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**A framework for evaluating presence
in VR narrative games**

A thesis

submitted in partial fulfillment

of the requirements for the degree

of

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by

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Abstract

This research develops a framework that unveils how players feel present in Virtual Reality (VR) narrative games. In 2017, there were over 2.2 billion active video gamers, and VR is a future game platform because VR provides immersive gaming experiences where players experience presence. Slater and & Wilbur (1997, p. 14) define presence as the “sense of being in the virtual environment.” Previous research demonstrated that narrative could improve presence in VR games but left open the discussion on the causal relationship. Therefore, understanding how game narrative contributes to presence could further improve VR gaming experiences.

This research reviews Wei, Bizzocchi & Calvert’s (2010) and Ryan’s (2015) frameworks that evaluate narrative games and presence in VR narratives respectively. Wei et al. and Ryan's frameworks are combined to propose The Augmented Framework which is then used to evaluate the self-produced VR narrative game, *Caillte*. The evaluation yields insights which improve the usage of The Augmented Framework for analysing other VR narrative games.

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Chapter 1 - Introduction

Playing video games has become an indispensable part of modern life. Globally, there were over 2.2 billion active video gamers by the end of 2017 (AAStocks, 2017). Virtual Reality (VR), described as “an illusion of reality created by a computer system” (Christensson, 2006, para. 1), is popularised as the future game platform.

VR provides a unique experience compared to traditional screen-based technology. “The (psychological) sense of being in the virtual environment”, known as Presence (Slater & Wilbur, 1997, p. 14), is an important feature of the VR experience, as it creates an illusion where the player feels transported into, as if personally attending, the events happening in the game world.

The VR game *The Virtual Hospital* (Gorini, Capideville, De Leo, Mantovani & Riva, 2011) demonstrated that narrative can also improve presence. However, Gorini et al.’s work does not discuss how narrative affects presence, so there is opportunity for further research into the relationship between narrative and presence.

Shin (2018) emphasises the significance of a narrative to the VR experience: “One practical implication is that, no matter how functional and advanced

the technology, the key is to focus on the story, not the technology itself or any special 3D effects" (p. 72).

Wei, Bizzocchi and Calvert (2010) have developed a framework for examining the narrative design of a non-VR computer game. However, Wei et al.'s framework does not analyse how presence emerges from the narrative. Ryan's (2015) framework explains how presence is affected by narrative design. By combining Wei et al.'s and Ryan's frameworks, there might be a systematic framework for examining how presence arises in VR narrative games.

Therefore, this research investigates how combining the frameworks of Wei et al. and Ryan (2015) can provide a lens for understanding how narrative improves presence in VR games.

1.1 Research questions:

There are three research questions (RQ) to investigate in this thesis, as shown below:

1.1.1 Research Question 1:

What is the current understanding of presence in VR?

Research Question 1 surveys the status quo within the literature on VR and presence to lay a groundwork for the understanding of Wei et al.'s (2010) and Ryan's (2015) works, which look at narrative games and VR narratives respectively.

1.1.2 Research Question 2:

How can Wei et al.'s (2010) and Ryan's (2015) frameworks be combined for examining how presence arises in VR narrative games?

While Wei et al.'s framework (2010) evaluates player experience in narrative games and Ryan's (2015) framework links viewer experience in VR narratives, neither examines presence in VR narrative games. Addressing Research Question 2 involves combining Wei et al.'s and Ryan's frameworks into an augmented framework.

1.1.3 Research Question 3:

What can be learned from applying The Augmented Framework to a self-produced VR narrative game?

The Augmented Framework is used to analyse a self-produced VR narrative game, *Caillte*, to provide insight for improving how the framework unveils the mechanisms behind presence. Research Question 3 provides the basis for abductively addressing the thesis statement.

1.1.4 To answer Research Question 1

Answering Research Question 1 requires investigating the roles of VR and presence, and the ways in which different VR systems induce presence. The literature review chapter (Chapter 2) contains the investigation and answers Research Question 1.

The research starts with the current literature on VR and presence. Then, the research presents the literature that examines how technological factors contribute to presence, including an overview of the history of VR technology and a discussion of the capacity to induce presence by existing VR devices. The characteristics of presence and how existing VR technology contribute to presence become clear, which benefits the research to further investigate the relationship between presence and VR narrative which form the basis of the practice led trial in Chapter 3.

1.1.5 To answer Research Question 2

Answering Research Question 2 requires an understanding of VR narrative and narrative games, how presence arises from a VR narrative, and a close look at Wei et al.'s (2010) and Ryan's (2015) frameworks individually, as well as what further insights can be gained by combining them.

