behaviour. Schulzke speaks about this more broadly: ‘Video games have several advantages over traditional narrative thought experiments. They provide more complex decision-making environments, incorporate the effects of probability and luck, and make players active participants in the narratives (Schulzke, 2014). Games can immerse players as active participants and, thus, provide the ideal conditions to carry out a psychogeography of a virtual landscape. Therefore, I propose to develop an RPG that should provide meaningful contributions to the field of psychogeography and media arts.

## **1.2. Project Description**

Psychogeography is a practice-based research methodology, but to see it as that alone misses the reason for its conception. It was first conceived as a revolutionary protest for radical social change, a reaction against capitalist ideals (Debord, 1955). However, there

are very few psychogeographies that use the vehicle of technology and fulfil this political criterion of Situationism. Contemporary artists are inspired by the Situationists' aesthetic – particularly in geographic visualisation – but very few are consistent with the fundamental principle of achieving social and cultural change (Lagoudi *et al.*, 2018). The problem is that there is an apolitical vision to most of the contemporary computational work in psychogeography. Furthermore, the development of gaming as a methodology to engage in research is also a very limited area. This connection has yet to be developed. As such, there are several assumptions, limitations and delimitations that must be defined to achieve this proposal.

### 1.2.1 Assumptions

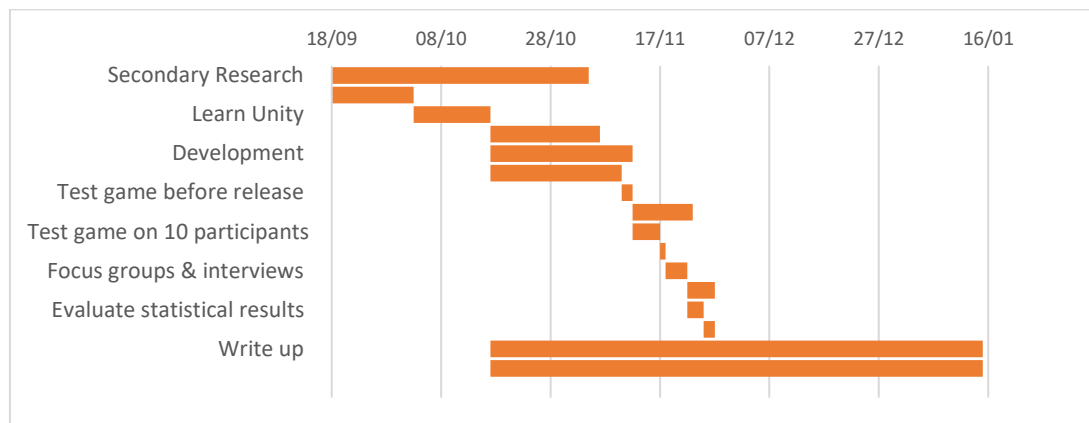
There are two unprovable assumptions that I will make. First, that participants will answer questionnaires and interview questions honestly and factually. This will be ensured by informing the participants that their identities will be anonymized and confidentially preserved. Second, that the emotions and behaviours of participants will not be disturbed by the immersion in the dream-like landscape and the subsequent assessment of this reality. To make this assumption, participants will be adults and will require informed consent to use the game.

### 1.2.2 Limitations

There will be limited access to geospatial technology, such as UCL Bartlett's space syntax software (UCL Space Syntax, 2023), which would have proven useful in spatial analysis and evaluation of the game. There will also be limited infrastructure and computational resources in game development.

### 1.2.3 Delimitations

The aim of research is to develop an application that will contribute to the field of contemporary psychogeography and postcolonial digital humanities more broadly. The RPG will be developed in Unity 2022. Magicavoxel and Blender will also be used to create the character. However, it will not be possible to develop the game in its entirety. A simplified version of the game will be developed. The game will be loosely based on Richmond Park.



*Figure 1: Overview of Experiment*

#### 1.2.4 Hypothesis

Psychogeography understands our perception of geographical environment to be affected by our subconscious thought and feeling, provoked by the real-world experiences that we have in those spaces. The people we speak to, the events that we experience, and the emotions that we feel, can change how we perceive a space. The research will explore these ideas in the virtual world.

David Chalmers proposes a theory of ‘virtual digitalism’, which states that virtual objects are real digital objects, and virtual experiences involve non-illusory (i.e. veridical, accurate, true) perception of a digital world (Erica Webber & Griliopoulous, 2017). ‘It’s a real world that we’re accurately perceiving as virtual,’ he says, ‘not a fictional world that we’re inaccurately perceiving as physical’ (Chalmers, 2017).

Chalmers’ theory of virtual realism means that an object we see in a virtual world is not an illusory object. It would be an illusory object if it was entirely imagined. A virtual environment, such as an RPG, stimulates non-illusory experiences. Our experience of them is not radically different than if we had been experiencing them in the real world. Chalmers’ understanding of the similarity of these two modalities is important for my research. It suggests that the virtual world can stimulate the same emotions and thoughts as the real world. My hypothesis is that players who report a strong emotional response within the game will also experience high levels of immersion (H1).

One further point to add is that this hypothesis does not assume that there will be no

difference between a real-world psychogeography and a virtual one. Rather, it is understood that this difference hinges upon bilocation. In virtual environments, the self, which has the experiences, is separate from the body. Thus, the way we internally experience virtual environments is fundamentally different – regardless of how immersive or active these games are. The RPG will be used as a research method in psychogeography to uncover more about our lived *virtual* experience.

### **1.3. Project Aims and Objectives**

The research objectives to be carried out fall into four main categories: research, design & development, experiment design, and evaluation. The first stage, proposing gaming as a method for psychogeographic research, involves conducting an extensive review of literature to identify existing theories and methodologies in psychogeography. I will conceptualise how games can be utilized as a method in psychogeographic research. I will also examine the psychological and cognitive aspects of digital perception and the potential ways that it can be used to shape an individual's understanding and experience of the geographical environment. The mechanics of location & spatial based games, such as Superliminal, will also be tested.

The second phase of research is designing and developing the game, that will be called *Melancholy Reverie*. The game that I propose to develop is intended to encourage a different kind of thinking about psychogeography. As a research methodology, psychogeography has not been used to explore the virtual world before. However, I believe that the narrative technique of Role-playing games (RPGs) naturally lends itself to psychogeography. Single-player RPGs explore new landscapes by delving into the character's thoughts and actions. Therefore, I propose to develop an RPG as a psychogeographic landscape in the virtual world.

*Melancholy Reverie* will be modelled in Unity using C# and its design will integrate the research findings from the previous phase. The game will serve as an interactive platform for experimentation and data collection in the third and fourth phase. The objective of the game is that it can be used as a research tool in psychogeography.

In the testing phase, I will deploy *Melancholy Reverie* on a sample of 10 participants. The game will be evaluated to see whether it meets the three of psychogeography that I

have identified in *Section 4* (interactive, political and subjective). The evaluation of the experiment's outcomes will be conducted using two main statistical methods. Firstly, a questionnaire using a 5-point Likert scale will be administered to participants after they have engaged in the game. This questionnaire will be used to identify any potential issues or challenges and calculate an immersion score to capture users' experiences. Secondly, in-person tests will be conducted with 5 participants to understand the game's effectiveness in immersing the user their geographical environment. Think-Aloud Protocol and Shadowing will be utilized as qualitative evaluation techniques.

Analysing participants' responses from in-person testing will be particularly important in evaluating whether there is a qualitative difference in their perception of the geographical environment between the virtual and real-world experiences. This will determine the *Melancholy Reverie*'s ability to simulate and evoke a sense of place.

Psychogeography is exploratory and qualitative research. The relationship between gaming and psychogeography is not clearly defined and it is a new problem that has been identified. By accomplishing these research objectives, this study will generate valuable findings on the effectiveness of gaming as a psychogeographical tool, providing alternative perspectives and insights into the psychogeographical environment. These insights will help provide meaningful contributions to the field of psychogeography, and the alignment of its principles with gaming.

#### **1.4. Project Evaluation**

Research method triangulation will be used in this experiment to test the hypothesis. The following quantitative and qualitative evaluation approaches will be used: Think-Aloud Protocol, Shadowing, and an Immersion Questionnaire. The development of each of these methods will be explained in *Chapter 4*.

The immersion questionnaire can be found in *Appendix A*. The first 6 questions cover the demography of participants, age, gender, computer use, etc. The next 13 questions three areas: immersion, flow and presence, with specific questions targeted at identifying which of these the participant was experiencing. The final

4 questions allow participants to share their own comments. The questionnaire was adapted from Jennett, Cox, *et al.*'s (2008) study into whether immersion can be defined quantitatively.

From the questionnaire, the overall immersion score is calculated as:

$$i = \frac{flow + presence + immersion}{13}$$

The immersion score will provide the quantitative metric that can be used to understand the participants' level of immersion in the game. This will also be used to understand the relationship between the participants' level of immersion and emotional response to the game.

## **1.5. Project Scope**

The aim of this project is not to create a game that has a score board or can be used to track the character's progress throughout the game. *Melancholy Reverie* is not a strategy game or even a puzzle. Indeed, it is expected that some players may not enjoy the simplicity of the game. The premise of the game is very simple: wander the landscape. The way in which the player does this is at their own discretion. They may listen to the dialogue, pick up items or just walk around. It is deliberately non-linear and non-didactic. However, players will be actively encouraged throughout *Melancholy Reverie* to form their own ideas and narratives about what is happening within the game. These thoughts may generate reflections and emotions that suggest the game can be considered a virtual psychogeography.

## **1.6. Thesis Roadmap**

Chapter 2 is the Literature Review chapter, it focuses on the main topics of this research: Psychography, History of Games, Virtual Environments, and Spatial Evaluation Approaches.

Chapter 3 is the Design & Development Chapter which presents the design of *Melancholy Reverie*. and the stages that were undertaken for its development

Chapter 5 is the Experiment Design chapter which details the design of the range of

experiments that will be undertaken as part of this research.

Chapter 6 is the Results and Evaluation Chapter which presents the results of each of the experiments as well as an analysis and evaluation of these results with respect to each other and the relevant literature.

Chapter 7 is the Conclusions and Future Work Chapter which presents the key findings of this project, highlighting what aspects of the research went well and what aspects did not go well. It also discusses some future directions that the research may take.

## 2. LITERATURE REVIEW

### 2.1 Introduction

This chapter presents an overview of some important literature relevant to this research project. The purpose of which is twofold, first, to explore what has been done in the past to help determine the design and development of this experiment, and second, to identify results of previous experiments that might be compared to the results of this experiment.

The chapter explores four main research areas:

- An overview of psychography
- The history of games
- Understanding Virtual Environments
- Spatial Evaluation Approaches

### 2.2 An Overview of Psychogeography

“Our Riches” is a novel about a bookshop owner in Algiers. It begins with the narrator navigating the streets of the city. The reader is taken on a tour down the Didouche Mourad, ending at Les Vraies Richesses, where the bookshop can be found. On this walk, Kaouther Adimi writes:

*You will be alone; you have to be alone to get lost and see everything. There are some cities, and this is one, where any kind of company is a burden. You wander here as if among thoughts, hands in your pockets, a twinge in your heart* (Kaouther Adimi, 2020, p. 3).

The idea articulated here is that there is an emotional component to the spaces that we occupy. Adimi understands walking through a city as an individual experience. You must do it when you are alone to share it with your thoughts and feelings.

The practice-based research methodology of ‘psychogeography’ is encapsulated in this idea, that we cannot separate our environment from our experience of it. Psychogeography was first developed by the Situationists as a technique to investigate this. It is a research process that attempts to explore the intersection of ‘the human and physical environment, the relationship of persons with their space’ (Sylaiou, Chountasi



& Lagoudi, 2014). As such, urban walking (especially getting lost) is a key method of psychogeography.

### 2.2.1 Contemporary Psychogeography

It is important to emphasise how unfamiliar and, indeed, subversive, contemporary research on urban walking is from its predecessor. It is starting from a completely different point than the ‘classical’ psychogeography of the Situationists. Where Debord believed that walking the city was generating emotions and thoughts in our subconscious, walking is now understood by contemporary psychogeographers as generating data. This data can be utilised for the practice of psychogeography. It is in this way that the theoretical foundation of psychogeography is being applied to a contemporary landscape.

Data psychogeography is about leveraging the data that has become available to us through new technology. Meier & Glinka (2018) believe that we are in a ‘new generation of activity data’. This new generation is able to ‘store a richer set of dimensions in activity data’ than seen before (Meier & Glinka, 2018, p.3). McGarrigle goes further than this. He believes that it is not only through tracking devices that we can understand the individual:

*To be in a city today and participate in the life of a city is to generate a detailed and complex record of your activity that is being saved to databases and cross correlated across any number of platforms and data sources from credit and purchase histories to travel records and internet searches (McGarrigle, 2018, p.253).*

This is how McGarrigle re-frames the methodology conceived by Debord as ‘data-psychogeography’. He believes that there is such a vast amount of data in this world that we can *produce* space through code. We can then apply psychogeography as a research methodology to understand the space that we created. This involves reading the layers of data and representing it (as the Situationists created poetry and art).

### 2.2.2 Data and the Subconscious

Essentially, where the flâneurs believed that walking the city provided a backdrop for their consciousness. The ‘cyberflâneur’ uses data as their tool to ‘walk’ the internet

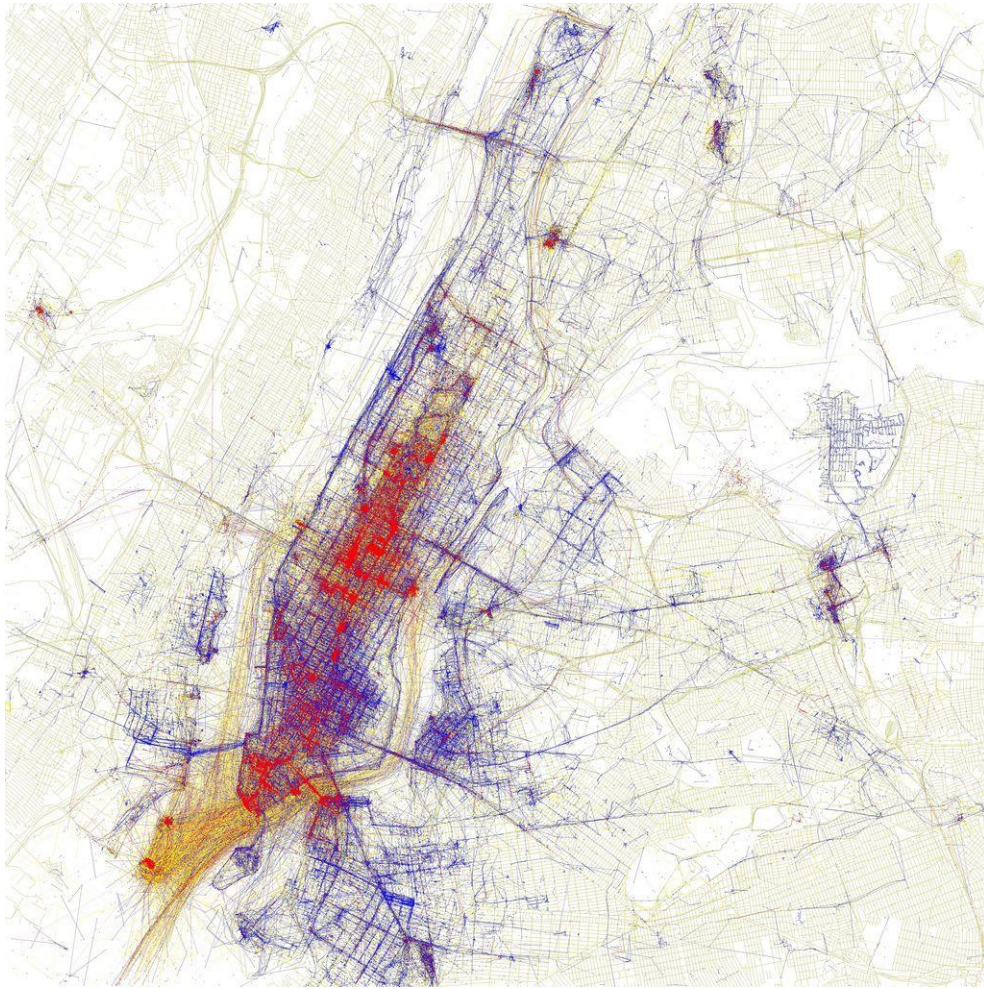
(Meier and Glinka, p.2). In a similar way to our thoughts and feelings, data leaves a trail that we can trace. This is significant because it suggests that, on some level, data can capture our subconscious. Data is the source of the subconscious in contemporary research.

McGarrigle does not limit his understanding of the data that is available to external data, such as location, direction, speed, time, and environmental measures. He believes that there is a second category that is available to us, what is called the 'subjective experiential aspects' (McGarrigle, 2018, p.253). The 'micro-displacements and micro-attentions, that is the granular contingent components' (McGarrigle, 2018, p.257). This is a completely different type of data. It is inward-looking and captures what is unique to that individual.

McGarrigle's distinction between these two datatypes is key to his proposal. The situation (subjective) dataset requires a completely different set of techniques to the action one. So, it is important to see them as distinct datatypes. Distinguishing between 'situation' and 'action' data leads McGarrigle to propose a framework for a database which is capable of recording both these datatypes. McGarrigle does not go into detail on how we can record this subjective data; however, recent research into Speech Emotion Recognition (SER) is one of example of how this could be achieved. SER is an emerging area of research that utilises many different techniques to understand emotion, including deep learning models and digital signal processing (Mustaqeem & Kwon, 2019).

### 2.2.3 Digital Media and Psychogeography

Research on psychogeography using data broadly falls into one of two stages: data collection or visualisation. We have explored the first of these - contemporary psychogeography leverages data as a tool for the subjective perception of the physical world. I will now move onto the second stage. Here we have the more artistic or experimental type of research, which looks more at the media that is produced. Mental maps, VR and AR are some examples of this. The below image is one example of a psychogeographic map created on the Internet. The blue images have been created by the locals, the red images by the tourists, while the yellow images can be created by both locals and tourists (Sylaiou, Chountasi & Lagoudi, 2014).



*Figure 2: psychogeographic map of New York*

One reason why this duality exists in research is due to the contrasting nature of each research field. GIS mapping is, first and foremost, concerned with the collection of quantitative data. Whereas digital media is more concerned with the thing that is created. There are very few examples where the methodology to create these visualisations is explained. Indeed, one recurring theme within digital media is that we should not know how the visualisation is produced. McGarrigle suggests that, to protect the nature or integrity of the work itself, the process of how it is created must remain opaque to its audience. He asks, ‘Why codify these practices? Is psychogeography not an ephemeral practice of tactical resistance, offering temporal interventions that appear and recede?’ (McGarrigle, 2018, p.252). Psychogeography is not something that should be encoded, recorded, or even understood.

T. Gillespie provides insight into why digital media artists are averse to documenting their process. He describes it as the ‘proceduralization of information selection’ (Gillespie, 2013, p.181). Once you define a process, a set of steps by which something can be easily replicated, you remove the personal dimension. It can be replicated by anyone; it is no longer unique to its creator. This is particularly pertinent when we are creating a psychogeography because individual experience is such an important part of this. A psychogeography is unique to one person.

#### 2.2.4 The Counter-Intuitive Nature of Data Psychogeography

However, this creates a problem within the literature. Contemporary artists and cartographers very rarely choose to explain how they have created their digital media because it goes against the principles of the psychogeography to explain the process. Psychogeography resists transparency and strives to conceal how it was made from its audience – it should only be understood by the individual who made it. Saying that, though, there one notable exception where an attempt to bridge this duality has been made. This is in the work of Meier & Glinka (2018).

If we look at Meier & Glinka’s mental map modelling, they are seeking to create ‘collages of experiences in our memory which include stimuli such as images, sounds, or odours’ (Meier & Glinka, 2018, p.5). This is achieved through an algorithmic approach, a process which is documented with great transparency. The algorithm predicts the level of memorisation that an individual will have for a certain location. This is used to create a visualisation which shows a map of the individual’s most memorable locations, layered with trajectories from personal activity data.

The most remarkable part of these visualisations is that Meier & Glinka deliberately remove the distance element from these visualisations. This distorts the map in such a way that one cannot understand the geography or cartography of the visualisation, unless it is one’s own map. The design is a visual representation of a mental map. It is no longer a map that can be used to navigate geography: ‘The artefact should rather trigger personal reflection than analytic exploration’ (Meier & Glinka, 2018). It is representing a personal and existential landscape. Though it is inscribed in geospatial data, it cannot be used as a map by anyone apart from the person who it belongs to.

### 2.2.5 The Politics of Psychogeography

Psychogeography is a practice-based research methodology, but to see it as that alone misses the reason for its conception. It was first conceived as a revolutionary protest for radical social change, a reaction against capitalist ideals (Debord, 1955). However, there are very few psychogeographies that use the vehicle of technology and fulfil this political criterion of Situationism.

Contemporary artists are inspired by the Situationists' aesthetic – particularly in geographic visualisation (Meier & Glinka, 2018; McGarrigle, 2018; Sylaiou, Chountasi & Lagoudi, 2014). However, very few are consistent with the fundamental principle of achieving social and cultural change (Lagoudi *et al.*, 2018). The problem is that there is an apolitical vision to most of the contemporary computational work in psychogeography.

There are very few modern psychogeographies that use the vehicle of technology *and* fulfil the political criterion of Situationism (Lagoudi *et al.*, 2018). Psychogeography is a revolutionary protest that takes the form of geographic visualisation. It inherently critiques cartography as a colonial tool of oppression (Harley, 1988). Thus, mapping models such as the one created by Meier & Glinka (2018) take the *aesthetic* of psychogeography – mapping the subjective and experiential aspects of a landscape – but lack the political ideology that underpins it.

Debord understood cartography to be incomplete in its representation of geographic space as space cannot be separated from its effects on our emotional and individual experience (Debord, 1955). This emotional and individual experience cannot be separated from the political. To practice psychogeography is to envision new liberated futures free from the ancient monoliths of misogyny, colonialism, censorship, and wealth disparity (Morrison *et al.*, 2017).

This dimension is something that has yet to be realised within psychogeography and computation. I find this gap in research a surprising one. Computation has already been used to build new systems, new landscapes, new perspectives on reality within the domain of interactive computer simulation and gaming (Ibezim, 2016). One notable example of this is *Teslaism*, a 3rd person racing musical game featuring Elon Musk and

his self-driving car/lover and life coach, as they drive towards a shareholder meeting in a post-gamified Berlin landscape (Noorizadeh, 2023). This provides insight into how gaming technology can be harnessed as a psychogeographic method to bend the environment to will, challenge boundaries, and provoke thought.

#### 2.2.6 Summary of Psychography

This section presented a review of some key research literature associated with the topic of psychography, looking at up-to-date research on psychography, as well as the impact of new technologies on psychography, and the politics of psychography. This review is essential as the research question being investigated in the project is to explore human beings' self-localized relationship with space in a virtual reality using a narrative based Role-player game (RPG), thus each of the components of above review will be essential in the design and development of this project.