The research introduces the concept of narrative and the elements upon which narrative relies. This is followed by a brief introduction to narrative

in computer games, with reviews of narrative in selected computer games. Finally, Wei et al.'s framework (2010) is introduced and discussed.

The research then links narrative to VR by introducing Ryan's framework (2015), listing and discussing existing VR narrative strategies for inducing presence in films and games, and analyses examples of different VR narratives for their effectiveness for inducing presence. This examination illuminates how presence arises from VR narrative games and prepares Ryan's (2015) framework for augmenting.

Then the research adjusts Wei et al.'s (2010) and Ryan's (2015) frameworks to suit VR narrative games and the resulting Augmented Framework is proposed and outlined.

1.1.6 To answer Research Question 3

Research Question 3 is addressed by a practice-led research study where the augmented Ryan/Wei et al. framework is used to examine a self-made VR narrative game. The study, in Chapter 3, examines a self-created demonstration game using The Augmented Framework. The suitability of The Augmented Framework for examining VR narrative games is then addressed in Chapter 4.

1.2 Thesis structure

Chapter 2 reviews the existing literature to aid in understanding the individual roles of presence, VR and narrative, as well as their functional relationship with each other. Chapter 2 first surveys the link of the concept of presence with VR technology by introducing a brief history of VR, with focused discussed on presence. Then an analytical discussion of the literature is given to answer RQ1: *what is the current understanding of presence in VR?*

Chapter 2 continues with a close look at Wei et al.'s (2010) framework and an investigation on narrative game examples are presented. Similarly, Ryan's (2015) framework and VR narrative examples are introduced to discuss presence. Chapter 2 ends with a discussion of how to integrate Wei et al.'s (2010) and Ryan's (2015) frameworks into The Augmented Framework.

Chapter 3 investigates the emerging mechanism of presence from VR narrative games. An experiment was done using the practice-led methodology of Abduction. A VR narrative game *Caillte*, created for the experiment, is documented followed by an analysis of *Caillte* using The Augmented Framework. Discussion and summary of the results are given at the end of Chapter 3, which creates the conditions for answering Research Question 3 in Chapter 4.

Chapter 4 answers RQ3, *what can be learned from applying The Augmented Framework to a self-produced VR narrative game*, by addressing the hypothesis through a discussion of the results found through the experiment, as well as considering the limitations of the research, arriving at proposed suggestions for the improvement of presence in VR narrative games. This chapter continues by discussing how the research's Augmented Framework may be applied to other VR narrative games. Chapter 4 ends with proposals for future research that may improve The Augmented Framework.

Chapter 2 - Literature Review

This chapter investigates the definitions and concepts relating to presence (see Section 2.1), video game narrative time and space (see Section 2.2), as well as VR storytelling (see Section 2.3). Wei et al.'s (2010) and Ryan's (2015) frameworks are introduced, and an augmented framework (see Section 2.4) is created. This chapter addresses RQ1: *what is the current understanding of presence in VR*; and partially addresses RQ2: *how can Wei et al.'s (2010) and Ryan's (2015) frameworks be combined for examining how presence arises in VR narrative games?*

2.1 VR and presence

An increasing number of people appreciate the fascination of Virtual Reality (VR) as a game platform for a unique and compelling gaming experience. Because of the rapid advances of VR technology, presence shows signs of sprouting. Game designers and researchers believe that presence makes the VR game experience exceptional, and therefore creating presence is a worthy goal.

This section will briefly outline the development of VR and the characteristics of presence, followed by an introduction of existing VR

devices related to presence, and concluding by answering Research Question 1.

2.1.1 Virtual reality

To understand presence, it is necessary first to understand VR. So, the research begins by introducing VR, its definition, characteristics and popularity as a game platform.

2.1.1.1 Defining virtual reality

VR refers to a three-dimensional artificial environment simulated by a computer and presented in a highly humanised way, through which the user feels present in the environment (Virtual Reality Society, n.d., para. 5).

VR can simulate environments that are either realistic or imaginary, so VR can provide experiences that are impossible in the real world. This research uses the term 'VR Environment' to denote the artificial world generated by a VR system.

2.1.1.2 The uniqueness of VR

Creating the illusion of presence is the unique capability of VR, which other interactive technologies find hard to replicate. VR is delivered via devices which may provide the user with, visual, auditory, tactile and other sensory

information. This variety of sensory information imitates the way the physical world provides information that is perceived by human senses, so that the brain can perceive the artificial world as real. It is this perception of the VR environment as real that makes VR special.

Benefited by this imitation, the user can act in the VR environment as naturally as in the real world, rather than being limited to interacting in a rigid manner, such as performing actions using the traditional screen, keyboard and a mouse. When using up-to-date VR technology, the user can look around and navigate within the VR environment, as well as modify virtual objects using gestures or verbal commands, which makes the performance of the user's actions in the environment realistic and similar to those in the physical world.