### 2.3. The History of Computer Games

Video games are a powerful computational tool that encourages players to interact actively with the gaming environment that they are situated within. However, the development of gaming as a methodology to engage in psychogeographical research is a very limited area. This connection has yet to be made in the field of contemporary psychogeography or data psychogeography. The earliest computer games were developed in the 1960s, and have evolved in genre, style and even dimension over the past 60 years. Therefore, this section will explore the history of video games, from text-based games to open world games, to gain a richer understanding of how video games can be used as a tool for psychogeographical research.

#### 2.3.1 Early Computer Games (1960s-1980s)

It is hard to be sure what the first computer game was however most literature marks *Spacewar!* as the first graphical game. In 1961 a “hacker” at MIT, Steve Russell, created *Spacewar!*, a two player game where each player controls a spaceship and must try to destroy their opponent's spaceship. It is said to have defined a new computer-dependent genre, as a game that was not simply based on a pre-digital traditional game (Aarseth, 2001). Indeed, James Ivory believes *Spacewar!* influenced some of the most popular

action games of today, such as *Call of Duty*, *Grand Theft Auto* and *Assassin's Creed* because it was the first video game prototype simulating sport and combat (Ivory, 2015).

Ivory posits that there are two distinct ancestries that can be drawn in the history of video games – one for action and one for narrative games. Whilst *Spacewar!* (1961) is the first video game in the history of action simulations, MUDs or text-based games mark the beginning of the line of ancestry for fantasy narratives and online role-playing games. MMORPGs developed further into the 21<sup>st</sup> century with games based on popular films, programs & books, such as *Star Wars*, *The Matrix*, *Star Trek*, *Conan the Barbarian*, *Final Fantasy* and *The Sims*.

Wolf describes the audience's sense of awe at the early technology of *PONG* and *Star Raiders* (1979), even though these games were limited in graphics, motion and sound. For example, in games of the 1970s (e.g. *Adventure* (1978) and *Superman* (1979)) the graphics making up the playing field laid over the solid-colour background were drawn only on the left side of the screen and then duplicated on the right as a repetition or a mirror image (Wolf, 2003). The games of the 1970s and 1980s were also limited in motion. Horizontal and vertical movement had to be programmed in different ways, with the former being more difficult, resulting in a preference for action on the vertical axis (Wolf, 2003). These are a number of the limitations that faced developers of the earliest video games. It was not until the 1980s that games with real 3-D computation appeared, including the vector-arcade game *Battlezone* (1980) and the abstract world of *I, Robot* (1983).

### 2.3.2 Modern Computer Games (1990s-2020s)

The progression from the early graphics in the Golden Age of video games to modern games is almost beyond comprehension. The creation of huge landscapes to explore in games such as *Deus Ex*, *Half-Life*, *Age of Mythology*, *Rise of Nations*, or *Neverwinter Nights* involve a visual and auditory world in which the player manipulates a virtual character.

*Such games often come with editors or other sorts of software with which the player can make changes to the game world or even build a new game world. The player can make a new landscape, a new set of buildings, or new characters. The player can set up the world so that certain sorts of*

*actions are allowed or disallowed. The player is building a new world but is doing so by using, but modifying, the original visual images (really the code for them) that came with the game (Gee, 2008).*

The development in graphics allowed for this progression in video games. In the earliest video games, the player-surrogate was function-based (Wolf, 2003). The player was represented onscreen by a graphic of a tool or vehicle that the player controlled, such as, spaceships, tanks or planes. But as graphics improved, there was a move away from function-based characters to anthropomorphic characters. And when the player inhabits this virtual character, they can draw upon the identity, mind and body of their avatar. Thus, with this development of the player-character came this modern genre of video game where the player could build a new world within the game.

Some of the earliest player-surrogates are completely non-representational, such as the square in *Adventure* (1978) or the “spark” surrogate in *Qix* (1981) (Wolf, 2003). When the player-character is a visually abstract character, it is normally limited to one function. For instance, a battleship can ‘shoot’ other ships, and Pac-Man’s (1980) wedge-shaped gap can eat tiny dots. But as player-surrogates became more anthropomorphic and less function-based, they were able to do more. The master-thief, Garrett, from *Thief: Deadly Shadows* (2004), can build new paths, buildings and even characters.



*Figure 3: Qix (1981)*

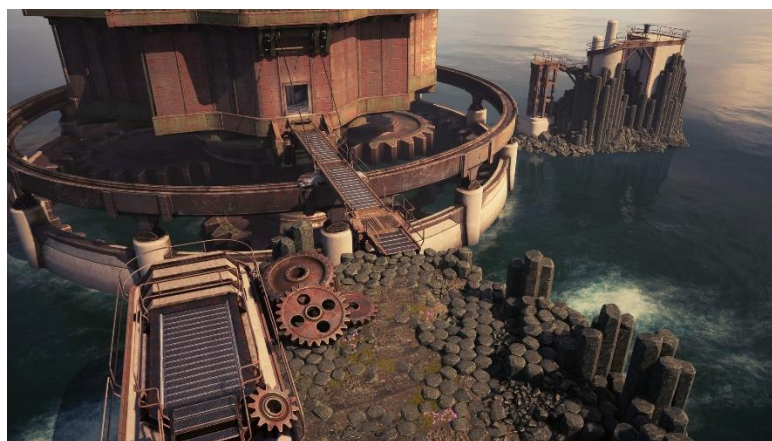
The development from abstract to anthropomorphic players also brought another shift in the game world that these players are situated within. Anthropomorphic players means that multi-player landscapes are seeing an increase in popularity, and this is significant for the challenge that the game presents. ‘Since the opponent is human, the challenge is



no longer located in the landscape which must be “neutral” and equal for all players’ (Aarseth, 2001, p.168). The challenge has shifted away from the landscape because players are not competing against the landscape, they are competing against each other. Whilst *Thief* (2004) and *Myst* (1993) are single-player games about conquering landscapes, *Myth* (1997) is a tactical game about battling opponents.

### 2.3.3 Abstraction, Imagination and Representation

Indeed, Aarseth makes the point that in games where the player is competing with the landscape (shapeshifting and switching between locations) and in games where the player is competing against other players, both landscapes are “unrealistic”. However, there are different kinds of un-realism at play in these games. This is a notable point as it gestures to a greater shift that has occurred within gaming. When we compare the graphics of games from the Golden Age with the huge landscapes to explore in modern games, an evolution has occurred that seems to go beyond improvements in processing power, memory and RAM. The earliest video games have been described as a form of abstract art (Wolf, 2003). But as software and hardware improved, graphics became more representational (‘photorealistic’) and lead to a decline in abstraction in the mid to late ‘80s.



*Figure 4: Myst III (2001)*

These two styles are painted as antithetical poles: ‘All games fall along a continuum between the abstract and the representational. Pac-Man is a purely abstract game; its not a simulation of anything real. Its location is imaginary, and its rules are arbitrary’ (Adams, 2014). Representation stands in opposition to abstraction: where representation seeks to *reproduce*, abstraction seeks to simplify something to its basic forms. The crux

of this dichotomy, however, is that the naturalistic ideal found in photorealistic representation removes *imagination*. The player is no longer required to complete or imagine game details in their mind as they were in the ‘abstract’ games of the 1970s and 1980s (Wolf, 2003).

It is evident that changes to graphics and the player-character have enabled a movement away from ‘abstraction’. However, this is not to say that imagination is entirely lacking from the modern games of the 21<sup>st</sup> century. We can see that imagination emerged in a different form – in the actual goal and narrative of gameplay. Aarseth’s comparison of *Myth* and *Myst* illustrates this. Even though *Myth* is in fact a very accurate representation of the landscape, using techniques like 3D texture mapping, the landscape it is representing is allegorical.

*Myth offers several different game world arenas (landscapes), and several different types of play. So Myth is not a single game, but a type of discursive field, a machine to play several related games on. The players can even create their own landscapes (Aarseth, 2001, p.165).*

Through this shapeshifting, *Myth* is making a comment on the representation of real space. The ‘original physical objects’ that it is seeking to represent are real. But this landscape is allegorical and figurative - the players can create it, change it, or, indeed, leave it and enter an entirely different game world. So, what Wolf (2003) saw as a complete departure from abstraction has been interpreted more subtly by Aarseth (2001) as an allegorical reading of the landscape. *Myth* is making a figurative comment on the ultimate impossibility of representing real space (Aarseth, 2001, p.169).

Overall, the different ideas that are represented and contained in video games has changed significantly between each epoch of gaming. Whilst the earliest games were abstract because of the actual graphics of the game – e.g., MUDs and text-based games, with function-based characters and symmetrical scenes – contemporary highly realistic games are abstract because of the allegorical landscapes they represent. In games like *Deus Ex*, *Half-Life*, *Age of Mythology*, *Rise of Nations*, or *Neverwinter Nights* the player can build a new landscape by modifying the original images. The player is still imagining other representations, like the earliest abstract games, but this is happening in a very different landscape.

#### 2.3.4 Summary of Computer Games

Developing an RPG as a psychogeography requires an understanding of the evolution of video games, particularly in how games have evolved to create open-world landscapes that enable the creation of new worlds within the game today. *Melancholy Reverie* is an allegorical landscape that takes place in the player's mind. Thus, this chapter has explored the evolution of video games, with particular reference to abstraction, representation, and open-world games. These ideas will be utilised in the development of *Melancholy Reverie*.

### 2.4 Understanding Virtual Environments

One element that sets video games apart from other forms of media, such as novels and films, is “interactivity”. Video games are *played*, they are interactive and require considerable participation from their players. Thus, although games vary in genre, challenge, graphics, player-character, etc., all successful games have one thing in common: they have an ability to draw people in. There are several concepts which are used to describe the experiences connected with being drawn into a game and distracted from the outside world. Such terms include presence, immersion, and flow, which have been given various definitions in the literature (Soutter & Hitchens, 2016). I will first define each of the three concepts (including any disagreement within the literature) before moving onto the complexities of how they relate to each other.

#### 2.4.1 Virtual Presence

A high-level definition of presence is broadly accepted: ‘Presence is a psychological state in which users’ subjective experience in mediated environments is shaped by technological features of the environment in ways that are not readily apparent to the user’ (Tamborini & Bowman, 2010). Presence is a psychological state, a subjective experience, and an altered environment.

Some authors further elaborate on their definition of presence, describing presence as a ‘multidimensional construct in nature’ (Jin, 2011) and a ‘multidimensional concept’ (Bulu, 2012). Here, the word ‘multidimensional’ denotes the number of different levels that presence can be broken down into, physical, spatial, and individual. Physical presence is interacting, touching or controlling virtual objects as if they have actual, physical properties (Lee, 2004). Spatial presence is the sense of being physically located

in a virtual environment (Jin, 2011). Self-presence is a ‘psychological state in which virtual self/selves are experienced as the actual self in either sensory or non-sensory ways’ (Lee, 2004, p.46). What is unique about self-presence is that it is far more emotional and affective. The user believes that they are the virtual self.

This typological approach makes subtle but important distinctions between physical, spatial and self-presence. Jin (2011) explores the distinction in three separate studies, taking an in-depth look at physical, spatial and self-presence, respectively, in different virtual settings, a medical simulation game, a driving game, and an avatar-based RPG. However, not all authors distinguish between these different types of presence with such consideration. For instance, Jennett, Cox *et al.* (2008) define presence as ‘an altered state of mind,’ a psychological sense of being in another environment. They propound the high-level definition of presence stated earlier, but do not provide any indication that they distinguish between the three types of presence.

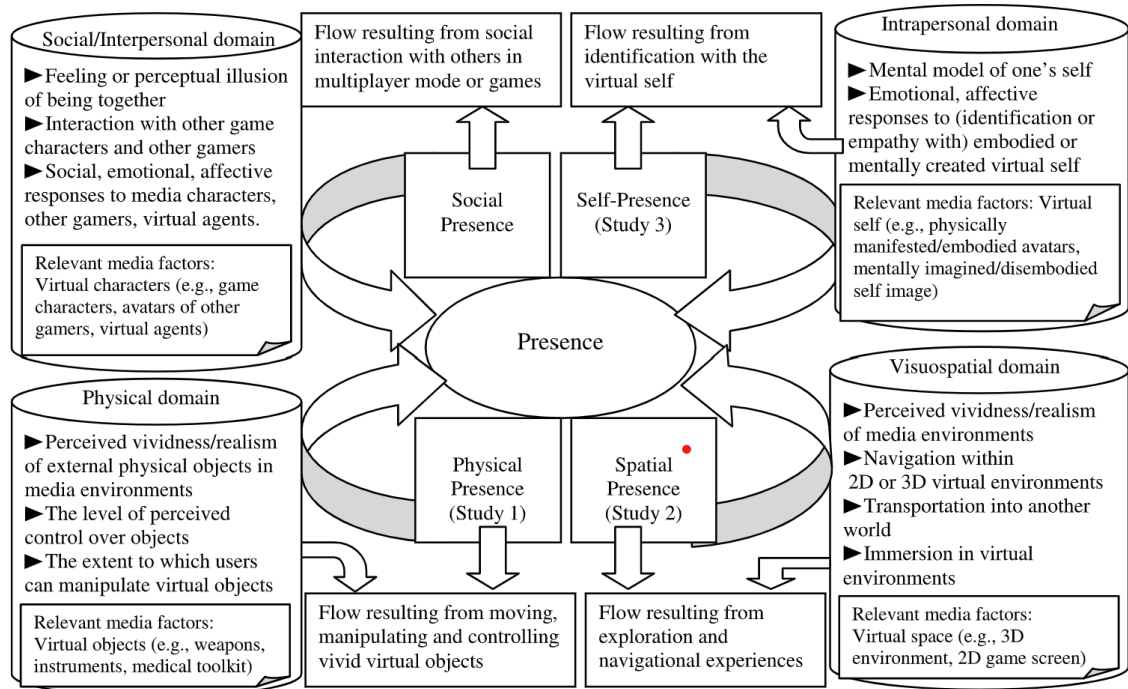


Figure 5: A model of presence in interactive electronic media (Jin, 2011)

In a similar vein, Cairns & Sanders (2010) only acknowledge one type of presence: namely, physical presence. In their very literal reading, presence is strictly limited to virtual reality environments and is the sense a person has of actually being located in the virtual space. There are moments when Cairns & Sanders (2010) appear to take this one

typology of presence and conflate it with the whole concept, i.e., substituting the term 'presence' for 'physical presence'. Those who do not distinguish between the different types of presence can fall into conceptual confusion, particularly when defining the relationship between immersion and presence (Jin, 2011).

#### 2.4.2 Virtual Immersion

There are conflicting definitions of immersion. Some describe immersion as completely losing sense of the world outside (Jennett, Cox *et al.*, 2008) – which is very similar to descriptions of flow – whilst others describe immersion as retaining an awareness of the outside world but being engaged in the task at hand (Soutter & Hitchens, 2016).

Jennett, Cox *et al.* (2008) seek to measure the experience of immersion by looking at the switch from the game world into the physical world. The video game *Half-Life* (1998) was played in the immersive environment, and a random online clicking test was played in the controlled environment. After these games, the players would then perform a real-life task that requires physical interaction. Players were given cut-out tangram pieces and timed on how quickly they could generate a shape from these (e.g., a fox). The results suggest that being increasingly immersed in a game decreased one's ability to re-engage with the "real world". Thus, supporting their hypothesis that immersion in the "world of the game" causes a degree of removal from, and delay in returning to, the "real world".

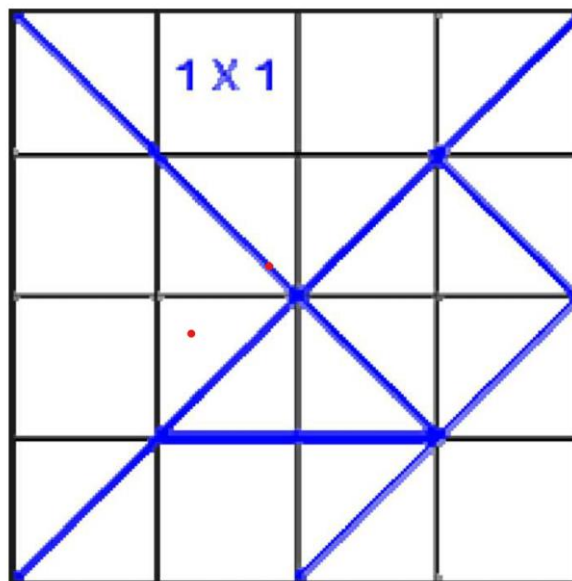


Figure 6: Tangram pieces arranged as a square (Jennett, Cox, *et al.*, 2008)

However, this idea of immersion is not accepted by all research. For example, Brockmyer *et al.* (2009) described immersion as “the experience of being engaged while retaining some awareness of one’s surroundings.” They still maintain some sort of connection to the real-world. One way that Jennett, Cox, *et al.* (2008) reconciled this contradiction was by placing immersion on a continuum. This helps explain why there are conflicting definitions of immersion – it is not that there are different understandings of immersion, but that these descriptions are situated at different places on the continuum.

A qualitative study conducted by Brown & Cairns (2004) analysed players’ feelings towards their favourite game and led them to propose three gradual and successive levels of player immersion: engagement, engrossment, and total immersion. The first level is engagement: overcoming the barriers of the game (controls, instructions). Then comes engrossment: overcoming the barrier of game construction and becoming less self-aware of ‘playing’ a game. Finally, total immersion is the state of being completely cut off from reality. This final stage is similar to some descriptions of flow. Placing immersion on a continuum is also important when articulating the relationship between the different states of presence, immersion, and flow in *Section 2.4.4*.

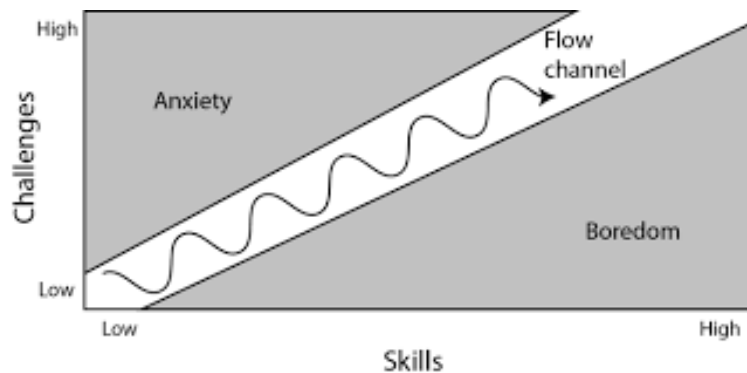
### 2.4.3 Flow in Games

Flow is the most extreme of all experiences. It is understood to be the state that is entered when one loses complete sense of their surroundings and concern for anything else apart from the game. One illustrative example of the difference between flow and immersion is that when a player is immersed in a game, they are still aware of things outside the game, such as catching the bus or going to a lecture, but it is only when the player excludes the outside world completely that they can be in flow (Jennett, Cox, *et al.*, 2008). For those who place immersion on a continuum, flow is understood to be very similar to the final stage of total immersion.

Flow is a particular sort of experience. When a player is immersed in a game, they are playing the game, but when a player is in the mental state of flow, they are said to be “in the game”. This distinction is clearly made by Cairns & Sanders (2010): ‘Flow is an all or nothing experience. By contrast, immersion in games is a much more prosaic experience and graded with low and high levels of immersion possible.’ The player

cannot experience low flow and high flow – they can only experience flow. There is less ambiguity surrounding the state of flow because of the intensity of the experience.

One area of literature where there appears to be some conflict is the affective characterisation of flow. In some instances, flow is depicted as an activity of energized focus, intense attention, full involvement and perceived skill or success in the process of encountering challenges (Csikszentmihalyi, 1997). Indeed, this characterisation leads Jin (2011) to hypothesise that the level of challenge in a game corresponds to the level of flow, i.e., the player will be more likely to enter flow state if they are challenged by the game.



*Figure 7: The relation of flow, skills, and challenge*

However, other authors, such as Jennett, Cox, *et al.* (2008), describe flow as a serene state, calmer than the emotionally charged experience of immersion. This contradiction in the literature could stem from the fact that flow is an intensely subjective experience. During flow, individuals often lose awareness of time and their surroundings. Whether players find this internal experience energizing or calming varies from person to person. In Section 2.5, I will explore various spatial evaluation approaches to objectively estimate whether users are experiencing flow, using quantitative metrics.

#### 2.4.4 Presence, Immersion and Flow

This section looks at the above three topics (Presence, Immersion and Flow) with respect to each other. These concepts have so far been explored with respect to their individual properties, which is important to understand first before we examine the points at which they connect. Presence is understood to be a psychological state comprising of spatial, physical and self-presence. Immersion is gauged by the player's level of awareness of

their surroundings, manifesting in varying levels including engagement, engrossment, and total immersion. Flow is understood to be the most intense experience, and to share similarities with the final level of immersion. The nuances of flow, presence and immersion can thus provide insight into the complexities of how they relate to each other as this is dependent on the order and level of each concept.

#### 2.4.4.1 Flow and Presence

The simplest relationship to define is that of presence and flow. The experience of flow proceeds from presence. As such, the language of ‘mediation’ is used to speak about presence in relation to flow (Jin, 2011). Presence is the mediator. The player must move *through* some type of presence to achieve flow, the most extreme of all experiences.

Research into flow is interested in its unique position as the final and most extreme experience as the product of presence. Jin (2011) examines how presence mediates the link between flow and various antecedents of flow. Each of the three types of presence are connected to flow and respectively examined in different game scenarios.

#### 2.4.4.2 Flow and Immersion

Presence and immersion are concepts that have been extensively investigated and their relationship to flow has been noted. The final level of immersion is said to be ‘used interchangeably with the concept of presence’ (Nacke & Lindley, 2008). However, this point of view entirely conflicts with other research and does not make as much sense given that presence is not the most extreme out of flow, immersion and presence.

It is more commonly found that the concept of immersion is used interchangeably with the flow state. In the research that finds immersion to exist on a continuum (Brown & Cairns, 2004; Jennet *et al.*, 2008), the final level (total immersion) is very similar to some descriptions of flow. Indeed, Soutter & Hitchens (2016) suggest that flow is the final stage of immersion: ‘It could be that flow represents one end of a continuum, which captures the most intense experiences’ (Soutter & Hitchens, 2016 p.1031). Research most consistently supports flow as the final stage of immersion (Brown & Cairns, 2004; Jennet *et al.*, 2008; Soutter & Hitchens, 2016), not presence (Nacke & Lindley, 2008).

#### 2.4.4.3 Presence and Immersion

Some authors suggest that presence and immersion are distinct from each other (Jennett, Cox *et al.*, 2008; Cairns & Sanders, 2010). Indeed, both pieces of research make the



point that there are some games where the player may be present but not immersed, e.g., carrying out a boring task in a virtual simulation, and other games where the player is immersed but not present, e.g., in Tetris, the player is engaged, though they do not enter a world of falling bricks. It is possible to be in one state but not the other. The conclusion to be drawn from this is a significant one. This relation of presence and immersion is a ‘double dissociation,’ meaning the dissociation is operating in both directions. Presence is experienced independent of immersion, and immersion independent of flow.

#### 2.4.4.4 Is Immersion a Continuum or is Immersion on a Continuum?

There are several points that have been elucidated so far:

- i) Flow is the most extreme level of immersion.
- ii) Flow proceeds from presence.
- iii) Presence is independent of immersion (and vice versa).

The question this raises is as follows: if presence is separate from immersion, is it still possible to maintain that flow is the most extreme level of immersion? As it stands, this is not possible. One cannot identify flow with immersion *and* maintain that immersion is separate from presence. The reason for this is that it has already been established that flow proceeds from presence.

The ‘double dissociation’ means that it is not possible to experience presence and immersion at the same time. However, it does not exclude the possibility of experiencing them sequentially, i.e., on a continuum. I would venture that presence is experienced independently of immersion because it is antecedent to immersion. This is consistent with the research into the relationship between flow and presence (Jin, 2011) and the successive levels of immersion (Brown & Cairns, 2004). In other words, flow and immersion are overlapping concepts. They describe different parts of the same feeling.

#### 2.4.5 Summary of Virtual Environments

Video games provide the ideal conditions to carry out a psychogeography of a virtual landscape because players become active participants in the narratives. This section provided a review of some key metrics associated with virtual environments, including: Presence, Immersion and Flow. It also reviewed the associations between these three metrics. For example, if the player loses sense of their surroundings or forgets about worries in the ‘real world’, this can be an indication that they have achieved some level

of Presence, Immersion or Flow. In order to discriminate which one of these three stages the player is experiencing, we can use a variety of different spatial evaluation approaches.

## 2.5 Spatial Evaluation Approaches

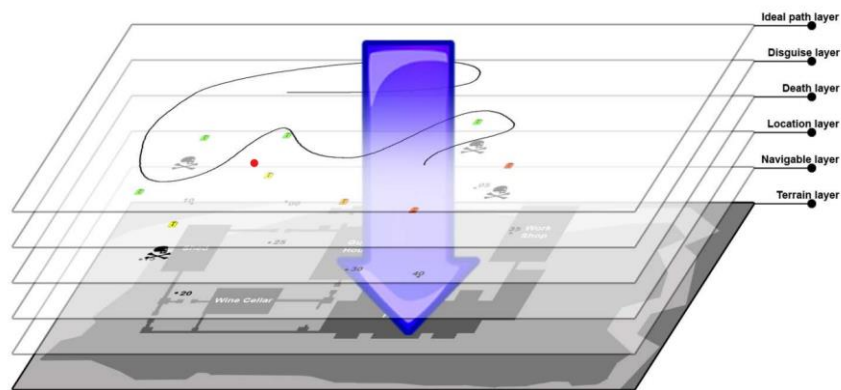
There are several different dimensions of *Melancholy Reverie* to be evaluated: the usability of the game, the player's ability to attain presence, flow or immersion in the game, and the success of the game as a psychogeography. The multifaced nature of *Melancholy Reverie* means that several different quantitative and qualitative metrics, from both user-based and expert-based techniques, will be required for the evaluation (Section 5). Therefore, this chapter will review the literature on spatial evaluation approaches. It will provide information on the different tools and techniques that can be used to measure the effectiveness and usability of *Melancholy Reverie*.

### 2.5.1 User-Oriented Spatial Metrics

The essence of a psychogeography is exploring the landscape. To evaluate the success of this game as a psychogeography, I will have to evaluate how the player observed, explored and interacted with the game level sceneries. User-oriented spatial metrics are designed to achieve this. Gameplay metrics can take different forms, from logging of keystrokes to recording specific types of player behaviour, e.g., firing a weapon, completing a level, etc. Spatial gameplay metrics can provide detailed information about location of these behaviours. They are a specific type of data that come with some sort of spatial reference information attached, e.g., (X, Y, Z) coordinates. Spatial gameplay data is commonly visualised in heat maps. These visualisations can show the locations where a player most often activates a specific player-character power, e.g., fires a weapon or interacts with an object. However, it is not often that an actual analysis of this data is performed for user research and game development.

Drachen & Canossa (2009) use Geographic Information Systems (GIS) to analyse the data that has been gathered from the user-oriented testing. This research combines GIS with gameplay metrics. One of the things that is unique to this research is that it is also concerned with *analysing* the data. This is achieved through GIS because GIS data can have a spatial and thematic component. The map links map features with attribute

information. ArcGIS allows the placement of several layers – you can perform calculations across the variables and their attributes.



*Figure 8: A GIS represent different data sets as layers on top of a game level map  
(Drachen & Canossa, 2009)*

Drachen & Canossa's research (2009) uses *Tomb Raider* to gather gameplay metrics, and then uses ArcGIS to analyse this data. The patterns of death in the *Valaskjalf* map are analysed – first a heatmap is produced based on the locations (X, Y, Z) using ArcGIS. Spatial analysis is performed on the different types of death performed in different areas. This analysis of the multiple variables leads to the conclusion that maybe there are too many challenges overlaid. Designers can change the design of “trouble spots” to improve the player's experience.

There are two types of player behaviour analysis that are of interest to game developers. The first is how the player moves around the game, which is what Drachen & Canossa (2009) are analysing. The second is how the player *visually* explores the game. Heat maps can be used to represent both types of behaviour. Data that relates to the player's movement trail (i.e., the player's position on the map) is mapped onto a Visual Field View heat map (VFFV) whilst the data that is generated from eye tracking is mapped a Point of Regard heat map (PoR). It is generated from the eye tracker during game play.

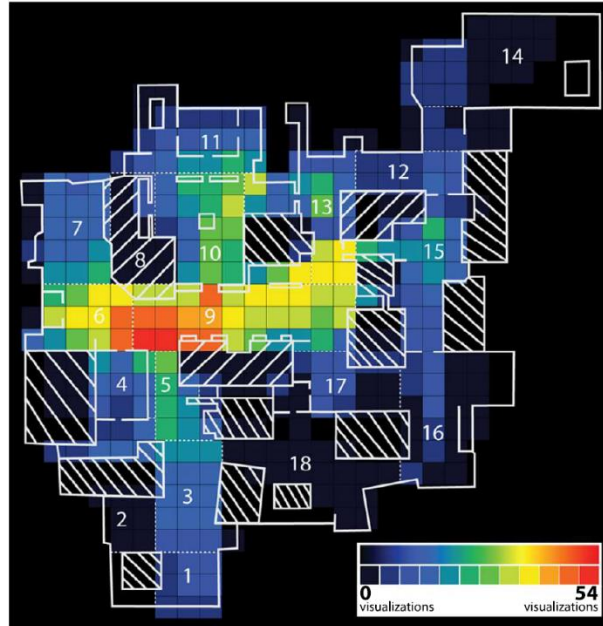


Figure 9: Visual Field View heat map (Almeida *et al.*, 2016)

The second type of heatmap is also explored by Almeida *et al.* (2016) in a later paper. This study compared 2 tasks from the same game, *Call of Duty 4: Modern Warfare*. First, the participants played the multiplayer game mode ‘Free for All,’ which enabled total freedom in exploring the map. Second, in the ‘Domination’ mode, the players’ were assigned a goal to defeat the enemy players and secure the flags that have been placed in pre-determined locations on the map. This contrast between “exploring” and “dominating” the landscape demonstrates the usefulness of heatmaps as a tool to visualise gameplay metrics.

The problem is that, as an evaluation instrument for user-oriented spatial metrics, heatmaps require a large infrastructure to track and capture the data. It is only possible to map the player’s location by knowing the X, Y, Z coordinates of all the rooms and having a memory structure with that information. Manually creating such a memory structure involves considerable time and effort.

Almeida *et al.* (2013) propose a far simpler solution to track the location of a video game character using Unity3D box colliders. They design a game which can track the movement of players by recording their collisions with these landmarks. A data log is created of the places the character has been to. Almeida *et al.* (2013) developed a Serious Game, a 3D model of a building in Unity. The player was tasked with having to navigate through the pathways of the building. One of the goals relies on testing the ability of the

player to find the fastest exit. By creating an invisible object, e.g., a box, in the places where the location of the character is needed, the game can track the movement by recording the collisions. This is done through assigning an action to this object. For example, each time a collision with a box is detected, a Boolean state associated with that box is changed from “false” to “true”. Each time this event is triggered, the position can be recorded. As an evaluation metric, this is one that I could feasibly integrate into my game design.

### 2.5.2 Using Questionnaires in Psychography

Thus far, quantitative metrics have been explored as an evaluation instrument. These provide an ‘objective’ measurement by which we can understand how the player’s observed, explored and interacted with the game. It is also necessary to review the qualitative metrics that have been utilised in the literature. Qualitative metrics achieve a deeper understanding of the player’s ‘subjective’ experience within the game – which is, arguably, more aligned with the theoretical principles of psychogeography. Jennett, Cox *et al.* (2008) designed a questionnaire as part of their evaluation to provide a subjective measurement for immersion.

This questionnaire is the one of the main measures of immersion within their experiment. It has been designed with the intention of combining the findings of studies into flow, presence and cognitive absorption. It consists of 32 questions – 16 pairs of related questions using negative and positive wording – marked on a five-point Likert scale, where 1 is strongly disagree and 5 is strongly agree. There is one additional question that asks how immersed the participant felt overall on a scale of 1 to 10, where 1 was not at all and 10 was very much so.<sup>1</sup>

Sanders & Cairns (2010) used the questionnaire designed in the research of Jennett *et al.* (2008) to test the manipulation of immersion and time perception in video games. The experiment is trying to alter the player's level of immersion to see how this changes the player’s perception of time. Music was chosen as the variable to manipulate immersion. (It was necessary to find a variable which does not change other factors known to

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<sup>1</sup> There are 2 questionnaires provided in the appendices of Jennett, Cox *et al.*’s study (2008). Appendix A is the questionnaire used in experiment 1 and 2. Appendix B is the simplified questionnaire used in experiment 3 (the mixture of negative and positive wording removed). I will be adapting the questionnaire from Appendix B.

influence time perception.) This experiment adds one further question to see if players could estimate the correct time interval of the game (6 options; 30 second intervals). The maze game lasted 2 mins 32 secs long. But the hypothesis was that if players were immersed, it is more likely that they would underestimate the length of time they were 'in the maze'.

This is a useful amendment to the questionnaire developed by Jennet *et al.* (2008). Time perception is another variable that could be useful for my measurement of immersion. Sanders & Cairns (2010) measured time perception under two paradigms: prospective time, the 'experienced duration,' where the player knows that they will be asked for the duration, and retrospective time, the 'remembered duration,' where the player is unaware that they will be asked for a time estimation. Both types of time perception were tested in the experiment. The results of this study found that music was not in fact very effective in changing the player's immersion. 'Music causes time to be underestimated in the prospective paradigm but not the retrospective paradigm. That is, music reduces the experienced duration of playing a game but not the remembered duration.' Nonetheless, I will integrate this additional question into my questionnaire.

### 2.5.3 Summary of Spatial Evaluation Approaches

This section provided a review of key evaluation approaches, including spatial measures, gameplay metrics (such as logging keystrokes, eye movement, and character exploration), and immersion questionnaires. Various evaluation metrics in the literature are used to measure participants' gameplay and quantify the experienced levels of flow, presence, and immersion. Spatial user-metrics are used to quantitatively measure user-experience. Surveys and questionnaires, where the player ranks a series of statements based on their subjective experience, qualitatively measure user-experience. I will employ both quantitative and qualitative metrics, derived from user-based and expert-based techniques, to evaluate the success of my RPG as a psychogeography. This approach will provide a subjective and objective view of *Melancholy Reverie*'s success as a psychogeography and its performance as an RPG.

## **2.6 Conclusions**

This chapter provided an overview of some of the key literature that helps to inform the design of this experiment, whose goal is to explore the relationship between emotional engagement and the level of immersion in virtual experiences. The chapter began with a review of psychogeography, which was an essential starting point in this experiment, and this review included literature discussing the potential impact of technology on the subconscious. Following this, a review of the history of computer games is presented, with special focus on three key concepts: Abstraction, Imagination and Representation. The next section looked at understanding virtual environments and presented another key trio of concepts: Presence, Immersion and Flow. Finally a number of spatial evaluation approaches were outlined.

### **3. MELANCHOLY REVERIE DEVELOPMENT**

#### **3.1. Introduction**

This chapter presents an overview of the design and development of the key assets that were developed for this project. Unlike many dissertations, this chapter combines the design and development processes, as they were extremely iterative and experimental in nature, and therefore, are presented in a single chapter. The chapter begins with an outline of the process of creating the terrain of the experiment, and from there documents each stage of development. The nature assets that were used to populate the terrain are detailed. The post-processing effects that were modified to enhance the dream-like state of the landscape are provided. Following this, the process of making changes to the player are explored: the character creation, the player movement and Nav-Mesh Agent, as well as the functionality for the player to pick up items for the inventory. Information on how the dialogue was written and the opening and closing scenes were made are also provided. Therefore, this chapter provides a detailed documentation of how *Melancholy Reverie* was made from beginning to end.

#### **3.2. Creating the Terrain**

Initially, the terrain material was set to a dark grass moss as a base setting. Following that, the terrain was raised and lowered, aiming to create lots of variation in the environment. Thus, when the user walks along the terrain they will be able to see hills in the distance and have different viewpoints across the whole area. This should give a sense of the size of the landscape.

It should be noted that this terrain is extremely large. It is 1000 units in width x 1000 units in length x 600 units in height. As a result of this, some activities took a long time to replicate across the whole terrain, e.g. drawing the paths, painting different materials on the terrain, and placing the trees.

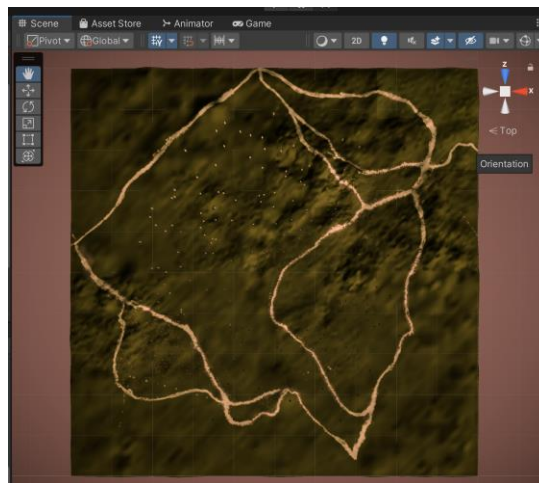
The terrain tools that were used have not yet been released for Unity 2022, the version being used in this research, therefore, a terrain sample asset pack is being used that is not yet available on unity 2019+, as the tool is still under development. This is achieved by going to the advanced settings on the Package Manager (under “Project Settings” or clicking on the Cog on the Package Manager window, and from there, going to “Advanced Project Settings”), and enable "Preview Packages".



When painting the paths onto the terrain, inspiration was drawn from Richmond Park, which helped visualise the placement of trees and the different variety of flowers that were placed in the terrain.



*Figure 10: Map of Richmond Park*

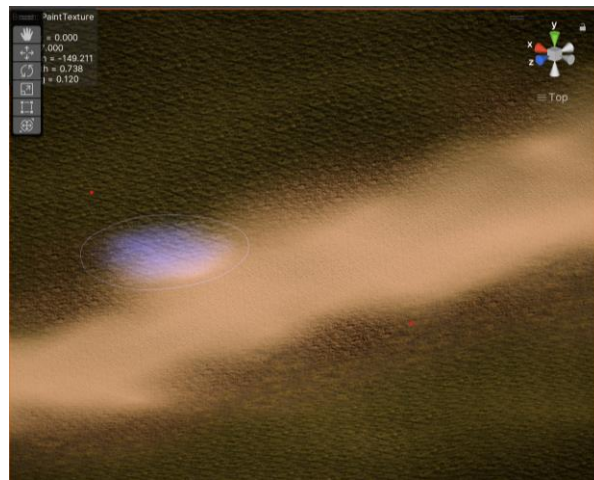


*Figure 11: Map of Melancholy Reverie*

The paths were first painted with a light sandy material. Then, the outside of the path was painted with a muddy material. The natural transition between the path and ground adds to the realism of the landscape.



*Figure 12: Photograph of the path in Richmond Park*



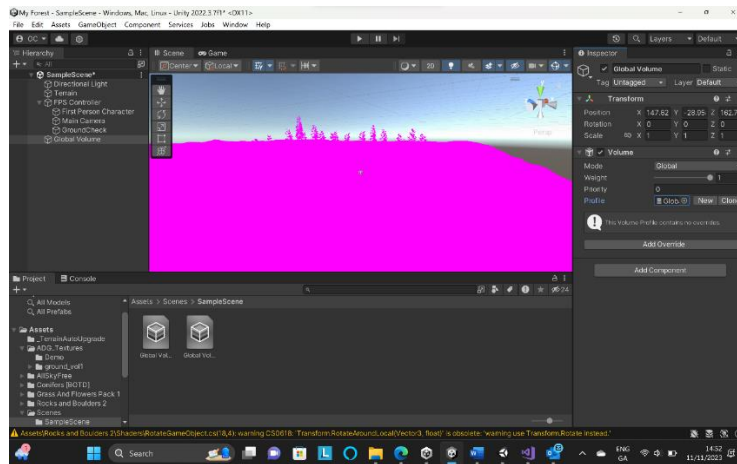
*Figure 13: Painting paths in Unity*

As this was a locale that the researcher had visited hundreds of times, it was somewhat easier to build the landscape. A key motif of the game is realism, and although it is not intended to be a replica of Richmond Park in the simulation, a goal of the project was to create a landscape that seemed familiar.

### **3.3 Creating the Nature Assets**

#### **3.3.1. Trees**

After adding trees to the landscape, all that was visible was this blanket of pink. The reason why this problem happens is that the shaders for the trees are using the built-in render pipeline, but the Universal Render Pipeline is being used for the overall project. Although this problem sounds quite simple, it took a long time to fix it.

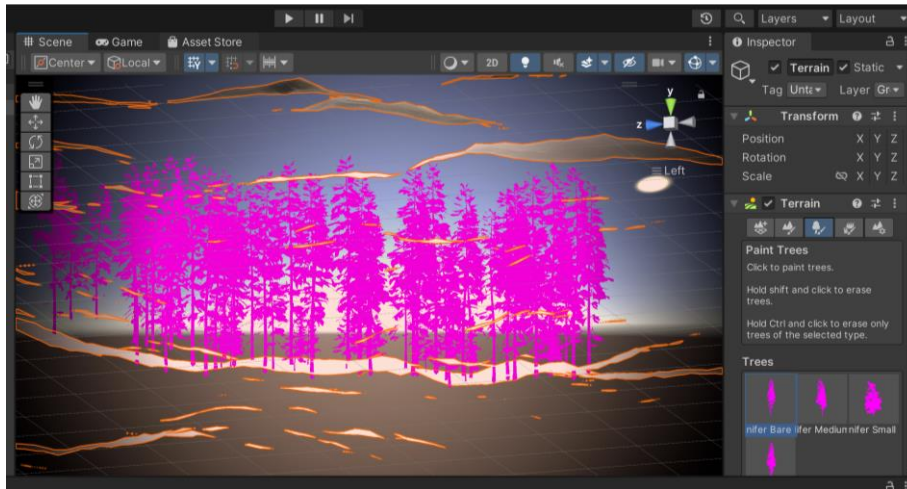


*Figure 14: The problem of the pink trees*

The result was a very beautiful blanket of pink though. One idea that was considered for the game was that the player could have the option to turn on another mode where the game scene was switched to this ‘broken shader’ scene.

The first solution tried was changing each of the shaders for the developed materials. This was very tedious, as there were over 100 materials to change. It involved converting each shader from standard to URP/Lit, then changing the albedo value to the right colour.

The next solution tried was changing to the built-in render pipeline. In theory downgrading the pipeline by removing URP / HDRP should automatically change all assets to standard shaders. Changing to built-in render pipeline removed the pink from the ground but did not fix the trees, which would suggest that the two items are compatible with different pipelines.




*Figure 15: The ground is no longer pink, but the trees are still pink*

After spending a very long time trying to fix the pink trees, ultimately the game development began from the start again, as only a basic modelling of the terrain and the trees were done at that point. But there were lots of different shaders, materials and pipelines in the game, so this was the easiest way to return it to a default state where there was certainty what was being used.

After a lot of research, the problem was identified as being to do with the Conifers BOTD asset. Apparently, there is a known bug in this asset that hasn't been fixed. Alternatives were sought, but this was the only free 3-D tree.

factober



Joined:

Sep 15, 2023

Posts:

5

Joamoco said: ↑

Like I mentioned before I would love a bit of a walkthrough as I am quite new and don't know what is required. I checked in the docs and I could not see any reference to prerequisites or URP packages

This is how I solved this in my **Ubuntu 2022 - Unity 2022.3.7f1 for URP 14+.**

You can try appropriate runtime from here for your URP version.

- 1) First of all install the Conifers [BOTD] package.
- 2) Then, this is a path where .unitypackages are located for various URP versions:  
/dev/games/unity/projects/Circuit Racer (3D, URP)/Assets/Conifers [BOTD]  
This is a installed package location.
- 3) From here I dragged and dropped: "CTI\_URP\_14plus\_runtime.unitypackage" package into the Assets inside Unity editor.
- 4) It compiled and problem solved.

factober

Nov 3, 2023

Report

#85

Like

Reply

*Figure 16: Solution to Pink Trees*

36

The solution was found here, in this Unity forum.<sup>2</sup> When importing the Conifers BOTD asset, it is necessary to import 3 additional packages in the package manager for URP 14 plus. There are different bark shaders for URP. The problem occurs when using a higher version of URP.

CTI\_URP\_14plus\_runtime for URP 14+ will switch the shaders from HLSL to Shader Graph. It is necessary to also install the "Conifers [BOTD] URP\_14plus.unitypackage" which will add new materials and update the URP prefabs.

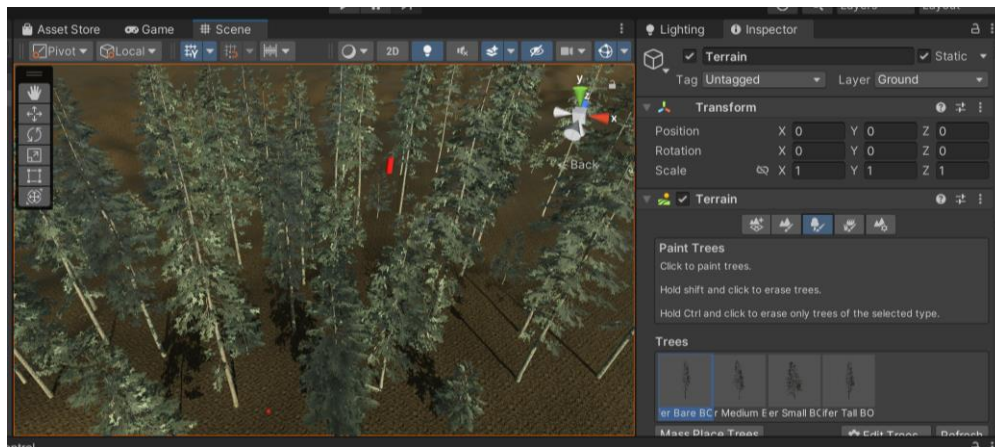


Figure 17: Green trees

### 3.3.2. Grass

There are many tutorials on simulating realistic grass, and the earlier tutorials (up to 2021) show how difficult it is to render grass. In order to render grass, we need a grass model to use. Unity, however, does not have one. This means that a number of tutorials which seek to create realistic grass use very complex methods.