The vividness of VR allows a possible experience within physical reality to be undertaken at less cost and danger in a VR environment than it would in real life. Cost-effective vividness provides unique opportunities to use VR as a simulator. Many fields have been found making good use of the features of VR, and the game industry is no exception. Natural interaction and costless plausible experiences have proved VR to be the next world that players explore.

2.1.2 Presence

Presence raises VR to a new level as a game platform. This section aims at understanding presence and how it can improve gaming experiences. Then the research introduces immersion as a contributor to presence and discusses the ways in which immersion and presence are related. A small subsection follows looking at interactivity and other contributors to presence. This section ends with a brief investigation of technological factors that contribute to increased immersion and interactivity.

2.1.2.1 Presence as a game experience enhancer

Presence is a mental state of belief of being situated in a VR environment (Slater & Wilbur, 1997, p. 14). When presence arises, the player feels they are absorbed into the game world and have become a part of it, just as the player feels they are a part of the real world. The objects that exist and events happening within the game world are perceived as real and as being in the same space and time as the player themselves. This perception can intensify the experience brought by the objects or events through which the player may enjoy living in the game world, instead of feeling like a spectator, sitting outside the space and merely watching it happening through a screen frame. Sanchez-Vives & Slater(2005) depict an outcome of the sense of presence:

For example, you see a deep precipice in front of you that you know is not really there in a physical sense. Your heart races and you are frightened enough by what you see to be very reluctant to move yourself closer to the edge. From a cognitive point of view you know that there is nothing there, but both unconsciously (e.g., heart rate) and consciously (your awareness of your own fear) you respond as if there is something there. How is this possible? This paradox is at the root of the concept of 'presence'. (p. 1)

Presence studies the nature of the phenomenon that differentiates VR from other electronic media. "Being in the game instead of merely playing it" (Gadget Flow, 2018, para. 2) gets the player caught up in the excitement generated by the game world. This is likely one of the reasons for VR becoming widespread. Presence has become a big topic within the game industry, due to its enhancement of the gaming experience. When people research the nature of presence, the concept of immersion, a significant factor in producing presence, is usually involved.

2.1.2.2 The concept of immersion

Bowman and McMahan (2007), paraphrasing Slater (2003), define immersion as "the objective level of sensory fidelity a VR system provides" (Bowman & McMahan, 2007, p. 38). Slater (2003, p. 3) claims that presence

can arise from a high level of immersion and so the theory of immersion helps understand presence inducement.

Immersion studies the richness of sensory information perceived by the user through a VR system. Vision plays a vital role in contributing to immersion, through:

field of view (FOV)—the size of the visual field (in degrees of visual angle) that can be viewed instantaneously, field of regard (FOR)—the total size of the visual field (in degrees of visual angle) surrounding the user, display size, display resolution, stereoscopy—the display of different images to each eye to provide an additional depth cue, head-based rendering—the display of images based on the physical position and orientation of the user’s head (produced by head tracking), realism of lighting, frame rate, and refresh rate. (Bowman & McMahan, 2007, p. 38)

FOV and FOR are significant contributors to the level of immersion, and highly immersive VR technologies tend to provide the user with wide FOV and FOR possibilities. Cummings and Bailenson (2016, p. 297) claim that FOV and stereoscopy are the significant factors contributing to increasing presence. Steuer (1992, p. 11) also points out that the number of senses immersed simultaneously by a system also contributes to immersion. As mentioned in Subsection 2.1.1.2, this includes visual, auditory, tactile and

other sensory information. The immersion properties listed within this subsection will be used to compare VR technologies (see Subsection 2.1.3).

2.1.2.3 Presence determined by interactivity

Steuer (1992, p. 10) defines interactivity as “the degree to which users of a medium can influence the form or content of the mediated environment”. By touching objects people have a sense of being in the same space as the touched object. Ryan (2015, p. 51) claims that interactivity also contributes to presence, because to touch an object in a VR environment imitates the way that people feel present in the real world.

Touching objects usually happens inseparably with firstly locating the objects in a space. Sheridan (1992, as cited in Ryan, 2015, p. 51) places interactivity into two categories which are, summarised by Ryan (2015, p. 52): “*to explore an environment*”, such as by repositioning the user’s head for stereo vision and/or auditory information, and “*to change it*”, which modifies the virtual objects existing in the environment.

A system reacts to the user’s inputs to support these actions. The aim of VR (see Subsection 2.1.1.1) extends the concept of reacting to abstract inputs (i.e. buttons pressed, such as those on a keyboard and a mouse) into the positioning and orientating of the user’s body. So a tracking system is

necessary in a VR system. Cummings and Bailenson (2016) use tracking level to measure a tracking system:

Tracking level refers to the number and types of degrees of freedom (DOF) with which a user is tracked by an immersive system. Manipulations of this feature include the quality of the input method (e.g., more natural movement tracking versus abstract controller input). It also refers to studies that have manipulated the relative (e.g., number of DOF tracked) or absolute (e.g., capacity to take action within the mediated environment versus simply observing the stimulus) level of tracking in order to measure its influence on feelings of presence. (p. 278)

Cummings and Bailenson (2016, p. 297) claim that tracking level is as important as FOV and stereoscopy in contributing to presence. FOV and head-based rendering rely on a tracking system. The interactivity properties listed within this subsection will be used to compare VR technologies (see Subsection 2.1.3).

2.1.3 VR devices and presence

With the growth of hardware capabilities, the levels of immersion and interaction raise, and a VR system can cope with increasingly complex tasks. To some extent, the innovation and development of VR technologies benefit the sense of presence. The following subsections evaluate previous VR

technologies to understand how presence arises from higher levels of immersion and interaction. The evaluation involves a variety of VR technologies: *Sensorama*, *The Sword of Damocles*, *CAVE*, VR-based powerwalls, *Google Cardboard*, *HTC Vive* and *Oculus Rift*.

2.1.3.1 *Sensorama*

Morton Heilig published *Sensorama* (U.S. Patent No. 3,050,870, 1962). *Sensorama* is a non-computerised multi-sensory theatre aim at providing the user with an immersive experience. *Sensorama* requires that the user sit by the machine and watch short films with a stereoscopic colour display; meanwhile, the spectator receives other sensory information, combining auditory, olfactory and tactile stimulus, coordinating with the film content, using a stereo-sound system, smell generator and vibrating chair, respectively.

Immersion benefits from utilising a wide range of human senses and stereo information, giving an illusion of depth. The films (Heilig, n.d.) designed for *Sensorama* give the user a first-person perspective. The lighting is more realistic compared with the lighting in the real world and VR environment. The interactivity of *Sensorama* is limited because there is no tracking system provided. *Sensorama* requires the user to fix their eyes on the lens. To some extent, the user must follow the pre-decided position and orientation of the

viewpoint camera in order to view the films, so the user has a low level of freedom to explore the environment. The user also cannot modify any virtual objects.

The VR environment provided by *Sensorama* immerses the user through multiple and detailed sets of sensory information. Regarding interactivity, however, the user feels isolated from the environment, since he or she cannot modify any virtual objects. Therefore, the presence perceived by the user through *Sensorama* relies on immersion.

2.1.3.2 *The Sword of Damocles*

The Sword of Damocles (Sutherland, 1968) was the first VR system to use a three-dimensional head-mounted display (HMD) and head tracking to map the first-person perspective and stereo view in real time. The weight of the HMD and the need for head tracking forced the system to have heavy frames and helmets fixed to the ceiling, and therefore the user's head position is fixed with the equipment.

The immersion by *Damocles* comes from head-based rendering and FOR, which also rely on the system's interactive function. Head-based rendering covers the user's vision with the display with "3000 lines at 30 frames per second" (Sutherland, 1968, p. 758), and changes images as the user moves their head. Regarding the FOR, the user can tilt their head and/or turn their

body to view “completely around” and “up or down thirty or forty degrees” (Sutherland, 1968, p. 757). However, FOV is 40 degrees, and therefore much narrower than human FOV. *Damocles* involves only vision, the width of sensory information provided is relatively narrower than *Sensorama*. Regarding the interaction to explore the VR environment, the tracking system of *Damocles* allows for the changes of view by moving the body and head. In terms of tracking level, reacting to head and body movement is a more natural interaction than *Sensorama*, which did not react to any kind of body movement. Similar to *Sensorama*, *Damocles* does not provide the user with the ability to modify any virtual object.

Unlike *Sensorama* which focused on only output fidelity, *Damocles* is a computerised system which considers the user as a part of the VR environment through reaction to the user’s inputs. The user thus has the feeling of being in the environment, since he or she has the power to choose the view. Immersion to *Damocles* is still the major contributor to presence increase and a starting point for being supported by interactivity.

2.1.3.3 CAVE

Cave Automatic Virtual Environment (CAVE) (Cruz-Neira, Sandin, DeFanti, Kenyon, & Hart, 1992) is a VR system using projectors directed to the surfaces of a room-shaped canvas. Situating the user inside the canvas and

wearing stereo glasses coupled with the tracking system, this technology aims at providing the user with a 360-degree VR environment.