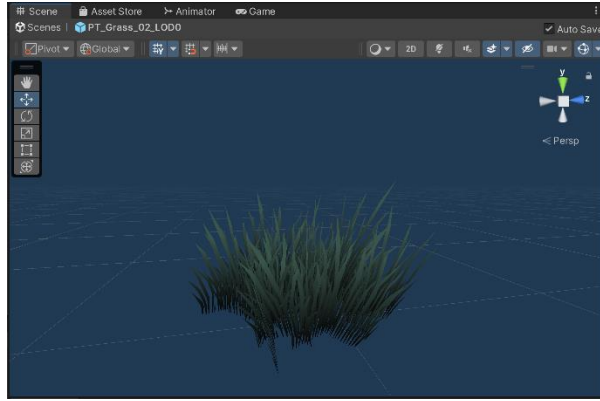
For adding texture to the grass, one method uses a Sin wave (modified with noise) texture that scrolls across the grass field and displaces the grass.<sup>3</sup> This tutorial instantiates millions of blades of grass for a very small area. Therefore, to animate the grass using the sin wave, it requires GPU algorithms to render grass for the size required.

<sup>2</sup> Unity Forum. Retrieved from: [Conifers \[BOTD\] | Page 2 - Unity Forum](#)

<sup>3</sup> Acerola. (2022). *Modern Foliage Rendering*. [Video file]. Retrieved from [\[https://www.youtube.com/watch?v=jw00MbIJcrk&t=477s\]](https://www.youtube.com/watch?v=jw00MbIJcrk&t=477s).



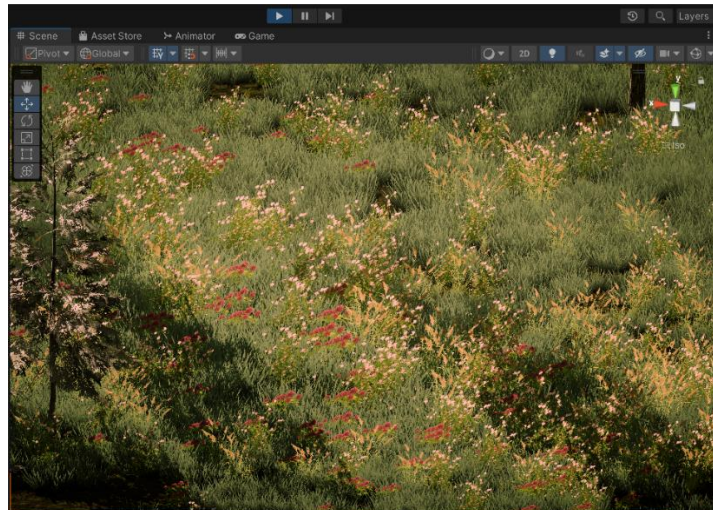
The easiest way to render lots of grass is achieved with GPU instancing.<sup>4</sup> A free stylized grass prefab was used from the online Asset Store (Polytope Studios). Unity's GPU instancing system does not support Level of Detail (LOD) proofs, so we have to take one LOD and turn that into its own prefab. After this small bit of setup and modification to the grass prefab, we can then create a grass detail mesh from this LOD.



*Figure 18: Grass Detail Mesh*

### 3.3.3. Flowers

Flowers were a very simple addition to the terrain. The terrain tools were used to paint 5 different types of flowers onto the terrain, and a variety of flowers were used across the terrain, in different colours and heights, as this makes the landscape appear more realistic.



*Figure 19: Melancholy Reverie flowers*

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<sup>4</sup> Shrooms (2023). *The Best, Fastest, and Easiest Way to Render Tons of Grass - Unity 2023*. [Video file]. Retrieved from [<https://www.youtube.com/watch?v=zWn61No6Ncc>]

#### 3.3.4. Low-poly poppy field

After adding the grass to the game, the interpolation of low-poly foliage amongst the highly realistic trees and lighting was very interesting. A small section of the terrain was populated with apple trees and poppies in this low-poly stylized asset. I really like wandering through this field of bright green and reds, and up the hill that it sits on. It could represent a myriad of things: the poorly rendered areas of childhood memory, the idealised places we hold in our heads, or even the cartoons we used to watch when we were younger.



*Figure 20: Low-poly poppy field*

### 3.4. Post Processing

There are two different ways to set up post-processing in Unity. This depends on the render pipeline that is being used.<sup>5</sup> Post Processing Volume works with the Built-In Render Pipeline. Volume works on URP/HDRP. Using post-processing with the Universal Render Pipeline is a lot easier to do than method required for the Built-in Render Pipeline.

The difficulty when setting up post-processing was that there are different render pipelines that are available in Unity, and a lot of the processes depended on which render

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<sup>5</sup> CodeMonkey (2023). *Post Processing Volume*. [Video file]. Retrieved from <https://www.youtube.com/watch?v=vmwdKK-GZDc>

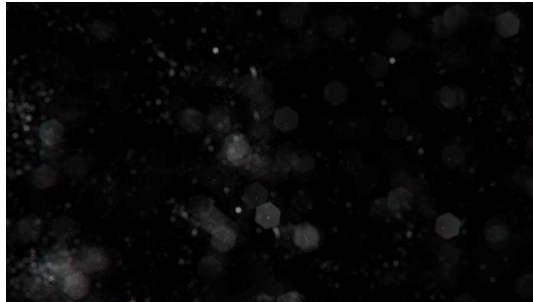
pipeline is being used in the game. It did not help that the terms used for the different pipelines and processes are very similar.

The Universal Render Pipeline was used, which has a pre-configured package for post-processing. Once this package is installed via the asset manager, configuring post-processing is not difficult.<sup>6</sup> It requires a layer and a volume. The Post-Process Layer component is added to the camera. The Global Volume component is added to the game hierarchy. Finally, the layer of both these game objects is set to a new custom one that is set up and named post-processing.<sup>7</sup>

With the profile created, several different effects were added to the game. These are the effects chosen:

Tonemapping: ACES makes the scene look a lot more cinematic, the colours stand out within the scene.

Bloom: Diffuses this texture effect across the whole screen, which goes well with the fog effect. It simulates these light smudges on the screen.



*Figure 21: Bloom Filter Used*

Vignette: Adds darkness around the corners and frames the view. It was set to 0.32 for a soft and subtle effect.

Colour grading: This is where most of the change happens to the colours within the scene. Using ACES mode, The post-exposure (EV) was set to 1.5. The tint in white

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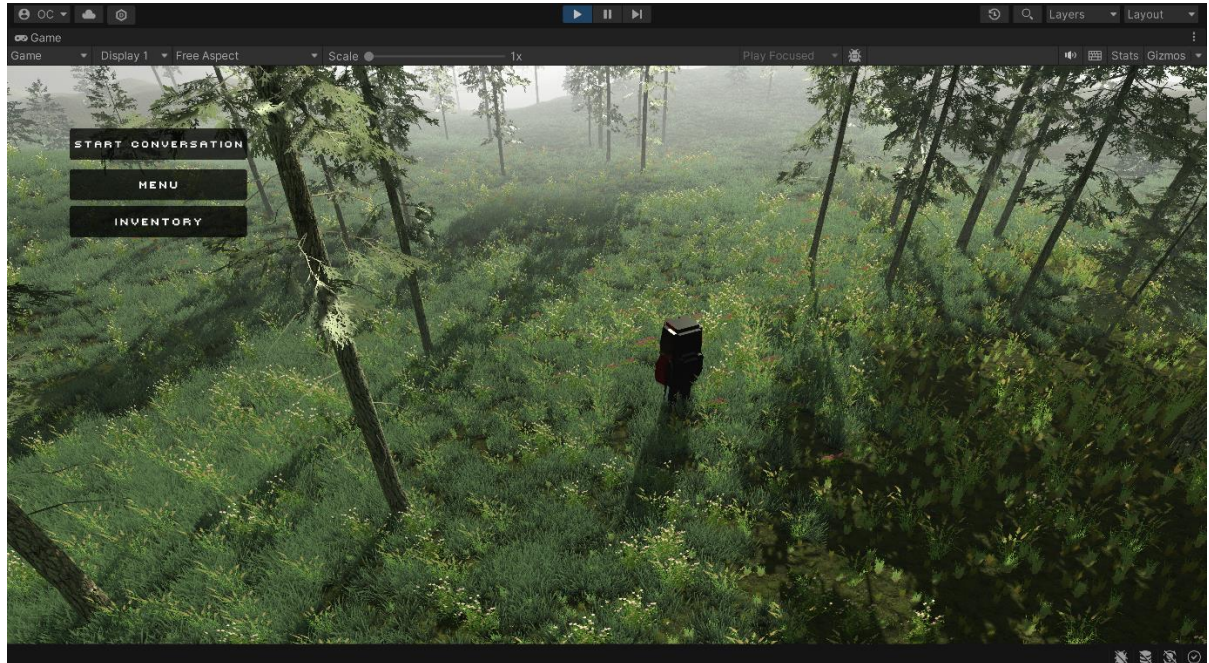
<sup>6</sup> Dani Krossing (2023). *How to Do Post Processing In Unity*. [Video File] Retrieved from [\[https://www.youtube.com/watch?v=yugZTujILB0\]](https://www.youtube.com/watch?v=yugZTujILB0)

<sup>7</sup> Doblyo (2023). *How to Add Post Processing*. [Video File] Retrieved from [\[https://youtu.be/nbxigHCsYFg?si=KcCrJN2NfqgZm-pH\]](https://youtu.be/nbxigHCsYFg?si=KcCrJN2NfqgZm-pH)

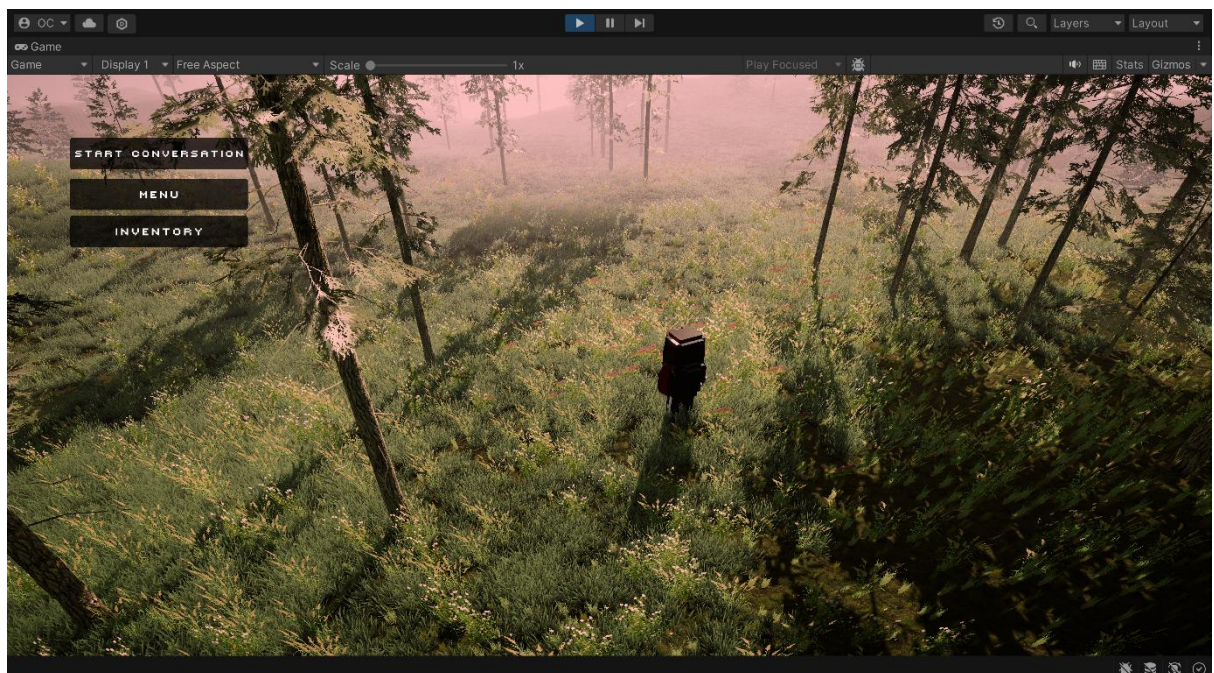


balance was increased to 33. The most important adjustment here is the colour filter, and a colour with a light pinkish hue was used.

Ambient Occlusion: Ambient occlusion is not an option in this system's post processing, which is a shame, because it changes the shadows depending on the distance between two surfaces; simulates darker lines.



*Figure 22: Melancholy Reverie before post-processing.*



*Figure 23: Melancholy Reverie after post-processing.*



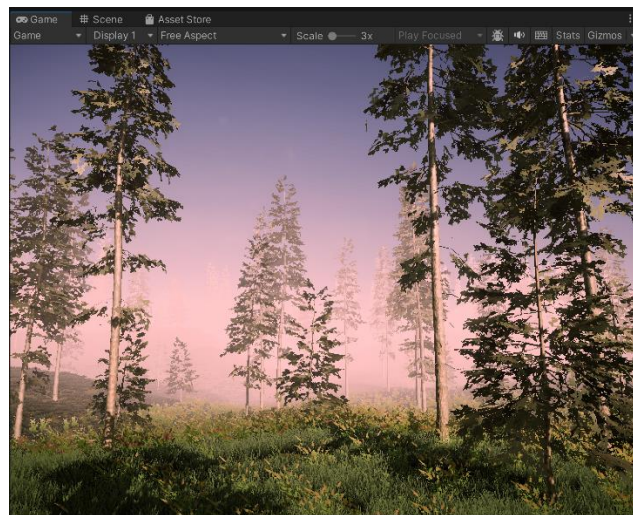
## 3.5. Camera Set-up

### 3.5.1. First-person perspective

When the camera component was first set up, it was positioned inside the graphics object / character's head. This provides the player with a first-person perspective on the game world.



*Figure 24: Positioning of the camera in the graphics object*



*Figure 25: From the player's perspective during the game*

The controls for looking around were simple. Everything is controlled with the mouse on two axis. MouseX and MouseY. If the player moves the mouse on the X axis, this allows the player to turn around (rotate). If the player moves their mouse on the Y axis, the player only rotates the camera on the X axis (the player does not move). This allows

the player to look up and down. Clamping limits the rotation of the camera to 180 degrees.

### 3.5.2. Third-person perspective

The position of the camera was subsequently changed from the first-person perspective to third-person perspective. This means that the player can see the character as well as the scene. The camera controls were also changed so that the player can zoom in and out using the trackpad and rotate the camera view using A&D or the left and right arrow keys.



*Figure 26: New positioning of the camera*



*Figure 27: Third-person perspective in gameplay*

## 3.6. Player Movement

Two different were tried methods for player movement. The first method used was the character controller component and the second was the capsule collider. Both have their

advantages. The character controller was originally chosen because it is specifically designed for character movement, as well as ground-checking, steps and slopes. However, it is not designed for its interaction with physics objects. As the game was being developed, it was decided to change to the NavMesh Agent for movement instead.

### 3.6.1. Character Controller

Movement, gravity, ground-checking, jumping, in air movement, steps, slopes are simple to implement using the character-controller component as most of these are already built in.<sup>8</sup> The only real restriction is that the character controller doesn't interact with physics objects. I will discuss the issue this caused later.

To move the player using the character controller, we want to gather input on the horizontal and vertical axis. Similar to MouseX and MouseY, in Unity these are pre-programmed to map to the keyboard. If the player holds down W then vertical = 1; S then vertical = -1. The same thing applies to horizontal but with the A and D keys. Based on these inputs the player can move from the sides and forward.

The player can jump using space bar. This involves applying gravity so that the player moves down a little bit each frame. Velocity / speed of the fall increases more each frame. Reset the velocity when the player is on the ground. The ground check was also implemented to check if the player is grounded.

```
if (Input.GetButtonDown("Jump") && isGrounded)
{
    velocity.y = Mathf.Sqrt(jumpHeight * -2f *
gravity);
}

velocity.y += gravity * Time.deltaTime;

controller.Move(velocity * Time.deltaTime);
```

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<sup>8</sup> Brackeys. (2020). *First Person Movement in Unity – FPS Controller*. [Video File]. Retrieved From [[https://www.youtube.com/watch?v=\\_QajrabyTJc](https://www.youtube.com/watch?v=_QajrabyTJc)].

### 3.6.2 NavMeshAgent

Several weeks later, the player's movement was changed from a character controller to a NavMesh Agent component instead. Whilst the CharacterController is more suited to free exploration, it is limited in its ability to interact with physics objects. The NavMesh Agent solved some problems that were occurring with picking up items for the inventory.

The NavMesh Agent is useful for the functionality required for the inventory. It uses Artificial Intelligence to 'path-find' by identifying what items are walkable and what items are not. This can include trees (not walkable) and grass (walkable). The NavMesh Agent distinguishes between which items can be clicked and picked up from the items which can't.

There wasn't much information on using AI Navigation for Unity 2022.3 – this AI system has just been released – but one tutorial was found which provided useful information on how to bake the terrain.<sup>9</sup>

NavMesh Baking is the process of creating a NavMesh from the level geometry. Any objects which have been selected as 'static' before baking are unwalkable in the terrain; the remaining objects are dynamic. This was the first step to implement the NavMesh Agent.

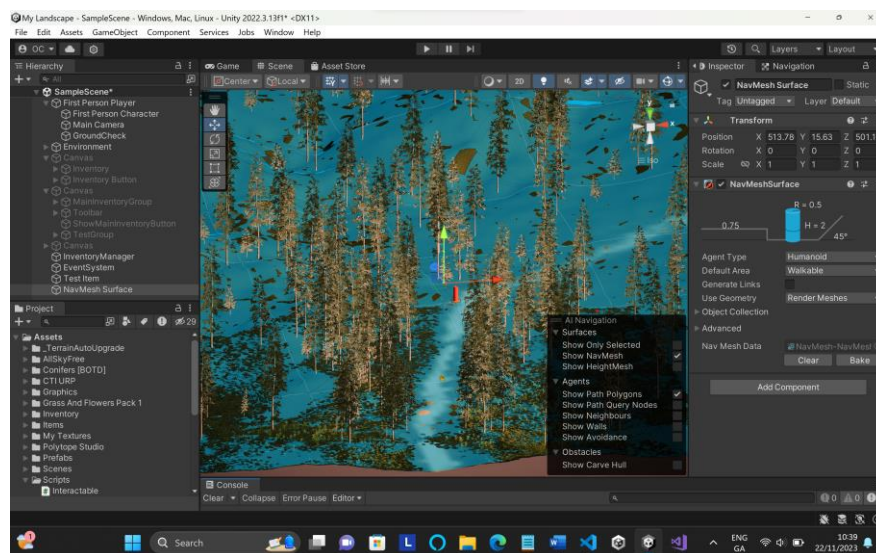


Figure 28: Baked NavMesh Surface.

<sup>9</sup> Creative Media Tutorials. (2023). *New AI Navigation in Unity*. [Video File]. Retrieved From <https://www.youtube.com/watch?v=u2EQtrdgfNs>.

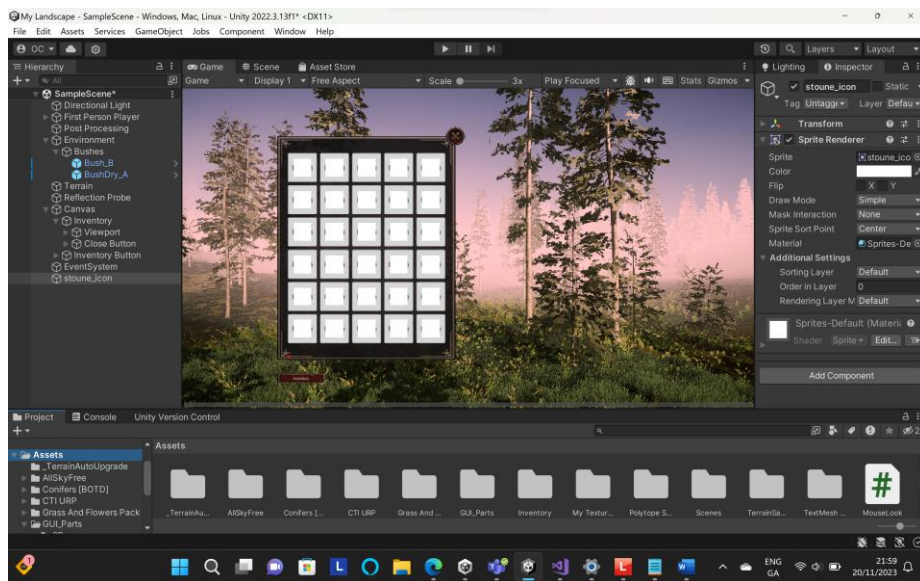


After the landscape was baked, the navigation meshes were created from the scene geometry, so the character was able to intelligently move around the game world. The player can click the mouse anywhere on the ground. The character will then navigate to that position.

NavMesh Agent has the built in function *SetDestination*. This sets or updates the destination thus triggering the calculation for a new path. One of the key changes to the earlier implementation of PlayerMovement was using the NavMeshAgent for navigation. Whilst the CharacterController received input on the horizontal and vertical axis and used WASD to walk around, the NavMesh Agent uses the mouse to move around.

### 3.7. Inventory

The inventory can hold a number of objects. The player can pick items up and store them in the inventory. This makes the game more interactive.



*Figure 29: An early mock-up of the inventory*

#### 3.7.1. Prefabs & Scriptable Objects

Two notable concepts / tools were utilised to organize the inventory: scriptable objects and prefabs.

##### i) Prefabs

Using prefabs to make changes to the inventory slots saved a lot of time. Rather than editing each of the inventory slots to make changes to buttons or icons, an inventory slot prefab was used as the template for all slots. When the values of the prefab were changed, this automatically updated the values for all slots.

## ii) Scriptable Objects

To manage the interactions and behaviours of items in the game, scriptable objects were used. Each item in the inventory was represented by a scriptable object.

```
using UnityEngine;

[CreateAssetMenu(fileName = "New Item", menuName =
"Inventory/Item")]
public class Item : ScriptableObject
{
    new public string name = "New Item";
    public Sprite icon = null;
    public bool isDefaultItem = false;

    public virtual void Use()
    {
        Debug.Log("Using" + name);
    }
}
```

### 3.7.2 Interacting with Items

The PlayerController script was created so that the player can click on items. It is to do with choosing the "focus", where to move and most importantly interacting with the objects. This is different from PlayerMovement script (responsible for moving around).

Creating the inventory took a significant amount of time. Although the PlayerMovement script was already created, which uses a similar functionality to picking up items, this functionality was derived from the NavMesh API. In the end, it took a lot of time to create the functionality to click on an item.