CAVE supported a higher level of immersion than *Sensorama* and *Damocles*, because of the better FOV, FOR and stereoscopy. The room-shaped canvas creates a full FOV and FOR (Cruz-Neria et al. use *panorama* as FOR) when viewed from the inside. *CAVE* also outputs sound. Regarding interactivity, the head tracking function and stereo images allow the user to explore the VR environment in any position and orientation within the room meanwhile perceiving depth, which allows the full range of head motion rather than been limited by a heavy hardware system like *Sensorama* and *Damocles*. The weight and size of the stereo glasses used in *CAVE* guarantees a more natural head and/or body movement compared to the weight and size of *Damocles*. Cruz-Neria et al. (1992) did not claim that *CAVE* at the time supports any ability to change a virtual object.

Compared to *Sensorama* and *Damocles*, *CAVE* benefits from a more advanced system inducing presence through intensifying the immersive visual experience and offering more freedom to interact.

2.1.3.4 VR-based powerwalls

The world's first powerwall, *PowerWall* (The University of Minnesota, 1994), is a six by eight-foot screen-based visualisation system. Powerwalls were

not initially intended to provide an immersive experience but for displaying high-resolution data and facilitating collaboration. However, VR-based powerwalls do have immersive properties that can induce presence. Nowadays, some powerwalls combined with VR technology support stereo 3d imaging and motion tracking (e.g. TechViz, n.d.), meaning the user can observe and modify an object from various angles in detail.

A VR-based powerwall concentrates on presenting an object to the user rather than placing the user in an environment. Powerwalls commonly do not fully cover the user's sight which, in terms of immersion, leaves the user more aware of the real world than *Sensorama*, *Damocles* and *CAVE*. FOV and FOR are changeable and depend on the powerwall size and the relative positions and orientations of the user in relation to the powerwall. Some powerwalls offer rendering based on head position/orientation and may have stereo 3D glasses. The high image quality and resolution give powerwalls some advantage over *Sensorama* and *Damocles* to provide presence. As Cummings and Bailenson claim (2016), these properties that contribute to presence are "particularly" (p. 297) lower than others, such as high FOV and motion tracking.

The interactivity of a VR-based powerwall can be natural. Head and hand tracking combined with stereo vision aid the user to understand the depth of objects, allow the user to change virtual camera by the head and/or the

body movement, and to interact with the objects using motion tracking controllers or data gloves.

The immersive properties of powerwalls vary from installation to installation meaning that, in general, the immersive capabilities of each powerwall must be examined individually in terms of presence. A VR-based powerwall can make good use of interaction, and the user can perceive presence due to the simulated contact allowed by the system.

2.1.3.5 Google Cardboard

Google Cardboard (Google VR, 2014) is released in 2014, the first mobile VR headset to fit a smartphone as the display. The user fixes a smartphone with the head mount, runs a compatible software presenting images for each eye, and views through the lenses boxed in *Cardboard* for stereo vision. This representation as a low-cost system is designed for popularising VR by its smooth and instant experience.

The immersion of *Cardboard* benefits from the FOR, stereoscopic vision and head-based rendering. The user has 360-degree of FOR in the VR environment, which immerses the user to a greater extent compared to the FOR of *Sensorama* and *Damocles*. The stereoscopic visual and head-based rendering coupled with the high pixel density of a smartphone provide the user with immersive visual experience. The FOV varies depending on the

Cardboard version. A comparison (Hypergrid Business, n.d.) claims that the FOV of a *Cardboard* can reach 100 degrees, which is higher than *Damocles*. Generally, a *Cardboard* system involves visual and auditory sensory stimulus. When it comes to interactivity, the head tracking function and stereo vision allow the user to turn their head and 'naturally' look around. Hand tracking functions are not initially included, but could be developed and would provide the user with the power to modify virtual objects.

Presence comes from the immersive visual experience, while the interactivity by an initial *Cardboard* setting does not significantly contribute to presence since the tracking level is ordinary: the user is able to look around only. Notably, *Cardboard* system capacity strongly relies on smartphone performance and it is common that, when using a smartphone-based VR device, the user notices system latency in the forms of, for example, low frame rate and poor motion synchronisation, which jeopardises immersion, leading to a presence decrease.

2.1.3.6 HTC Vive and Oculus Rift

HTC Vive (HTC & Valve Corporation, 2016) and *Oculus Rift* (Oculus VR, 2016) are professional VR systems combining head-mounted displays, controllers and tracking systems. These VR technologies are the mainstream

in the video game field and have similar capacities, aiming at highly immersive game experiences.