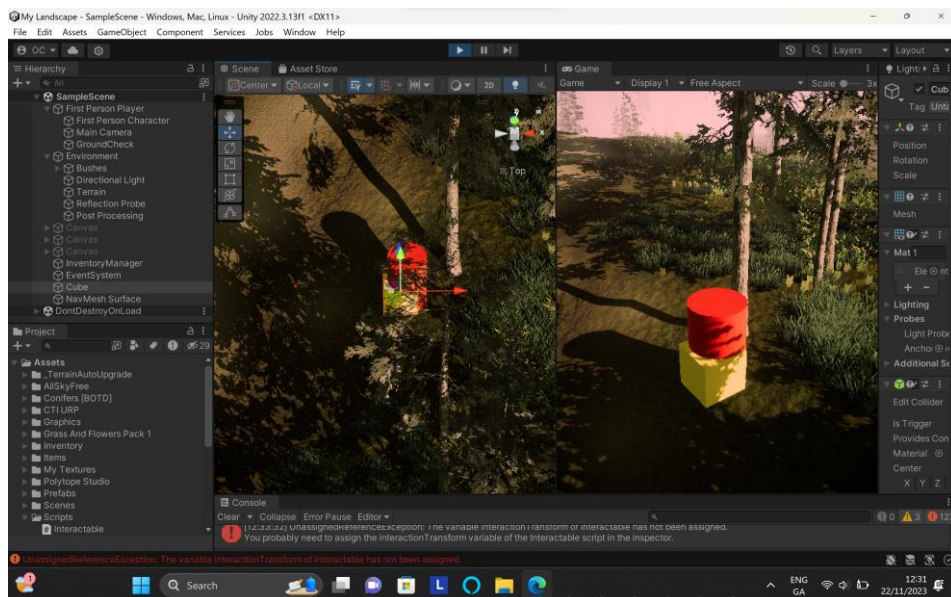
First, the functionality for the player to interact with the items was created. After this, the functionality for the player to pick up the item was made. Each item has the ItemPickup script attached to it as a component. The ItemPickup script inherits all of the functionality of the Interactable script.

The Interactable script manages the general behavior of interactable objects. It provides a framework for interaction: handling the focus and de-focus of the mouse, setting up interaction radius, and ensuring the player is facing the object after they click on it.

The ItemPickup script extends the functionality of the Interactable script and overrides the Interact() method to define specific behavior for picking up items. This way, when the player interacts with the item, the Interact() method from the ItemPickup script should be called, allowing the specific pickup behaviour to take place.

#### 3.7.2.1 Illustrative problem: NavMesh and player interaction

One of the issues faced was that the player was not able to stop moving into the objects. In the image below, the yellow cube is a test item that the character/graphic object is attempting pick up.



*Figure 30: Issue with player interaction*

The PlayerMovement script was modified so that the player could not go within a certain radius of objects, but this solution did not work.



After implementing NavMesh, the NavMesh Obstacle component was added to the test object (yellow cube). In the AI Navigation tutorial, this component is used to block certain items from being walked into by the Agent, e.g., walls. Although this was successful in preventing the graphics object from walking into the cube, the player was no longer able to pick up the test object.

The solution to this issue was found when the NavMesh Obstacle was removed and the NavMesh Surface re-baked with all new inventory objects marked as 'static'. This was successful. Now the player can't bump into objects, and when the player right clicks on an object, the player stops within a certain radius and picks up the item.

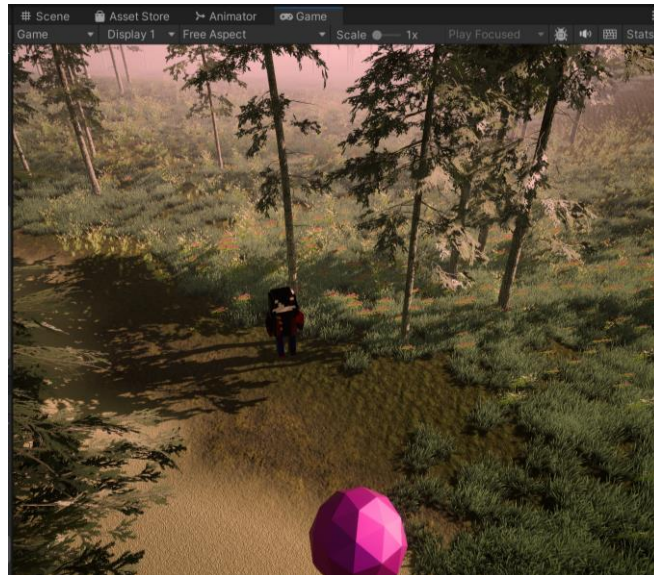
One further point to note – after the surface was re-baked, there was a strange vibration on the edges of the camera which seemed to be caused by the grass in the Nav Mesh. The cause of the vibrating movement, which is quite a common issue with the NavMesh Agent, was in fact caused by the Rigid Body component. Removing the Rigid Body component from the player solved this problem.<sup>10</sup>

### 3.7.3. Inventory Items

A simple animated gems asset in a low-poly style from the Unity Asset Store was used for the inventory icons. There are seven gems in different colours. The player can navigate around the landscape and collect these gems that have been placed across the whole terrain using a random gem spawner. The gems were chosen for their arcade/retro style. They appear strikingly out of place in this landscape, which adds to the novelty of finding them.

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<sup>10</sup> Stardog. (2010). *Why nav mesh agent movement so weird*. Unity Forum. Retrieved from <https://forum.unity.com/threads/why-nav-mesh-agent-movement-so-weird.745631/>

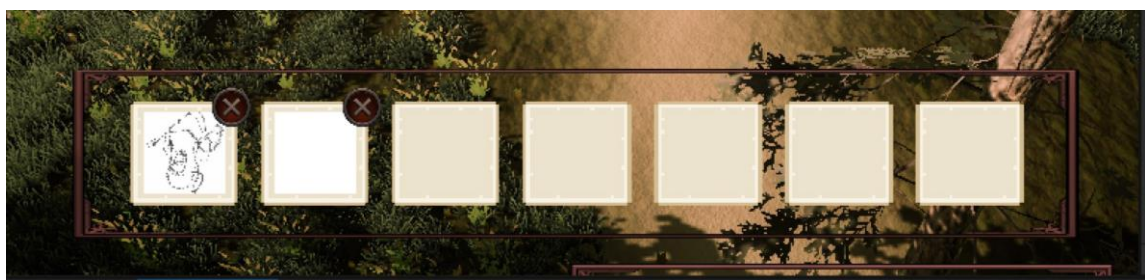


*Figure 31: Inventory Item*

#### 3.7.4. Inventory Icons

The player can right-click on the gems to add the items to their inventory. Each type of gem has a different item that is revealed once it is collected, as though it is a surprise gift. The items are things that one might find at home or in their bag: headphones, keys, wallet, Vaseline, nail clippers, and phone.

The inventory icons were hand-drawn. The images were imported into Unity and then converted into 2D Sprites. However, one problem was that when these images were used as icons for the inventory, the quality was very poor.

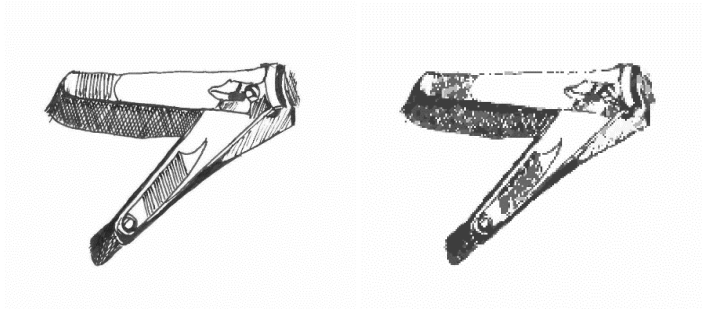


*Figure 32: Inventory Icons*

A couple of methods were attempted to fix this. Including, using an online tool to convert the drawings into pixelated images.<sup>11</sup> This seemed like it could be a solution because

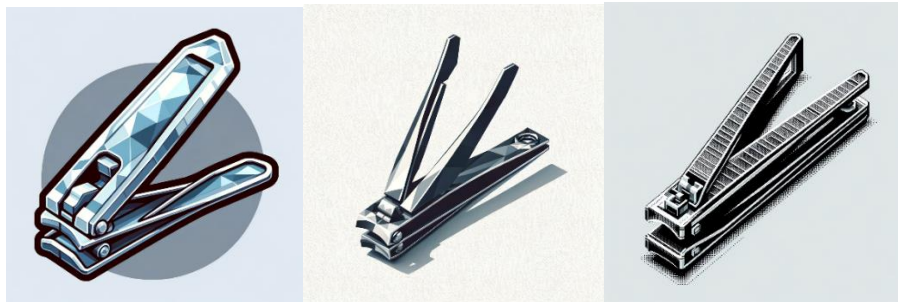
<sup>11</sup> Pixel Converter. (n.d.). *Image to Pixel Converter*. Retrieved from <https://www.pixelconverter.com/image-to-pixel-converter/>

Unity 2D Sprites are compatible with digital drawings. However, this image conversion was not successful as it retained the detail of the shading rather than the lines.



*Figure 33: Using pixellator tool to convert drawings*

DALL-E was also used to generate 2D sprites for the inventory icons from the drawings. DALL-E was not capable of doing of this. Whilst DALL-E can generate images that simulate a low-poly style, it is more a powerful as a generator for realistic images. The final image above is based on a prompt to create the most low-poly and pixelated 2D image of nail clippers. This was not the correct style of image.



*Figure 34: Using DALL-E to convert drawings*

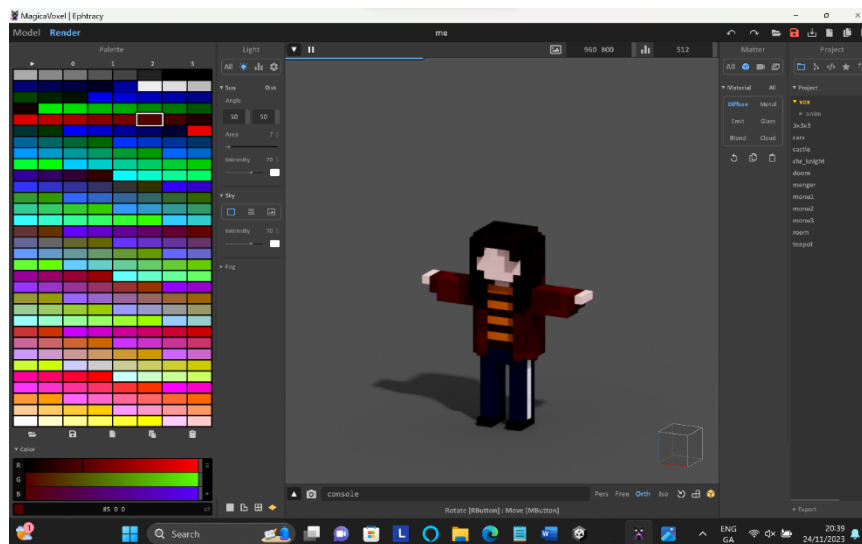
The solution was very simple. The images of the drawings were converted to JPG format instead of PNG format and this increased the quality sufficiently for the images to be used as inventory icons.



*Figure 35: Inventory in Melancholy Reverie*

### 3.8. Character Creation

Magicavoxel was chosen to create the player avatar because of the abstract style of it pixel art, which was something that I had wanted to incorporate into my game after reading about the decline in abstraction in video games. It was also quite simple to create. This is the main character of my game in Magicavoxel.



*Figure 36: MagicVoxel character*

### 3.9. Blender

#### 3.9.1. Importing from MagicaVoxel to Blender:

The most common formats for importing from MagicaVoxel to Blender is Wavefront (.obj) or PLY. The Voxel character was imported into blender as a PLY file. This format retained the pixellated cube layout from MagicaVoxel and required the least clean-up in Blender. The cubes were merged by distance to remove the extra vertices, which fused any verts that were on top of other verts.

When Magicavoxel exports a PLY file, the colour data is stored as vertex colour data. The colour data was added back into Blender using the shading tool. The vertex colour node was plugged into the base colour (in the Principled BSDF node).

#### 3.9.2. Texture Mapping

It is recommended to bake textures into a UV map when using the character in a game. Otherwise, when the character is moving, the textures stay in the same place. A UV map ensures that the textures deform properly. The process of baking involves making the texture of a pose and then converting this to an image that can be used with a UV map.

The diffuse bake setting was used with a diffuse shader in Blender. However, after the character was baked, all the colour blocks had rearranged into the wrong position. The character looked particularly disfigured around the face and the torso. This was most likely because the UV map was not set up correctly.



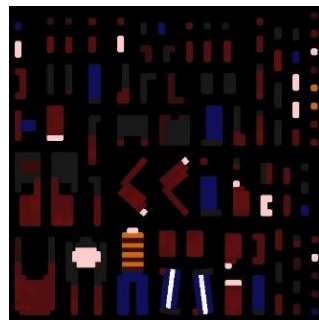
*Figure 37: Base Map*



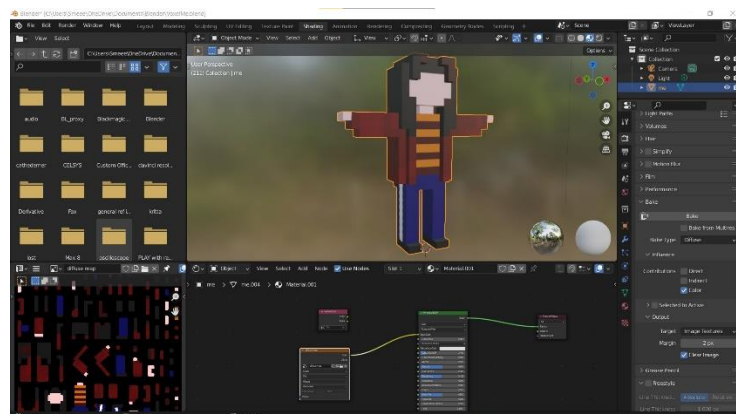


*Figure 38: Base map baked onto character*

As you can see below, the second time the texture map was baked, the colours were in the correct place. The diffuse map is used for the character's colours when the character is imported into Unity. Thus, it was important for the diffuse map to be correct.



*Figure 39: Base map second attempt*



*Figure 40: Base map second attempt baked in Blender*

### 3.9.3 Roughness Mapping

A roughness map was added to the character, a noise texture with high detail and high roughness. This was chosen because the appearance of natural light through the trees and on objects plays an important part in the realism of *Melancholy Reverie*. For some reason, when this texture map was emission baked onto the character, it made the character very shiny.

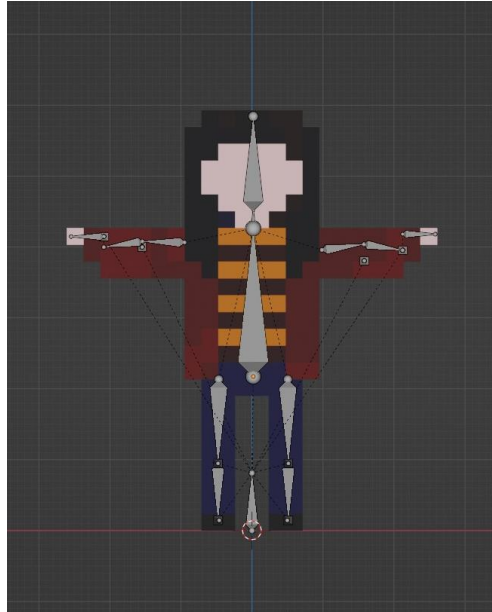


Figure 41: Problem with roughness mapping in Blender

It should be noted that, by the final stage of character development, several faulty characters had been produced, e.g., incorrectly textured, incorrectly rigged, and incorrectly baked characters. These all had their own individual quirks that are not commonly seen in games. Therefore, one idea for future development of *Melancholy Reverie* is to implement a game that features each of these characters. For instance, the character could turn into this glossy version when she steps into a puddle, and shatter into her pixels/cubes. Ideas such as these are explored further in *Chapter 6*.

### 3.9.4. Creating a rig

Once the MagicaVoxel character was correctly shaded in Blender, the skeleton for the character was created. The image below shows the simple skeleton that was created with all the bones necessary for a full rig.



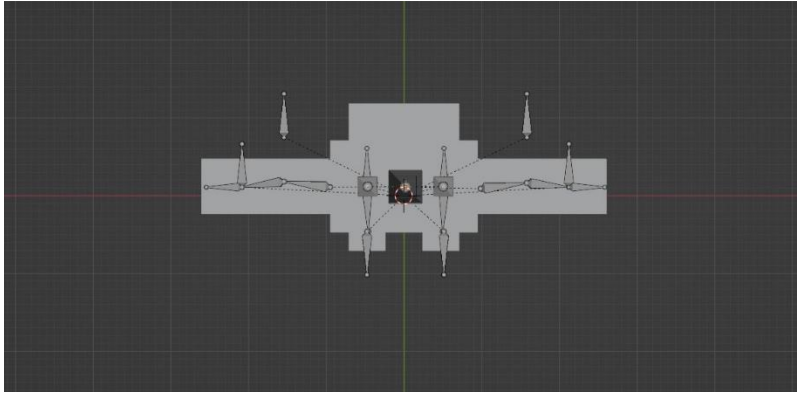
*Figure 42: Rigged character in Blender*

### 3.9.5. Adding Inverse Kinematics

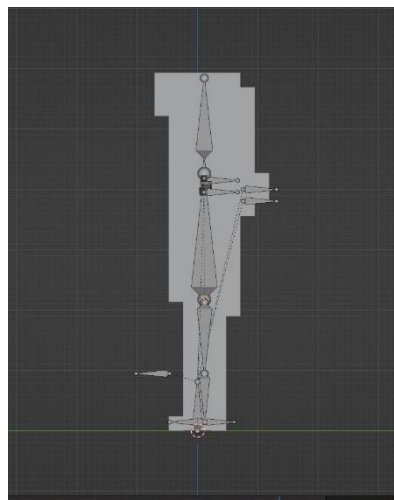
Adding inverse kinematics (IK) to a rig in Blender can make the process of animating much more efficient. Instead of animating each joint separately, only the final position of the end effector needs to be specified. For example, when the control bone in the left hand is moved, the left arm automatically moves forward. The IK system calculates how the joints in the chain (like the elbow and shoulder) should move to achieve this position. Inverse Kinematics is particularly useful for animating limbs, where the end goal is often a specific position of the hand or foot.

IK bones were added to the legs and arms of the Voxel (shinIK, thighIK, bicepIK and handIK). This involved extruding a bone perpendicular to the knee, heel, wrist, and bicep, removing their parent bone, and then adding an IK constraint. The IK constraint determined how far up the chain the IK effect will go. To achieve a rig with inverse kinematics working correctly, the rig was refined and tested many times. The settings and weights were also adjusted for more natural motion.





*Figure 43: X-ray view of IK bones (top)*

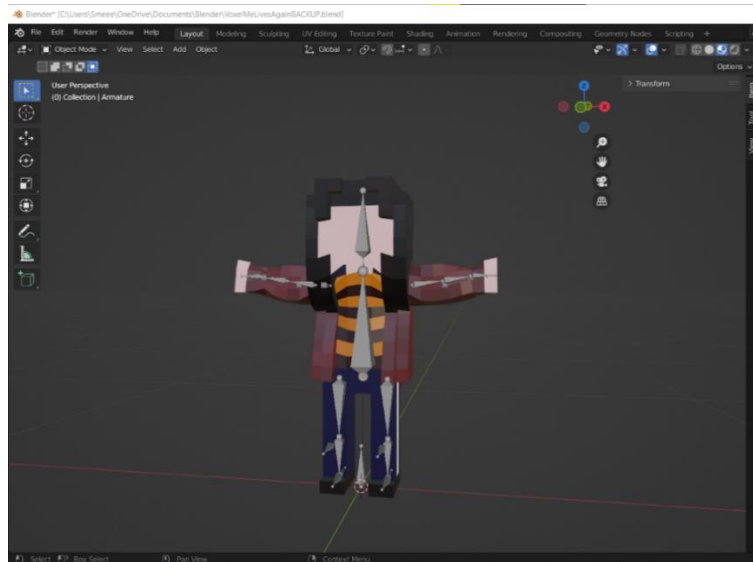


*Figure 44: X-ray view of IK bones (side)*

### 3.9.6. Adding weights

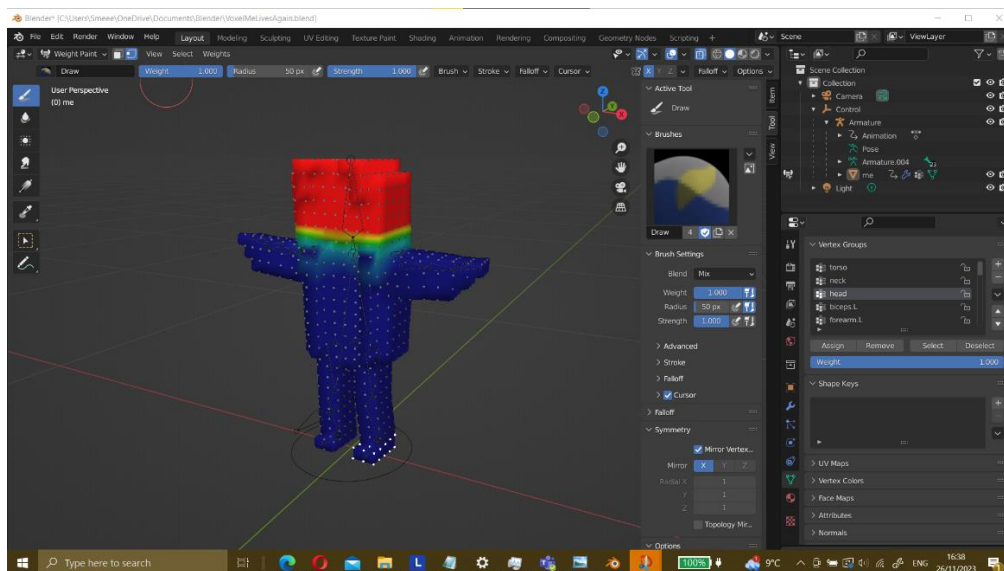
Each vertex group in Blender contains a weight value in the range of (0.0 to 1.0). For instance, the head, neck, left forearm, and right forearm are all vertex groups. It is important to have the correct weight values of each vertex of a mesh.

The next stage in Blender was adding vertex weights. This involved assigning each vertex to its correct vertex group with its weight value. Automatic weights were used to speed up the process. However, after choosing automatic weights, the rig was very deformed. This caused many strange problems later. E.g. the right arm moved when the left arm turned, and both legs were not able to move independently of each other. So, the rig was reset and the weights were manually applied.