Immersion within *Vive* and *Rift* increases compared to the devices discussed above. Both systems provide visual, auditory and haptic information, which are relatively richer, in terms of the range of sensory information involved. *Vive* and *Rift* provide head-based and stereoscopic visual and audio experiences allowing the user to locate virtual objects more easily. 110 degrees of FOV and 360 degrees of FOR give the user a wider range of vision compared to *Sensorama*, *Damocles*, VR-based powerwall and *Cardboard*. The interactivities of *Vive* and *Rift* have also reached a higher level. Both technologies include sensitive wireless tracking systems allowing engagement with the position and orientation changes of the body, such as head, main body, arm and hand. The user within the VR environments supported by *Vive* and *Rift* can not only observe but also modify the environments in various ways since highly developed controllers are offered. The user can also extend the functionality of both into recognising gestures, which is considered a more natural way to engage.

Almost every property of *Vive* and *Rift* is more advanced than that of the early VR devices. The user feels greater presence since *Vive* and *Rift* express the virtual world in a richly detailed way and allow for more freedom to explore and naturally change an environment.

2.1.4 Discussion

This section introduced the definitions and the concepts of VR and presence as an impressive technology and a unique experience respectfully. Presence is considered vital to VR games because presence reflects how immersive a VR environment is to the player. This section discussed immersion and interactivity which contribute to presence increase, and the properties of immersion and interactivity were given. The section also briefly outlined various VR technologies from history. Through this introduction to VR history, seven devices were discussed in terms of presence focusing on increasingly advanced technologies giving rise to greater immersion and interactivity properties. The degree of presence within those technologies varies with their advantages and disadvantages in both immersion and interactivity. The user could experience increasingly better presence since the devices become more and more advanced over time and provide an increasingly higher degree of immersion and interactivity. The comparisons highlight and clarify the mechanics of how immersion and interactivity properties contribute to presence, which facilitates and informs the choice of equipment for the experiment in Chapter 3.

2.1.5 Addressing Research Question 1

The following paragraphs address RQ1: *what is the current understanding of presence in VR?*

Virtual Reality (VR) is a computer-generated interactive and explorable environment (Virtual Reality Society, n.d., para. 5). Using a VR, the player feels surrounded by the VR environment of a game. Presence is the psychological state stimulating the feeling of being in the environment (Slater & Wilbur, 1997, p. 14).

Immersion is “the objective level of sensory fidelity a VR system provides”, as defined by Slater (2003) and paraphrased by Bowman & McMahan (2007, p. 38). High immersion induces presence (Slater, 2003, p. 3), for example, a 360-degree canvas makes the user feel more included in an artificial environment.

Interactivity is the “degree to which users of a medium can influence the form or content of the mediated environment” (Steuer, 1992, p. 10).

Interactivity also contributes to presence (Ryan, 2015, p. 51), for example, a tracking system follows the user’s head movement so they can access the full Field of Regard (FOR).

A variety of properties affect the levels of immersion and interactivity. The evaluation of VR devices shows that, with the improvement of immersion

and interactivity of VR technology, presence becomes increasingly stronger; the interactivity of a VR system supports its immersive effect, for example, FOR benefits from a tracking system which allows for physical engagement by the user. The investigation also discovered that contemporary consumer-grade VR, such as the *HTC Vive* and *Oculus Rift*, have immersion and interactive capabilities to a degree which can induce presence.

The key concepts are:

- Presence is the psychological state of being in the VR environment.
- High immersion induces presence
- Interactivity assists presence
- Contemporary consumer-grade devices are capable of inducing presence

2.2 Video game narrative

Video games have emerged with different ways to present stories. Wei et al. (2010) developed a critical framework to analyse these concepts, the framework can provide designers useful insights for improving story representation for future products. Wei et al.'s framework will be used by this research to develop an augmented framework examining presence in a VR storytelling game. To understand Wei et al.'s framework is the purpose

of this section, which defines related terms, outlines the essential background knowledge of the framework, introducing the framework in detail, and examining four storytelling game examples to demonstrate the utility of the framework.

Finally, this research follows the general practice of literature in the field to use the term Reader as the person who learns a story through traditional forms, such as paintings, books and films, while the term Player is more appropriate for a user of video games.

2.2.1 Narrative: storytelling formula

Story is one of the most important forms of enjoyment and inseparable from human life. The history of story runs parallel to human history, as humans have learned how to tell a story since they learned how to express. To tell a story, or storytelling, is the art of presenting a story. From cave paintings and early mythology, to theatre, literature, music and film, and even news media, all the way through to digital video games, storytelling has remained a stalwart human endeavor for enrichment and expression. When a storyteller thinks about improving the experience of a reader, it is inevitable to study the narrative that forms a story outcome.