*Figure 45: Rig after setting automatic weights. Notice the twisted angle of the torso and arms.*

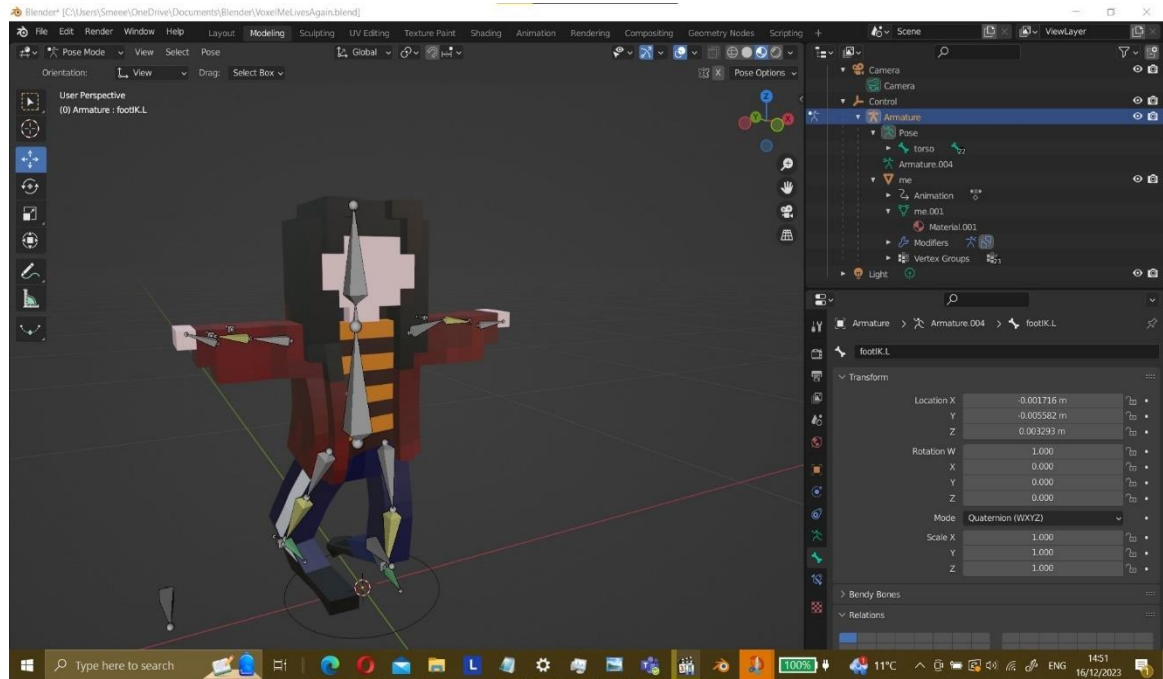
The below image shows the head in the Weight Paint mode. These are the weights that were assigned to the head. The highlighted red section shows the weight value of this vertex group. This will ensure that moving the head will not deform the neck or shoulders as well.



*Figure 46: Setting weights*

It should be noted that all the above information documents the author's second attempt rigging in Blender. After the skeleton was created, inverse kinematics set up, and the weights manually assigned, the rig was very flawed. There were too many inexplicable

problems with the first rig – arms connected to legs, bones in the middle of nowhere – so although it passed as a rig, it was very faulty. The second time was much faster. For documentation’s sake, an image of the first rig and its odd protruding bones is included below.



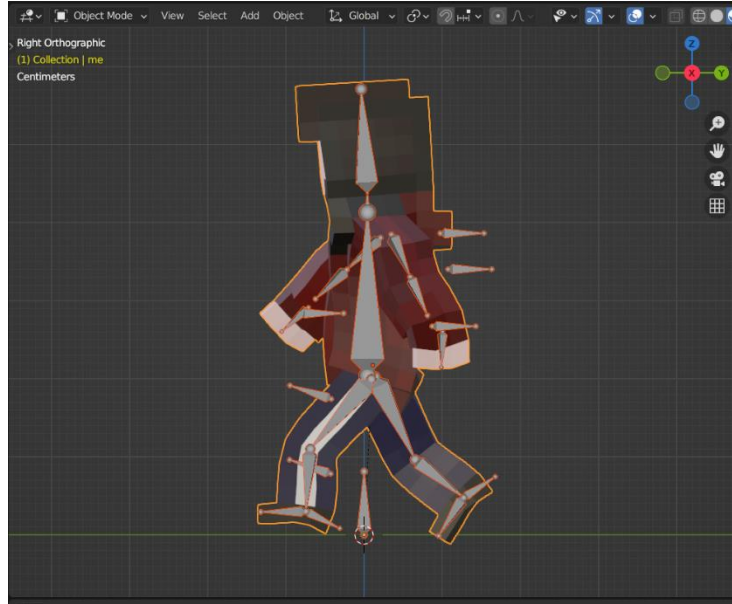
*Figure 47: First rig in Blender*

### 3.9.7. Animating in Blender:

5 main poses were referenced for the simple walk animation: contact pose, down pose, pass pose, up pose, and finally the reverse contact pose. Creating the first pose took a long time, as it formed the starting position of the animation of the walk cycle. The steps that were followed to set up the first contact pose are noted below. They provide a general guide for how the pose was created.

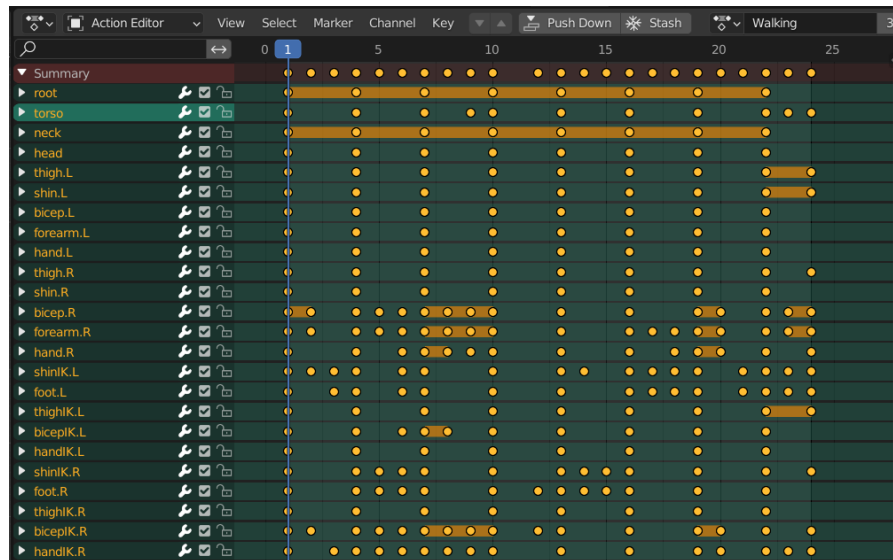
- i) Bring the left leg forward on the Y axis using the IK bones.
- ii) Rotate the left foot to point up.
- iii) Move the hip bone down on the Z axis until the heel of the foot is touching the ground and the leg has a slight bend.
- iv) Bring the right leg back.
- v) Rotate the right foot so the toes are touching the ground, but the heel is slightly off.

- vi) Move the torso forward slightly so the character is leaning slightly in the direction of movement.
- vii) Move left arm in the opposite direction of left leg and vice versa.



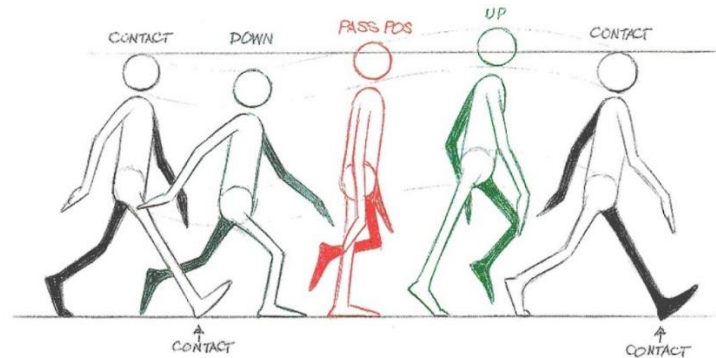
*Figure 48: Contact pose*

The first step of the walk animation was a total of 12 frames. After the down pose (frame 4), pass pose (frame 7) and up pose (10), the character reached the end of the first step. The reverse contact pose (frame 13), marked the beginning of the second step. The second step was made simply by mirroring the first step. The key frames that had already been created were simply pasted in the reverse. On frame 24, the animation was looped back to frame 1.



*Figure 49: The Action Editor shows the 24 keyframes in my walk cycle*

As only animated half of the walk-cycle was animated, and half was pasted inversely to create a whole walk-cycle, it was necessary to make some modifications to the two steps. Some more frames were inserted in between the poses, to create a smooth swing in the arms and legs, and other problems were fixed. For example, the left foot was not hitting the ground quickly enough, and the right arm was swinging into the torso.



*Figure 50: My reference image of a walk cycle*

### 3.10. Importing the character into Unity

When the animated character was first imported from Blender to Unity as an FBX file there was a problem with the rig; the foot bones were not the child of knee bones. The hierarchy of bones were rearranged in Blender and then imported again, in order to be compatible with Unity.

However, once all of bone configurations and animations were imported into Unity, the following import warning appeared: bicep.L has translation animation that will be discarded. This warning message appeared for every bone. The Animation Type was changed from humanoid to generic in Unity, even though humanoid is meant to be used with inverse kinematics.<sup>12</sup> This solved the import errors.

The materials for the character were imported manually. The base map that had been created from baking the character in Blender was used. Out of the two the base maps that were created in Blender, neither one translated to the character in Unity very precisely.




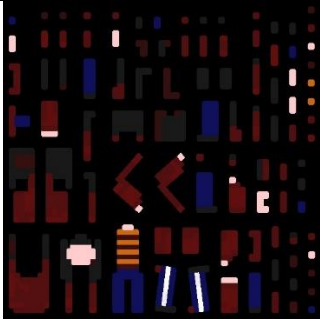


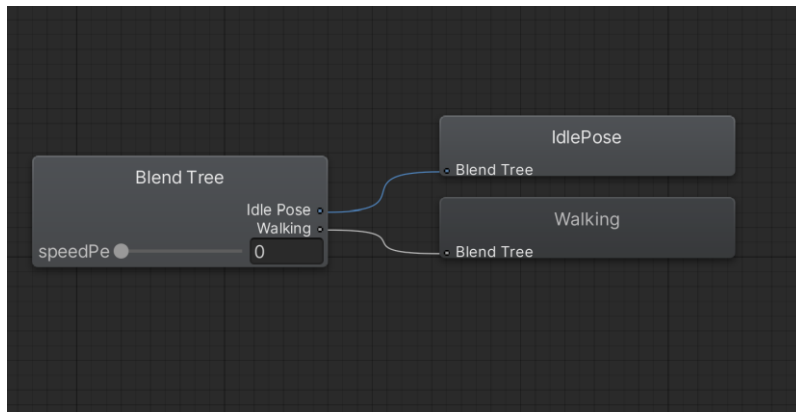
Base Map	Blender	Unity
		
		

Table 1: Comparison of Base Maps in Blender and Unity

### 3.10.1. Animation controller

There are two motion fields in the animation controller. The first one contains the idle motion and the second one contains my walk. When the blend tree was created, a default blend parameter was made to blend between the different motions. This parameter was re-named speedPercent.

<sup>12</sup> Imphenzia. (2022). Animated Character from Blender 2.93 to Unity 2021 with Correct Rotation. [Video File]. Retrieved from <https://www.youtube.com/watch?v=Bl2xBW-L7uU&t=79s>.



*Figure 51: Animator controller in Unity*

In order to drive the value of this parameter, the CharacterAnimator script was created. Both the agent component and animator were assigned in the Start method. The update method first calculates the agent's speedPercent. This speed percentage is then used to adjust the animation speed, ensuring that the visual representation of the character's movement aligns with its actual speed.

```
public class CharacterAnimator : MonoBehaviour
{
    const float locomotionAnimationSmoothTime = .1f;
    NavMeshAgent agent;
    Animator animator;

    void Start()
    {
        agent = GetComponent<NavMeshAgent>();
        animator = GetComponentInChildren<Animator>();
    }

    // Update is called once per frame
    void Update()
    {
        float speedPercent = agent.velocity.magnitude / agent.speed;
```



```

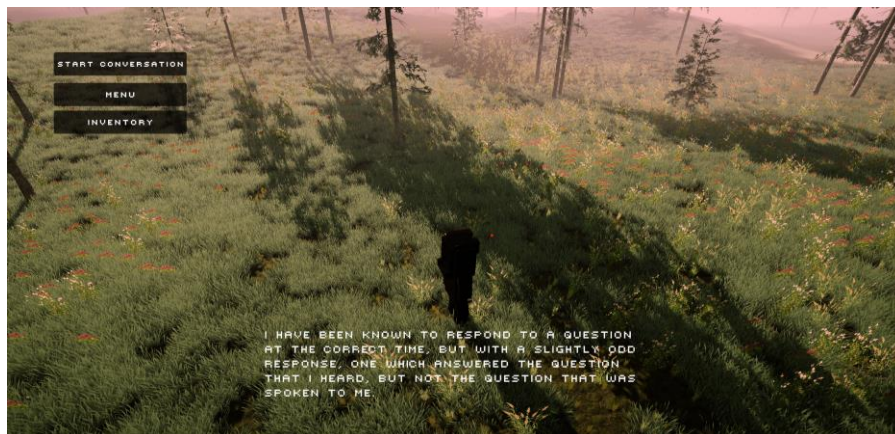
        animator.SetFloat("speedPercent", speedPercent,
locomotionAnimationSmoothTime, Time.deltaTime);
    }
}

```

### 3.11. Dialogue

The dialogue begins when the user clicks *Start Conversation*. The dialogue is a stream of consciousness piece that the author wrote for the game. It describes a dream-like state and is set in the forest, creating an immersive atmosphere for the gameplay.

The dialogue automatically changes independent of the user input. This is so that the user can read the text if they want to, but they do not have to devote full attention to it. There is also a voiceover in the background.



*Figure 52: Melancholy Reverie dialogue system*

*Dear Esther* uses this style of dialogue system.<sup>13</sup> It is suited to games that are dedicated to wandering the landscape.

<sup>13</sup> Windy Power. (2013). *Dear Esther – Complete walkthrough (1080p, no commentary)*. [Video File]. Retrieved from [<https://www.youtube.com/watch?v=hlGdbziSwEY>].



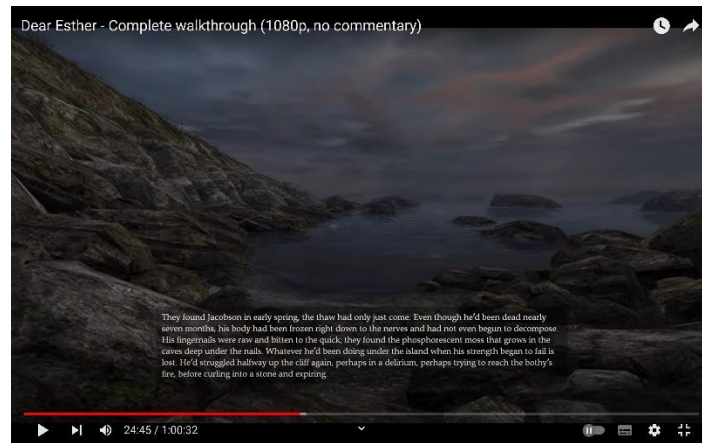


Figure 53: *Dear Esther* dialogue system

In an earlier mock-up, the user had to click through the dialogue. This functionality was removed and so that the script automatically progressed instead. The displayDuration is calculated dynamically as  $\text{wordCount} * 0.5f$ . This way, each sentence's display duration is dynamically adjusted based on its content length. It allows for a more natural flow in the dialogue presentation, as the duration on the screen varies according to the length of the text being displayed. The words of the dialogue were also animated so that they come onto the screen letter by letter.

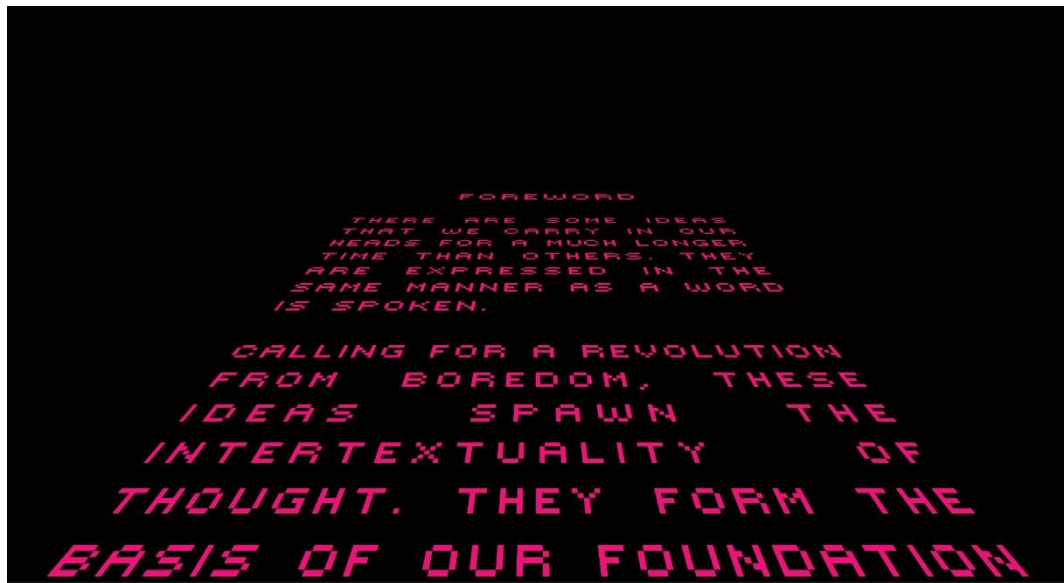
### 3.12. Scenes

So far, all the functionality that has been discussed falls into the Game Scene. This is where the character can navigate the terrain, pick up items and listen to the dialogue. After completing the development of this scene, two further scenes were created:

- Opening Scene
- Menu Scene
- Closing Scene

#### 3.12.1. Opening Scene

An opening crawl in the style of *Star Wars* was animated as well. This provides the user with a foreword to *Melancholy Reverie*. Here, the player is introduced to some ideas from psychogeography that inspired the development of the game, as well as setting the tone for my game.



*Figure 54: Melancholy Reverie opening crawl*

This animation was very simple to create. It involved setting up a basic animation using scrolling text. The render mode of the canvas was set to World Space and the text was set at an angle. Thus, the canvas acts like any other game object in the 3D world and will render like the camera. To achieve the sloped text effect, the camera was angled to -70 rotation on the Y axis.

### 3.12.2. Menu Scene

The menu scene contains various functionality that is essential to almost any game:

- Play and Quit
- Options (volume)
- Transcript
- Instructions



*Figure 55: Main Menu*

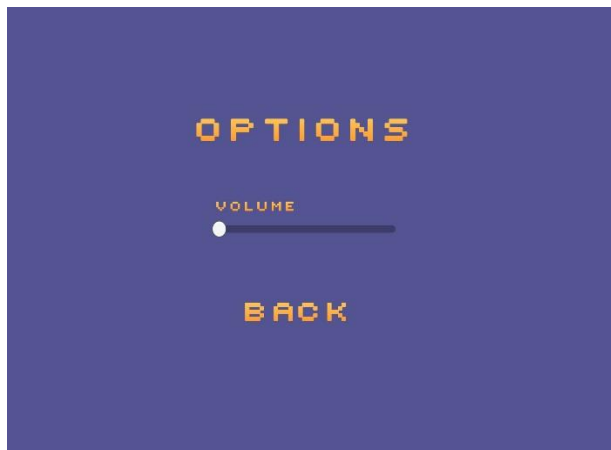
The menu was created in this simple style, like the Minecraft menu.

#### 3.12.2.1. Play and Quit:

The user will select *Play* to enter into the game. Quit to leave the game.

#### 3.12.2.2. Options:

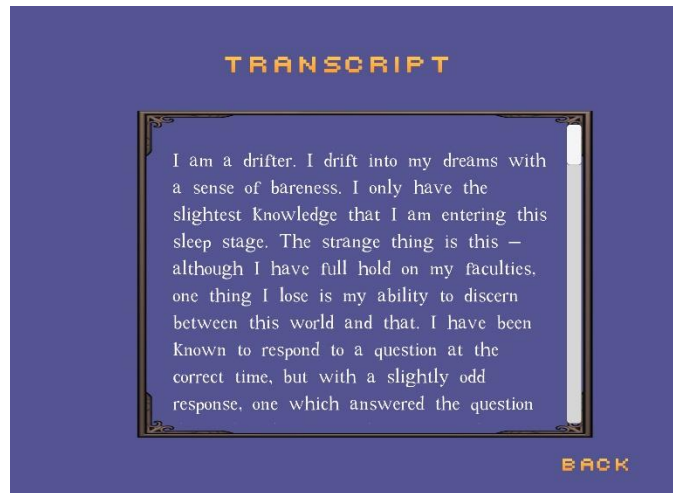
The options button can allow the user to turn down the volume of the dialogue.



*Figure 56: Options*

#### 3.12.2.3. Transcript:

The full transcript for the dialogue of *Melancholy Reverie* was also inserted here, should the user be interested in reading it.



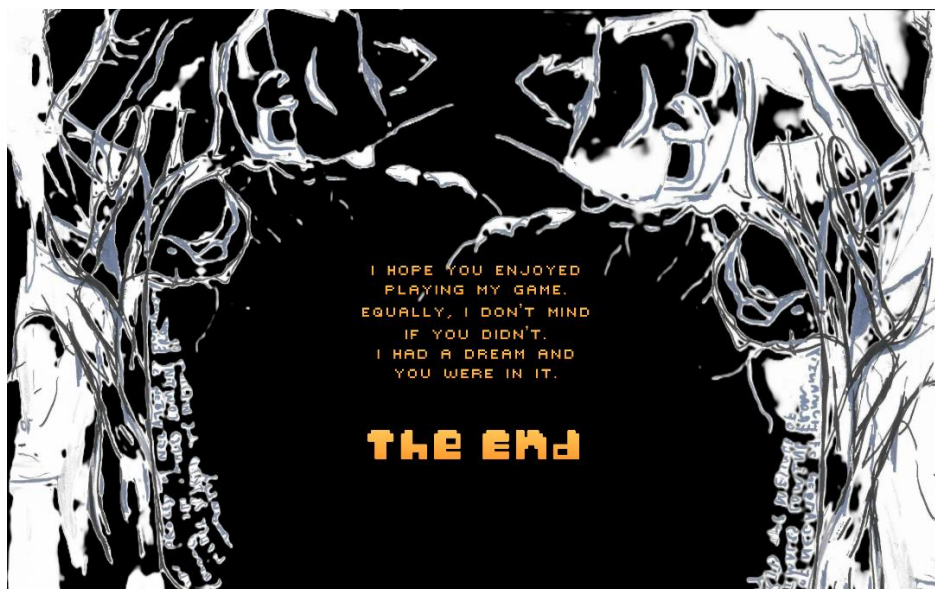
*Figure 57: Full Transcript*

#### 3.12.2.5. Instructions:

The instructions provide basic instructions on navigating the interface of the game, i.e., left click to move, A&D to rotate camera, left click to pick up an item, B to close or open inventory.

#### 3.12.3. Closing Scene

The closing scene for *Melancholy Reverie* was created from a scanned drawing by the author. It signifies to the player that the game is over, and that they can exit the game.



*Figure 58: Melancholy Reverie closing scene*

### **3.13. Conclusions**

This chapter covered the design and development of the system, and explained the key steps involved. It began by outlining the methods used to create the terrain and nature assets. From there the post processing and camera set-up were discussed. Next the player movement and the use of the NavMeshAgent was outlined, as well as the functionality for the player to pick up items for the inventory. Information on how the dialogue was written and the opening and closing scenes were created was provided. Overall, a detailed documentation on the creation of *Melancholy Reverie* and the reasoning behind some of these design decisions was provided in this chapter.

## 4. EXPERIMENT DESIGN

### 4.1. Introduction

The main goal of this experiment is to investigate the relationship between the player's level of immersion and their emotional response to *Melancholy Reverie*. This chapter will explain how the experiment explored this, and tested the hypotheses set out in *Section 1.3*:

1. Participants who report a strong emotional response within the game will also experience high levels of immersion.
2. Retrospective time estimates will be higher or lower than actual time spent in the game for those who record high levels of immersion.

Research method triangulation was used in this experiment to investigate these two points. The following quantitative and qualitative evaluation approaches were used: the Think-Aloud Protocol, Shadowing, and an Immersion Questionnaire. The development of each of these methods will be explained below.

### 4.2. In-Person Experiment

The three categories of measurements for evaluating usability, based on Nielsen (1993), are testing, inspection, and inquiry. A combination of different testing and inquiry methods that complemented each other were chosen. This provided a more detailed picture of the experience than if a single technique were used in isolation.

Methods	Type of Method
Shadowing	Testing Method
Think-Aloud Protocol	Testing Method
Questionnaire	Inquiry Method

*Table 2: In-Person Testing Methods*

*Melancholy Reverie* incorporates a range of sensory information. From the audio and dialogue to the video footage of the mountainous terrain in Derry, each participant was expected to react differently. Therefore, Shadowing and the Think-Aloud Protocol were the two qualitative methods chosen to record participants' reactions to *Melancholy Reverie*, whilst an immersion questionnaire provided a quantitative metric.

#### 4.2.1. Think-Aloud Protocol

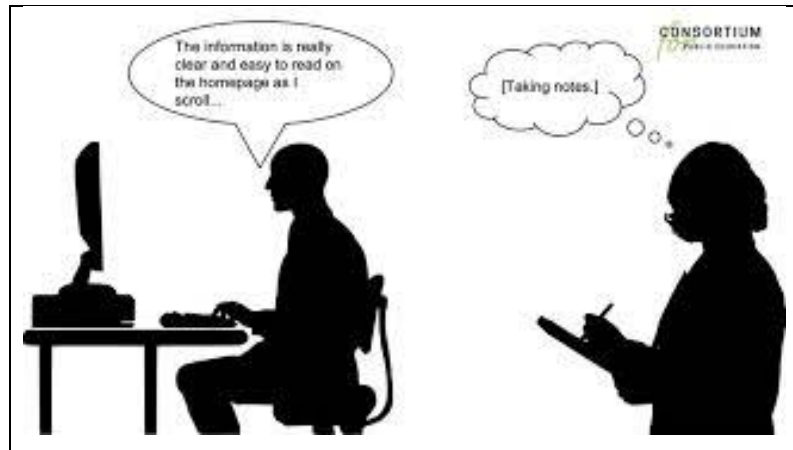


Figure 4.1. Think-Aloud Protocol<sup>14</sup>

The Think-Aloud Protocol is a user-based testing method that was first proposed by Ericsson & Simon in *Protocol Analysis: Verbal Reports as Data* (1984, revised in 1993), which itself is based on work by Karl Duncker (1945) in his work in experimental psychology where he was studying productive thinking. In HCI, researchers often position their discussion of techniques in relation to think aloud (Niel. It is said to be the most widely applied user-based method (Nielson, 1993). The method consists of two stages:

1. Collecting Think-Aloud Protocols in a systemic way
2. Analysing these protocols to obtain a model of the cognitive processes that take place while a person tackles a problem.

These protocols are collected by instructing subjects to solve a problem while ‘thinking aloud’; that is, stating directly what they think. During the experiment, the tester is encouraged not to interrupt the participant as interruptions can lead to distorted responses. The tester should only say ‘keep talking’ if the participant falls silent.

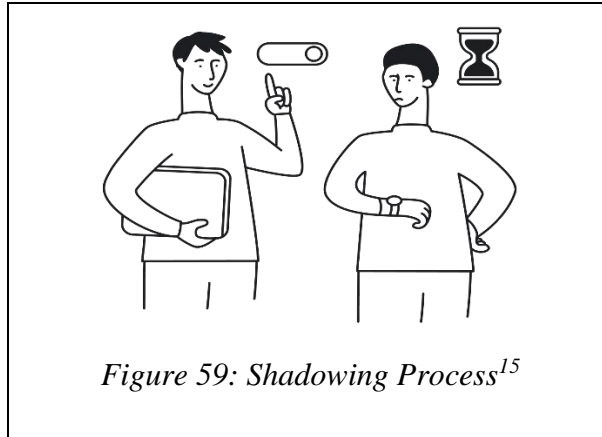
One critique which is often levelled at the think-aloud protocol is that its responses are too subjective (Jaspers, 2009). The participants are expected to continually verbalise their thoughts. However, the subjectivity of responses generated from think-aloud protocol makes it particularly well-suited to understanding participants’ responses to

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<sup>14</sup> YouTube. (n.d.). [Thumbnail image of YouTube video]. Retrieved from <https://i.ytimg.com/vi/csR-D2dVe6E/mqdefault.jpg>.

*Melancholy Reverie*. The think-aloud protocol will be utilised for one half of in-person user-testing.

#### 4.2.2. Shadowing



The shadowing technique will be used for the other half of in-person user-testing. This method involves the tester observing the participant. The tester does not speak during shadowing. The benefit of this technique is that it can be instrumental in identifying the flaws of a system. The tester can see how users choose to navigate *Melancholy Reverie* and whether or not it is intuitive, as well as providing immediate responses to the landscape.

*Like Bees Around the Hive* (Morrison *et al.*, 2009) is a useful resource that illustrates how shadowing can be used effectively. The research presents the findings from field trials of MapLens, a mobile AR map using a magic lens over a paper map. Three trials were held, with different sized groups, and different numbers of groups. In the final third trial five teams tested DigiMap and five teams tested MapLens. This was to see if there were differences in the two systems for the same task. For each of the trials, shadowing was one of the qualitative techniques used. Each team was accompanied throughout by one researcher taking notes, photographs and/or videos. There was no intervention from the experimenters during the trials. In the results section, the observations of the researchers are incredibly detailed. They documented body language and posture,

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<sup>15</sup> Eleken. (n.d.). User Shadowing: Research Method That Helps Fully Understand Your Clients' Needs. Retrieved from <https://www.eleken.co/blog-posts/user-shadowing-research-method-that-helps-fully-understand-your-clients-needs>

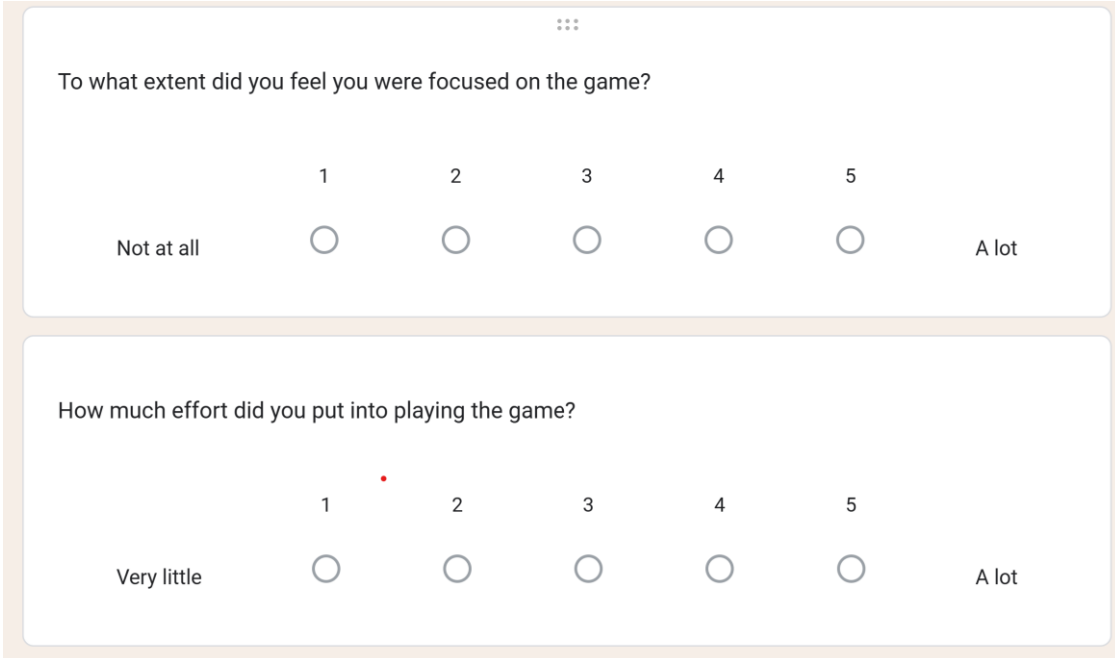


interaction in the teams, approach, strategy, even things like whether the users used one or two hands to hold the device.

The rich and detailed evidence that was provided in the results of Morrison *et al.*'s study (2009) was the core resource used to implement shadowing as a user-based testing method in *Melancholy Reverie*. It should be noted that, in comparison to the Think-Aloud Protocol, there was much less research on shadowing as a user-based testing method.

### 4.3. Questionnaire Design

#### 4.3.1. Questionnaire Development



The image shows a screenshot of a Google Form questionnaire. It contains two questions, each with a 5-point Likert scale. The first question is "To what extent did you feel you were focused on the game?" with response options "Not at all" (1), "A lot" (5), and three unlabeled points in between. The second question is "How much effort did you put into playing the game?" with response options "Very little" (1), "A lot" (5), and three unlabeled points in between. A red dot is visible above the number 2 for the second question.

...

To what extent did you feel you were focused on the game?

1 2 3 4 5

Not at all ☐ ☐ ☐ ☐ ☐ A lot

How much effort did you put into playing the game?

1 2 3 4 5

Very little ☐ ☐ ☐ ☐ ☐ A lot

Figure 60: Questionnaire distributed via Google Forms

Demographic details were gathered at the start of the questionnaire covering age, gender, glasses wear, level of computer use, and gaming history. These provided background information on each of the participants.

Following this, immersion was measured using a questionnaire adapted from Jennett, Cox, *et al.*'s (2008) study into whether immersion can be defined quantitatively. 13 questions were asked on 5-point Likert scales. Four questions were excluded from Jennett, Cox, *et al.*'s (2008) questionnaire as they were repeated in other questions with different wording:

- To what extent did you lose track of time?
- To what extent did you find the game easy?
- To what extent did you notice events taking place around you?
- To what extent did you feel as though you were separated from your real-world environment?

Players were also asked to estimate the duration of playing time and provide the actual length of playing time. This was an addition that Cairn & Sanders (2010) made to Jennet, Cox, *et al.*'s (2008) questionnaire as they understood one key measure of the player's immersion to be a loss of the sense of time passing.

Further questions were also added to the end of the immersion questionnaire to gain a sense of the *quality* of the game and people's individual experiences. This is where participants were able to write short comments about their experience.

#### 4.3.2. Immersion Questionnaire

The final questionnaire can be found in *Appendix A*. The questionnaire covered three areas: immersion, flow and presence, with specific questions targeted at identifying which of these the participant was experiencing.

Questions 1 to 5 are assessing flow. *Section 2.4.3* defined flow as an activity of (1) energized focus, (2) intense attention, (3) full involvement and (4) perceived skill or success in the process of encountering challenges (Csikszentmihalyi, 1997). Thus, Questions 1 to 4 assess each of these components. Flow is also understood to be the state that is entered when one loses complete sense of their surroundings and concern for anything else apart from the game (Jennett, Cox, *et al*, 2008). Thus, Question 5 assesses the degree to which the player forgets their concerns outside of the game.

Questions 6 to 9 measure presence. Physical presence is interacting, touching or controlling virtual objects as if they have actual, physical properties (Lee, 2004). This is measured in Question 6. Spatial presence, assessed in Question 7, is the sense of being physically located in a virtual environment (Jin, 2011). Self-presence is emotional and affective. The user believes that they are the virtual self. This is assessed in Question 8 and 9.

Questions 10 to 13 assess immersion. The continuum of immersion, first proposed by Brown & Cairns (2004), understands immersion to have three levels. The first level of immersion is engagement: overcoming the barriers of the game (controls, instructions). Engagement is assessed in Question 10. Then comes engrossment: overcoming the barrier of game construction and becoming less self-aware of ‘playing’ a game. Questions 11 and 12 specifically measure engrossment. Finally, total immersion is the state of being completely cut off from reality, which is assessed in Question 13.

From these 13 questions, the overall immersion score was calculated as:

$$i = \frac{flow + presence + immersion}{13}$$

#### 4.4 Conclusions

Two methods were chosen to test the quality of *Melancholy Reverie* and its effectiveness as a psychogeography. Method 1 uses two qualitative techniques: the Think-Aloud Protocol and Shadowing. These were performed by the tester in a controlled environment. Participants also completed an immersion questionnaire. Method 2 involved distributing *Melancholy Reverie* amongst participants to play from their own desktops. Participants were emailed an executable and asked to play with it for as long as they wished, and then fill out the questionnaire. These are the two methods and user-based evaluation approaches that were used to test *Melancholy Reverie*.

## 5. MELANCHOLY REVERIE EVALUATION

### 5.1. Introduction

This chapter presents the findings of the evaluation process that was undertaken as part of this project. It begins with a discussion of some of the key challenges to create a dream-like experience for the users, and how that was achieved. Following that the feedback from 10 users who played the game is presented and analysed. The users included two people with extensive experience with psychography, as well as 8 people who had no prior knowledge of psychogeography.

A total of 18 participants were invited to participate in the experiment, 10 of these participants agreed to take part in the experiment, giving a response rate of 56%. In terms of gender, six (6) were female (60%) and four (4) were male (40%). Ages ranged from 18 to 70, with the modal age group being 18 to 30. Seven (7) participants (77.8%) were right-handed, and three (3) participants (22.2%) were left-handed. Whilst eight (8) participants (50%) did not play video games very often, two (2) participants (20%) reported playing video games regularly.

### 5.2. Creating the Experience

*Chapter 3* documents the development of *Melancholy Reverie* from its original inception to the final game. However, several changes were made to *Melancholy Reverie* before the distribution, and some issues were also encountered during the execution of the experiment.

Changes were made to the Pause Menu of *Melancholy Reverie*, which contained the following functionality: view full transcript, read controls, and quit. Originally the Pause Menu was contained within a separate scene to the main gameplay scene. The pause scene was triggered by an on-click function. However, before distributing the game, the Pause Menu was moved onto a canvas in the main gameplay scene. When the player selected *Pause* on the main gameplay scene, the alpha of the main UI canvas group (inventory, inventory button, and start button) set to 0 to hide it and blocks ray casts to disable interaction. This meant that when the player resumed *Melancholy Reverie* the game did not restart.

To distribute *Melancholy Reverie* amongst participants, the game was exported from Unity as an executable file. However, the asset load time was 2 hours+ the first time that

this was attempted to build *Melancholy Reverie* in Unity. To reduce the build time, unused assets were removed, and other assets were optimised, but this did not reduce the asset load time. The recursive serialization error suggested that there was a problem with how assets were being serialized. There was also an exception when creating an asset at the path location Assets/HDRPDefaultResources.

*Melancholy Reverie* uses the Universal Render Pipeline, not the High-Definition Render Pipeline. However, the HDRP pipeline was installed in the project's built-in assets. Once this this pipeline was uninstalled, the build time was under 30 seconds.

Four of the participants contacted were not using a Windows operating system. Since *Melancholy Reverie* is not compatible with MacBook's, these individuals were unable to participate despite their willingness to test the simulation.

One item of feedback provided by the first participant was that there were too many gems to collect in the landscape. P1 said the gem system made him feel as if he was '*in a game collecting points*,' which took away '*from purely experiencing*' the game. Following this feedback, the number of gems in the *landscape* was reduced by lowering the 'Spawn Chance' setting in the resource spawner to 5. I also increased the 'Distance Between Checks' setting to 30, which determines how often the script will attempt to place a gem as it iterates across the terrain. The remaining participants found it more difficult to find gems.

### **5.3. User Feedback**

This section describes how the feedback was obtained. As discussed in *Section 4.2*, two methods were used to test *Melancholy Reverie*:

- User Feedback
- Questionnaire

10 users undertook the experiment to evaluate the system, split into two groups. The first group of 5 participants tested the game in-person, and both methods were used to gather the results. in a controlled environment. User-feedback was collected by shadowing the player, using the think-aloud protocol, and finally the questionnaire. The second group of 5 participants tested the game without the tester present and then filled out the questionnaire. The average immersion score of all 10 participants was 2.805 out of 5.

### 5.3.1 In-Person User Feedback

User-feedback was collected by shadowing the player and using the Think-Aloud Protocol. This qualitative technique was tested on five (5) users. The game was played in the application window of *Melancholy Reverie* on a Lenovo laptop. The Windows interface was closed to prevent accidental use of it. The participants in the experimental group also used Bose Quiet Comfort headphones to listen to the music and dialogue in the game. This was to prevent external noise from interfering with gameplay. The participants could not see any timepiece during the running of the experiment.

### 5.3.2 Questionnaire Deployment

The results for 10 participants were gathered from a questionnaire. 5 of these participants were tested as described in *Section 5.3.1*. The remaining 5 participants were tested without the tester present. 2 of these were participants were expert-reviewers with a background in psychogeography. Each were emailed an executable and asked to play with it for as long as they wished, and then fill out the questionnaire. Participants played *Melancholy Reverie* for between 15 and 30 minutes.

#### 5.3.2.1. Psychogeographer Feedback

Two psychogeographers reviewed the system; they were emailed an executable, and asked to play with it for as long as they wished, and then fill out the questionnaire. A brief biography of the two participants is presented below, and (as can be seen) both have extensive experience in psychogeography. Their completed questionnaires are presented in the Appendix.

<b><i>Psychogeographer 1 (PG1)</i></b>	Male, Aged 50-55, has been a psychogeographer for over 14 years. He is left-handed, and wears glasses. He is an expert computer user, and has played computer games regularly for over 40 years.
<b><i>Psychogeographer 2 (PG2)</i></b>	Male, Aged 55-60, has been a psychogeographer for over 22 years. He is right-handed, and wears glasses. He is an mid-level computer user, and does not play computer games at all.

*Table 3: Demographic Information of Psychogeographers PG1 and PG2*

Both participants were highly engaged with the system, and enjoyed mastering the game, and the experiences it gave them. PG1 and PG2 were amongst the highest scoring participants, with immersion scores of 4.385 and 4.308 respectively. Some notable differences between the two participants:

- PG1 was more aware of the real-world than PG2 (Question 3), and this may be because PG1 has more computer experience and more gaming experience than PG2.
- PG1 quickly forgot that they were using the control at all, and was experiencing the game, whereas PG2 took more time to master the controls, and was more conscious of them (Question 8), and this again may be to do with PG1 having more computer experience and more gaming experience than PG2. This is also reflected in Question 12, related to how easy they felt the games way.
- PG1 felt less emotionally attached to the game (Question 14), this may be related to their experience in gaming, or their desire to have their own avatar. PG2 was more emotionally engaged, and noted how much they enjoyed the setting and environment of the game.

In terms of what they enjoyed, PG1 really enjoyed the autonomy that the game allowed them, and loved being able to control the character, and create their own narrative from their interactions, whereas PG2 loved the environment, and they compared it to a fairy tale setting, giving the experience a dream-like quality. In terms of what they disliked, PG1 wanted more of everything (more forest, more interactions, more experiences), whereas PG2 wanted more reminders of how to use the controls, and how to interact with the environment. Finally, in terms of additional features, PG1 wanted a feature to create their own avatar, and PG2 wanted to have more audio features.

As well as the standard questions, the psychogeographers were asked for additional comments from their expertise as psychogeographers, and both were very impressed with the system, and were immersed in the game. PG1 felt that the games provided them with similar experiences (*'without having to get out of my chair'*), but because the setting was not urban, they saw differences between the game and their typical wandering. PG2 cared far less about the setting, and was more focused on how the experience produced reflections and memories for them. In fact, as mentioned earlier, they felt the forest setting produced a fairytale/dream-like quality to the experience.



Ultimately, both experts felt that the system provided them with a comparable experience to their psychogeographical wanderings. It is worth noting that the more technically experienced participant (PG1) found it easier to use the system, whereas the less experienced one (PG2) found it harder to master the controls, but ultimately felt the system was more emotionally engaging.

#### 5.3.2.2 Participant Feedback

The remaining eight (8) participants did not have a background in psychogeography. P1 to P5 tested *Melancholy Reverie* in-person. They were shadowed by the tester for half of the game. The Think-Aloud Protocol was used for the rest of the game. Then, participants completed the questionnaire at the end of the game. A brief biography of the 5 participants is presented below.

<b><i>Participant 1</i></b> <b><i>(P1)</i></b>	Male, Aged 18-30. He is right-handed and does not wear glasses. He is an expert computer user and has some experience with games.
<b><i>Participant 2</i></b> <b><i>(P2)</i></b>	Male, Aged 18-30. He is right-handed and does not wear glasses. He is an expert computer user and has never played video games.
<b><i>Participant 3</i></b> <b><i>(P3)</i></b>	Female, Aged 18-30, with a background in anthropology and linguistics. She is left-handed, and does not wear glasses. She is an occasional computer user and does not have much experience with games.
<b><i>Participant 4</i></b> <b><i>(P4)</i></b>	Female, Aged 18-30. She is right-handed and does not wear glasses. She is an expert computer user and does not have much experience with games.
<b><i>Participant 5</i></b> <b><i>(P5)</i></b>	Female, Aged 51-70. She is right-handed and wears glasses. She is an occasional computer user and does not have much experience with games.

*Table 4: Demographic Information of P1 to P5*

P6 to P8 tested *Melancholy Reverie* without the tester present; they were emailed an executable, asked to play with it for as long as they wished, and then fill out the questionnaire. A brief biography of the three participants is presented below.

<b><i>Participant 6 (P6)</i></b>	Male, Aged 18-30 with a background in Computer Science. He is right-handed, and wears glasses. He is an expert computer user and experienced gamer.
<b><i>Participant 7 (P7)</i></b>	Male, Aged 18-30. He is a theologian and writer. He is right-handed, and wears glasses. He is an expert computer user and has some experience with games.
<b><i>Participant 8 (P8)</i></b>	Female, Aged 18-30. She is a psychotherapist. She is right-handed, and wears glasses. She is an expert computer user and has some experience with games.

*Table 5: Demographic Information of P1 to P5*

Some notable differences in the participants.