2.2.1.1 Defining narrative, story and storytelling

This section defines and differentiates between narrative, story and storytelling. A story is a series of chronologically related events (Wei et al., 2010, p. 3) which can be real or imaginary.

Lavoy (2016, para. 1) describes narrative as “a system of beliefs or ideas. It is a way of interpreting events”. Richardson (2000, p. 170) claims that “narrative is a representation of a causally related series of events”. To the role of narrative to story, the central question is whether narrative includes events.

This research defines narrative as the designed way to choose and relate the events of a story and of how the events are presented. Thus, narrative works as a remodelling agent or an assembly line that decomposes then recomposes the original structure of a story towards a specific purpose or reason. A story can exist without a narrative; however, it is impossible to learn about a story without a narrative since transforming and transiting are parts of presenting. Narrative can exist independently from a story. As what Lavoy (2016, para. 1) claims, “a good narrative supports lots of stories”.

Since the roles of narrative and story have become clear, the research starts to define storytelling: it is a human action and art to present a story to a

reader, the representation is not limited to oral traditions. Storytelling consists of various aspects and techniques, and narrative is one of them.

“It’s safe to say that narrative choices are very important. They are how you deliver your story and how your objectives are communicated in the stories you tell. They also affect what stories you chose to tell and critically... why you do so.” (Woodget, 2017, para. 16)

Since narrative plays a crucial role to immerse a reader in a story, then it follows that investigating and understanding narrative and its function may improve immersion, and thus presence, in narrative games.

2.2.1.2 Narrative time, space and plot

This subsection briefly introduces narrative time, space and plot.

Narrative time deals with the relation between the chronological time when the events of a story happen and the time in which those events are presented. The time of a story determines how the reader understands events, forming a different understanding of the story. Many interesting effects can be created by proper management of narrative time. For example, a late revelation can lead to surprise. Narrative time in traditional forms of storytelling, such as books and films, is locked for the reader who has no power to change time flow of a story.

Narrative space is the representation of the location, setting and environment where a story takes place; improving the space structure and atmosphere can obtain a better understanding of the story. The manipulation of narrative space can lead to, but is not limited to, an emotional experience and increased story authenticity. Space depicted by text, such as in a novel, relies on the reader's skills of imagination to visualise the space, while in plays and films, space relies on *mise en scène* (or, visual design) more.

Plot is a narrative property, which refers to the causal and logical connections of the events of a story. Plot reinforces the relation of the events and the corresponding time and space. A good plot design determines the degree of suspense and/or tension of the storytelling outcome, which can lead to several effects on the reader, such as encouraging reasoning and a range of emotional experiences.

In traditional storytelling forms, time, space and plot are closed to the reader. However, this situation is changed by video game storytelling which considers the player as active and significant to the unfolding narrative. The following two subsections will introduce the brief history of video game storytelling and the advantage of video games as a storytelling form among the traditional ones, in order to acquire a better understanding on Wei et al.'s (2010) framework.

2.2.2 Video game and storytelling

Video games have become a widely-used storytelling device alongside other modern mediums, such as films. A video game is a game with which a user can interact and is presented on a visual display, such as a television screen, a computer monitor or a VR headset.

The field of video games is relatively younger, and was introduced in 1947, by the earliest form of “Cathode-Ray Tube Amusement Device” (U.S. Patent No. 2,455,992, 1948), which simulates an artillery firing at targets, and is presented as dots on a screen. As technologies grow, the increase of electronic system capacity has constantly expanded the door opened in 1947; the evolution of video games has continued apace ever since, and game designers started considering designing video games within a story context. *Pac-Man* (Namco Limited, 1980) starts providing recognisable characters: colourful ghosts; *Donkey Kong* (Nintendo R&D1, 1981) presents a more contextualised game goal: to rescue a girl; *Castlevania* (Konami Industry Co., Ltd., 1986) emphasises setting and situates the player into a conflict: to adventure in a ghostly castle and to defeat a vampire.

Since an increasing number of narrative elements have been added to video games, the player dives into richer and more vivid game experiences. The fusion of video game and story is memorably performed by the *Final Fantasy* series. Since the first episode (Square Co., Ltd., 1987), *Final Fantasy*

emphasises story delivery with a set of novel and vibrant designs of narrative which attracts the player, because of the entirely new world, distinct from reality, as well as complex characters and the relationships between them. This elevated the *Final Fantasy* series which became well-known for its alluring stories. Since then, video game, as a storytelling form, has become a booming trend.

2.2.2.1 Time, space and plot in game interactivity

This subsection briefly introduces the role of interactivity in video games storytelling. Compared to other forms of storytelling, such as literature and films, the form of video games is unique in its use of interactivity. Interactivity makes the player a proactive participant of a story rather than a passive observer, because the player can influence the narrative, as shown in Figure 1.

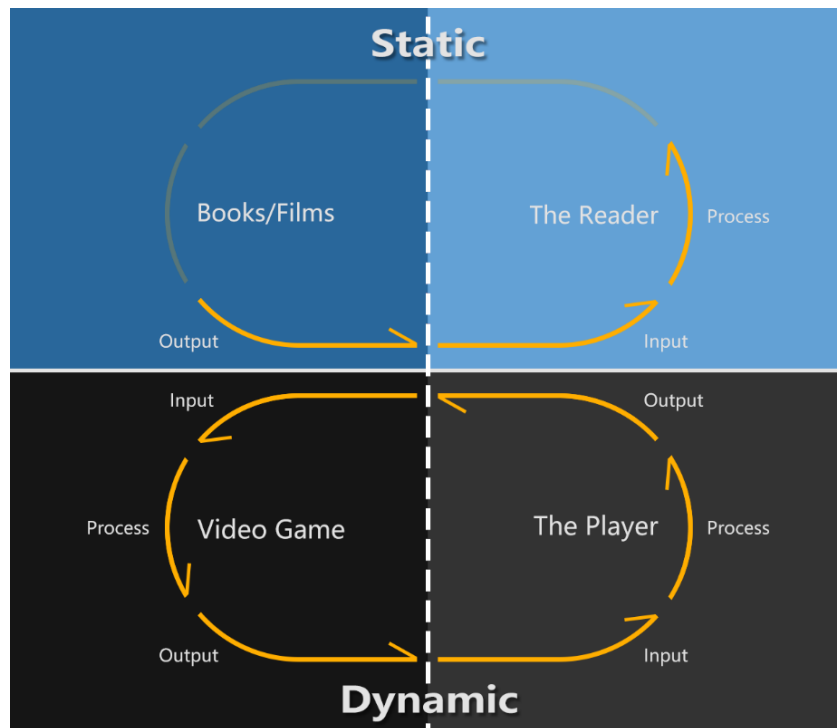


Figure 1 - Communication loop

If the narrative of a book or a film is seen as static, then the narrative of a video game is dynamic: a book or a film only outputs narrative to the reader but is not capable of receiving and processing the reader's response, the reader is allowed to receive the narrative and mentally process it, but has no power to influence it; while a video game and the player receive, process and then output to each other, thus, forming a loop of communication which plays the critical role of unfolding the narrative of the video game. The player is essential to the loop.

This loop can have, though is not limited to, three features that affect the player to uncover the narrative. The first feature is that the player has the power to influence plot development. The player can make and implement a decision and thus influences an event to become the catalyst of another

event, and then the latter can further cause the following one. In *The Elder Scrolls V: Skyrim - Dawnguard* (Bethesda Game Studios, 2012), the player needs to choose whether to support Harkon or Dawnguard, and the user's choice determines the course of upcoming events and what ability or equipment the player will acquire, which will affect change upon the player's future adventure. The second feature is that the player can decide the pace of the unfolding by having control over time. In *The Sims 3* (The Sims Studio, 2009), the player can stop, start and accelerate the in-game time flow. The third feature is that the player has more power of control over space. The player can navigate within the game space, control the camera to decide where and what to view, in turn influencing the player's perception of the game space. The player can be also allowed to interact with characters and modify objects, through which the time, space and plot of the narrative changes. One example that gives the player the abilities to control time, space and plot is *Divinity: Original Sin II* (Larian Studios NV, 2016): the player can kill characters leading to the plot tied to the murdered characters death and the corresponding time and space becoming unavailable to the player.

As described in the paragraph above, what makes video game storytelling unique is interactivity, which Crawford (2012) sees as the critical competency. Traditional storytelling occupies the power to determine narrative revelation, whereas, video games cooperate with the player to

push forward the narrative - putting interactivity and the player's role in narrative into consideration, Wei et al. (2010) developed a framework to examine narrative time and space in video game storytelling, which will be introduced in the following subsections.

2.2.3 Wei et al.'s framework

Aimed at presenting a better game world by narrative strategy, Wei et al. (2010) have developed a framework that decomposes the design of time and space of game narrative into various components, and analyses the components by a textual description. The analysis can further provide insight for the investigation of interactive storytelling mechanisms that facilitate game storytelling improvement, to achieve a better game experience overall.

The following subsections introduce Wei et al.'s (2010) framework by covering time and space individually. Each introduction to time and space defines the terms involved by this research on presence and gives background knowledge that improves the understanding of time and space that the framework examines. All the components of the framework are covered, each component is followed by one or