- Participants who were not experienced gamers were able to become more emotionally attached to *Melancholy Reverie*. P6 and PG1 were the only participants who regularly play video games. P6 and PG1 reported the lowest emotional response to the game out of all participants, respectively scoring 1 and 3. Whilst P2 to P5 reported the lowest levels of experience in gaming, they reported the highest emotional response to the game, scoring either 4 or 5.
- P1 and P5 spent the longest time playing *Melancholy Reverie* out of all participants. These two participants lost track of time the most out of all participants. Both participants spent a total of 45 minutes in the game and estimated that they had spent only 20 minutes in the game. This suggests that the more time that is spent in the game, the more immersed one can become.
- Around 30 gems in 7 varieties were placed across the whole landscape for players to pick up. When the player collected a gem, an item would appear in the inventory (e.g., purse, kit kat, cracked phone.) Responses to the gems were very different amongst participants. P2 was very angry that he couldn't do anything with the gems or 'win' anything. Indeed, P2 also received the second lowest immersion score of 2.846. Whereas P8 found the gems an 'interesting critique on our obsession with purpose/goals.' Even though she knew she could not 'complete or win' the game, she continued to collect all the gems.
- One focal point of *Melancholy Reverie*, which participants had very different reactions to, was the sky. The skybox was created from a 360 video of mountainous terrain in Derry. P2 really enjoyed the sky; he said that watching

the sky made him feel as though ‘something is about to happen, or he’s been there for a really long time.’ Whereas P5 said that the sky made her feel scared and deliberately angled the camera so that she couldn’t see the sky.

The results of the experiment reinforce the hypothesis that players who report a strong emotional response within the game will also experience high levels of immersion (H1).

- P5 was the only participant to create their own narrative during gameplay, and they had the highest immersion score out of all participants (4.538). P5 uniquely interpreted the game to be a survival game, the point of which was to make the character ‘un-lost’. As such, P5 was very afraid of falling off when she reached the edge of the game and led the character back to the path to bring the character somewhere safe. When P5 collected a kit-kat in the inventory, she said that this would come in useful if she was to find her way out of the forest.
- P4 also had a strong emotional response to the game and received one of the highest immersion scores amongst the participants (3.923). P4 found the ‘introspective nature’ of *Melancholy Reverie* thought provoking. This is particularly evident in her emotive description of the ‘unsettling juxtaposition of the beautiful, brightly coloured foreground, greyed out, desolate background, and the menacing sky.’

In terms of what participants enjoyed from the game, this varied depending on the background of each participant. For instance, P7 found the ‘exploration of time’ particularly thought-provoking and often referenced Proust in his comments on *Melancholy Reverie*. Whilst P8 commented that she enjoyed ‘the journey/experience of being in the game maker’s mind.’ The comments made by these participants appear to reflect the interests of P7, theologian, and P8, psychotherapist.

In terms of what they disliked, P1 and P4 commented on the gem system. P1 thought that the gems detracted from purely experiencing the game, whilst P4 found the gems difficult to pick up. P6 and P8 did not like the controls. P6, the experienced gamer, found they were like the controls on other open world games he had played. P8 also said that the controls were the reverse of what she was used to.

Ultimately, it is clear from comparing the immersion scores of participants with their responses that participants who were more immersed in the landscape experienced a more intense emotional reaction. Participants who were experienced gamers, P6 and

PG1, found it more difficult to engage with the landscape. P6 was not affected by the landscape. Whereas participants who were less focused on the ‘gamification’ of *Melancholy Reverie*, i.e., the gems and controls, were more immersed in the imagery and experience, particularly P4 and P5.

### 5.3.2.3 Quantitative results

The table below presents the results of the experiment from the immersion questionnaire.

Participant	Immersion Score
P1	3.231
P2	2.846
P3	3.769
P4	3.923
P5	4.538
P6	2.769
P7	3.385
P8	3.308
PG1	4.385
PG2	4.308

Table 6: Results of Immersion Questionnaire

The immersion score for each participant was calculated using the formula from Section 4.4.2 where:

$$i = \frac{flow + presence + immersion}{13}$$

## 5.4 Conclusions

The main goal of this experiment was to investigate the player’s level of immersion and their emotional response to *Melancholy Reverie*. This was to determine whether it was possible to provoke the emotional, sensory, and reflective experience of a psychogeography within a virtual landscape. The results showed participants experienced a wide range emotions and reflections in *Melancholy Reverie*. Participants reported feeling connected, lonely, scared and calm. The sky and edge of the game were two aspects in particular which provoked a strong emotional response. Overall, the

results of the experiment suggest that participants who experienced stronger emotional responses tended to be more immersed in the game.

## 6. CONCLUSIONS AND FUTURE WORK

### 6.1. Introduction

This project set out to explore a research question, and that question is if it is possible to develop a narrative-based psychogeographic experience that would be immersive, and if the level of immersion is associated with the level of emotional engagement of the participants. Based on the evaluation in the previous chapter, it is clear that there is evidence that this goal has been met. This chapter sets out to present some of the key conclusions derived from this entire project process (with conclusions from the literature review process, the design process, the development process, and the evaluation process), and finally it presents some ideas for future work for this project.

### 6.2. Conclusions

Presented below are some of the key conclusions from each of the key stages of this project: the literature review, the design process, the development process, and the evaluation process.

#### 6.2.1. Literature Review Conclusions

Psychogeography is typically used as a research method in the real-world environment. Lefebvre and Debord – the earliest pioneers of psychogeography – walked the streets of Paris. Tim Robinson and Manchan Magan – examples of contemporary psychogeography – recorded their experiences in Ireland. *Section 2.2* explores the work of these writers, poets and artists. There were two main points drawn from this review of psychogeography:

1. All these psychogeographies take place in the real-world.
2. Almost all contemporary research used static visualisations, e.g. mental maps.  
The only exception is Conor McGarrigle who developed an AR application *NAMALand* (2018).

Evidently, the use of computational technology and virtual landscapes in the field of psychogeography had yet to be explored. Thus, the conclusion was drawn that an interactive psychogeographical tool could be developed to explore a virtual landscape that was not situated in the real-world.

The medium of the video game provided the ideal conditions to carry out a psychogeography of a virtual landscape for one key advantage that it provides: players become active participants in the narratives (Schulzke, 2014). Unlike other narrative forms – such as books or films – players can make their own choices and guide the narrative themselves.

Immersion, presence and flow are key metrics that researchers use to analyse the effectiveness of video games. This is because video games are understood to possess several ideal characteristics that ‘create and maintain flow experiences’ (Sherry, 2004). Thus, several user-based spatial evaluation metrics were also researched to understand how to measure the participants’ level of immersion in *Melancholy Reverie*.

#### 6.2.2. Design Conclusions

Based on the conclusions from the Literature Review, I chose to design *Melancholy Reverie*, a video game that simulates a psychogeography within the virtual world. It is an allegorical landscape that takes place within my mind.

The allegorical landscape that is depicted in *Melancholy Reverie* is a forest. Inspiration was drawn from Richmond Park in the development of the simulation, a locale that the researcher had visited hundreds of times. However, the landscape was produced as a mental image. The foreword of *Melancholy Reverie* mentions the geographical location of this forest to the player. But the dialogue implies that this forest exists in the player’s mind, not the real world.

*Melancholy Reverie* was created in Unity with this specific idea in mind: to create a virtual landscape that could provoke thought and emotion. This guided the actual development of the psychogeography, which was extremely iterative and experimental in nature. But it should be noted that there was no real distinction between the design and development stages of *Melancholy Reverie*.

#### 6.2.3. Development Conclusions

*Melancholy Reverie* is an interactive role-playing game from the third person perspective. The participant can move around the landscape, pick up items, and listen to the dialogue. The participant is not merely observing the landscape, as they would watch a film, they can momentarily live *within* the landscape.



To develop this, several components were essential:

- A character controller
- An inventory
- A dialogue system
- An avatar

The character controller was first developed in the first-person perspective. However, this was later changed to the third-person perspective so that the player could see the avatar that they were controlling. When the Nav-Mesh component was implemented (to fix issues with picking up inventory items), the WASD controller was also altered. In the final version of *Melancholy Reverie*, the player uses right-click to move, left-click to pick up items, and the arrow keys to control the camera.

Creating the functionality for an inventory was one of the most challenging stages of development. It involved (1) creating the functionality of the Player Controller, which allowed the player to “focus” on items, (2) creating the general behaviour of interactable objects, e.g. focus & de-focus of the mouse and facing the objects, and (3) creating the specific behaviour for picking up items. This way, when the player interacted with the item, the specific behaviour to pick up the item and store it in the inventory was triggered.

The dialogue system was simple to create. I wrote a dream-like story that was intended to provoke reflections on the landscape. To encourage players to immerse themselves in *Melancholy Reverie*, the dialogue automatically changes, and a voice-over was recorded to read the story.

Creating the avatar was the most time-intensive stage of development. The program MagicaVoxel was used to create an avatar, combining the abstract pixellated style of the earliest video games with the anthropomorphism of contemporary games. The avatar was then rigged and animated in Blender to have a simple walk-cycle. Since the act of walking forms the basis of any psychogeography, it was essential to create an avatar with a realistic walk.

#### 6.2.4. Evaluation Conclusions

The experiment measured the extent to which a landscape that is not situated in the real-world can affect the same emotions and reflections as a real-world psychogeography (a

psychogeography that takes place walking the streets of a real-world place). The hypothesis set out in *Section 1* was as follows:

H1. Participants who report a strong emotional response within the game will also experience high levels of immersion.

A triangulation of quantitative and qualitative user-based evaluation metrics were used to test this hypothesis. Participants completed a questionnaire which had 13 questions covering the 3 concepts of flow, presence and immersion. An immersion score was calculated from this questionnaire, which comprised the quantitative metric. Shadowing and the Think-Aloud Protocol were used as the qualitative user-based metric.

A total of 10 participants, including 2 psychogeographers, participated in the experiment. It was found that an increased level of immersion in *Melancholy Reverie* resulted in a heightened emotional response. Emotions and reflections that would be experienced in a comparable real-world scenario were perceived in this simulacrum, including the feelings of loneliness, sadness, calmness, and connection, were all reported in *Melancholy Reverie*.

### **6.3. Future Work**

Based on the user feedback, and well as ideas developed during the lifecycle of this project, a new of potential new ideas and directions have been identified as potential future concepts for this project. Some of those key concepts are outlined below.

#### **6.3.1. Platform Independence**

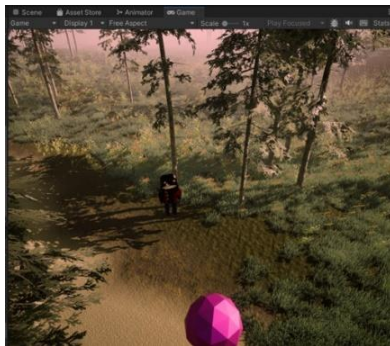
At the moment the system only works in Windows environments, which somewhat limits the overall userbase for this project, as well as limiting the number of people who could test this project, there are several potential ways that this issue could be addressed.

- Unity does provide a feature called *Platform Dependent Compilation*, which consists of preprocessor directives that let developers execute a section of code exclusively for one of the supported platforms (which includes Mac OS X, Unix, Android, PS4, Wii, and Xbox One).
- The executable could be shipped with a Cloud Container or a Virtual Machine that can be run on a Mac OS X system, while internally the system is running a window instance.

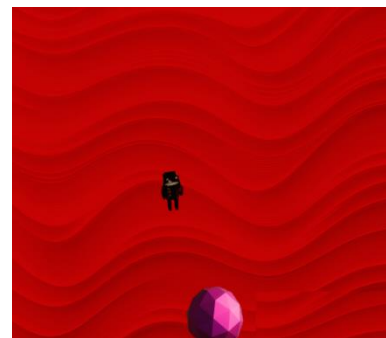
- The system could be redeveloped to be completely platform independent, and potentially web-based, this would involve wrapping the existing code in a language like Java or Python.

### 6.3.2. Additional Features

Most of the users who tested the system wanted more content (levels, items, characters, etc.), and this can be achieved in a number of ways. A simple way to add new levels would be to alter the background environment, by changing the colour of the foliage and “floor” of the environment, or more extremely to alter the background to a more surreal (“Twin Peaks”-inspired) landscape below:

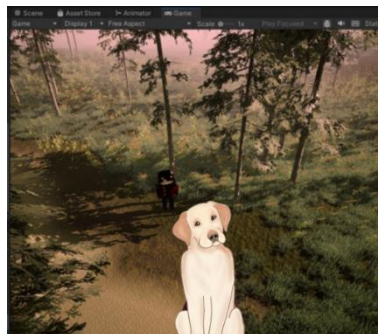


*Figure 61: Original Environment*



*Figure 62: "Twin Peaks" Environment*

Additionally, there could be more variability in the items to collect, as well as the addition of NPCs, that could include, for example, a companion character:



*Figure 63: Alternate Inventory Items*

### 6.3.3. More User Configuration

At the moment the users are brought into an environment, and the goal of which is to experience it as it is presented to them; and that environment is designed to elicit specific reactions from the users, based on a number of factors, one of which is their level of autonomy within the system. If that degree of autonomy were increased (e.g. that the users, could change their avatar, or change the environment from rural to urban), that would fundamentally change the experience for some of the users, and that would be worth exploring in the future.



*Figure 64: User Configuration*

### 6.3.4. Integrating alternate base maps

Rigging and animating the avatar in Blender caused lots of problems. Some of these issues, such as baking the character and creating the rig, created unique graphics. These could be integrated into the actual game in the future. For example, the image below shows the accidental abstraction that is caused when a base map is incorrectly exported from Blender to Unity. An option could be made for the user to switch between the correct and incorrect base map of their player.



*Figure 65: Incorrect avatar base map*

#### 6.3.5. Post-Processing Effects

One way that *Melancholy Reverie* could be developed in the future is by adding custom post-processing effects. Custom post-processing effects are based upon extending a custom render pass. It is a simple process, which involves running some shader code on the image during the post-processing phase or utilising the volume tool. The effects can be made in shader graphs, so can be easily customised. For example, it is simple to create a black and white filter, a pixellated effect, or even a dissolve shader effect. These different effects could be triggered when the player enters a certain area or clicks on an item. They could also be used as transitions into other scenes. It would be worth integrating these into the game as they could enhance the dream-like quality of *Melancholy Reverie*.



*Figure 66: Dissolve shader effect*

#### 6.3.6. Political Aspects of Psychogeography

The political dimension of psychogeography was explored in the Literature Review (Section 2.2.5). Psychogeography was first conceived as a revolutionary protest for

radical social change, a reaction against capitalist ideals (Debord, 1955). It was also found that there are very few psychogeographies that use the computational tools and fulfil this political dimension – most contemporary psychogeographies focus on the visualisation, rather than the political ideation.

In future work, the subversive/political dimension of *Melancholy Reverie* should be highlighted more. Some players described feeling unsettled by the eerie glitching sky and the edge of the game. Indeed, these were the strongest reminders that it was a simulation, an un-real environment capable of generating the sensation of being in the real-world. But *Melancholy Reverie* should make it clearer that it is part of the wider technological shift away from the real, tangible parts of our world, and towards AI and the un-real. The dialogue, or even the objects that are in the world, could integrate this unnerving political dimension.

## **6.4 Final Conclusions**

This chapter provided an review of the entire project. The research that was carried out in the Literature Review (*Chapter 2*) formed the starting point of *Melancholy Reverie* and highlighted the possibility of creating a psychogeography in an immersive virtual landscape. As documented in *Chapter 4*, Unity and Blender were used to develop *Melancholy Reverie*, an allegorical landscape that takes place in my mind. The design and results of the experiment were presented in *Chapters 5 and 6*. The evaluation confirmed the hypothesis set out in *Chapter 1* and demonstrated that a virtual landscape can provoke the same emotions and reflections as a real-world psychogeography.

## 7. BIBLIOGRAPHY

- Adams, E. (2014). *Fundamentals of Game Design*.
- Aarseth, E. (2001). Allegories of space. The question of spatiality in computer games.
- Almeida, J.E., Rossetti, R.J., & Coelho, A.L. (2013, June). Mapping 3D character location for tracking players' behaviour. In *2013 8th Iberian Conference on Information Systems and Technologies (CISTI)* (pp. 1-5). IEEE.
- Almeida, S., Mealha, O., & Veloso, A. (2016). Video game scenery analysis with eye tracking. *Entertainment Computing*, 14, 1-13.
- Doherty, S.M., Keebler, J.R., Davidson, S.S., Palmer, E.M., & Frederick, C.M. (2018, September). Recategorization of video game genres. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 62, No. 1, pp. 2099-2103). Sage CA: Los Angeles, CA: SAGE Publications.
- Drachen, A., & Canossa, A. (2009, September). Analyzing spatial user behavior in computer games using geographic information systems. In *Proceedings of the 13th international MindTrek conference: Everyday life in the ubiquitous era* (pp. 182-189).
- Duncker, K. (1945) "On Problem-solving", in Dashiell, J.F. (1976) "Psychological Monographs, The American Psychological Association", Inc., London vol. 58, pp. 1-114.
- Dorn, H., Törnros, T., Reichert, M., Salize, H.J., Tost, H., Ebner-Priemer, U., MeyerLindenberg, A., & Zipf, A. (2015). Incorporating Land Use in a Spatiotemporal Trigger for Ecological Momentary Assessments.
- Gee, J.P. (2008). Video games and embodiment. *Games and culture*, 3(3-4), 253-263.
- Gillespie, T., Boczkowski, P.J., & Foot, K.A. (2013). The Relevance of Algorithms. In *Media Technologies: Essays on Communication, Materiality, and Society* (pp. 167-193). MIT Press.
- Harley, B. (1988). *Maps, Knowledge and Power*.
- Ibezim, N. (2016). Interactive Computer Simulation and Computer Simulation Video: Comparative Perspective in Cognitive Achievement in Petrol Engine, 18(6), 126–131. <https://doi.org/10.9790/0661-180604126131>
- Ivory, J.D. (2015). A brief history of video games. In *The video game debate: Unravelling the physical, social, and psychological effects of digital games* (pp. 1-21).



- Jaspers, M.W., 2009. A comparison of usability methods for testing interactive health technologies: methodological aspects and empirical evidence. *International journal of medical informatics*, 78(5), pp.340-353.
- Jennett, C., Cox, A.L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International journal of human-computer studies*, 66(9), 641-661.
- Jin, S.A.A. (2011). "I feel present. Therefore, I experience flow:" A structural equation modeling approach to flow and presence in video games. *Journal of Broadcasting & Electronic Media*, 55(1), 114-136.
- Juul, J. (2001). Games telling stories? A brief note on games and narratives. *Game Studies*, 1(1).
- Kaouther Adimi. (2020). Our Riches. New Directions Publishing.
- Krahmer, E. and Ummelen, N., 2004. *Thinking about thinking aloud: A comparison of two verbal protocols for usability testing. IEEE transactions on professional communication*, 47(2), pp.105-117.
- McGarrigle, C. (2017). Walking Code. *Acoustic Space, Renewable Futures 16:1*, 247-259. doi:10.21427/n3gr-x667.
- Meier, S., & Glinka, K. (2018). Psychogeography in the Age of the Quantified Self — Mental Map modelling with Georeferenced Personal Activity Data.
- Morrison, D., Annamma, S.A., & Jackson, D.D. (2017). Critical Race Spatial Analysis. Stylus Publishing (VA).
- Morrison, A., Oulasvirta, A., Peltonen, P., Lemmela, S., Jacucci, G., Reitmayr, G., Näsänen, J. and Juustila, A., 2009, April. Like bees around the hive: a comparative study of a mobile augmented reality map. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 1889-1898).
- Mustaqeem, & Kwon, S. (2019). A CNN-Assisted Enhanced Audio Signal Processing for Speech Emotion Recognition. *Sensors*, 20(1), 183. <https://doi.org/10.3390/s20010183>
- Nacke, L., & Lindley, C.A. (2008, November). Flow and immersion in first-person shooters: measuring the player's gameplay experience. In *Proceedings of the 2008 conference on future play: Research, play, share* (pp. 81-88).
- Nielsen, J. (2000). Why you only need to test with 5 users. *Nielsen Norman Group*. <https://www.nngroup.com/articles/why-you-only-need-to-test-with-5-users/>
- Rieman, J., Franzke, M. and Redmiles, D., 1995, May. Usability evaluation with the

- cognitive walkthrough. In Conference companion on Human factors in computing systems (pp. 387-388).*
- Sanders, T., & Cairns, P. (2010). Time perception, immersion and music in videogames. In *Proceedings of HCI 2010 24* (pp. 160-167).
- Schulzke, M. (2014). The critical power of virtual dystopias. *Games and Culture*.
- Soutter, A.R.B., & Hitchens, M. (2016). The relationship between character identification and flow state within video games. *Computers in human behavior*, 55, 1030-1038.
- Sylaiou, S., Chountasi, M., & Lagoudi, E. (2014). Towards a Digital Age Psychogeography and the hybrid flâneur. *Walking Art / Walking Aesthetics*. Retrieved December 18, 2022, from <https://walkingart.interartive.org/2018/12/towards-a-digital-age>
- Wilson, C.E., 2006. Triangulation: the explicit use of multiple methods, measures, and approaches for determining core issues in product development. *Interactions*, 13(6), pp.46-ff.
- Wolf, M.J. (2003). Abstraction in the video game. In *The video game theory reader*, 1, 47-65.8.

## **8. APPENDIX A**

### **QUESTIONNAIRE**

1. Age  
18-30  
31-50  
51-70
2. Gender  
Female  
Male  
Non-binary
3. Glasses  
Yes  
No
4. Handed-ness  
Left-handed  
Right-handed  
Ambidextrous
5. Level of computer use  
Never  
Not very often  
Sometimes  
A Lot
6. Level of game playing  
Never  
Not very often  
Sometimes

### **YOUR EXPERIENCE OF THE GAME<sup>16</sup>**

Please answer the following questions by circling the relevant number. In particular, remember that these questions are asking you about how you felt at the end of the game.

7. To what extent did you feel you were focused on the game?  
Not at all 1 2 3 4 5 A lot
8. How much effort did you put into playing the game?

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<sup>16</sup> Adapted from Jennett, Cox, et. al., (2008)

Not at all 1 2 3 4 5 A lot

9. To what extent did you find the game challenging?

Not at all 1 2 3 4 5 Very difficult

10. To what extent did you feel motivated while playing?

Not at all 1 2 3 4 5 A lot

11. To what extent did you forget about your everyday concerns?

Not at all 1 2 3 4 5 A lot

12. To what extent did you feel that you were interacting with the game environment?

Not at all 1 2 3 4 5 Very much so

13. To what extent were you aware of yourself in your surroundings?

Not at all 1 2 3 4 5 A lot

14. To what extent did you feel as though you were moving through the game according to your own will?

Not at all 1 2 3 4 5 Very much so

15. To what extent did you experience an emotional response to the game?

Not at all 1 2 3 4 5 Very much so

16. At any point did you find yourself become so involved that you were unaware you were even using controls?

Not at all 1 2 3 4 5 Very much so

17. To what extent did you feel that the game was something you were experiencing, rather than something you were just doing?

Not at all 1 2 3 4 5 Very much so

18. To what extent did you feel consciously aware of being in the real world whilst playing?

Not at all 1 2 3 4 5 Very much so

19. At any point did you find yourself become so involved that you wanted to speak to the game directly?

Not at all 1 2 3 4 5 Very much so

**ADDITIONAL QUESTIONS:**

How long do you think you were in the game for?

How long were you in the game for?

One thing you liked about the game:

One thing you disliked about the game:

One thing you would change about the game: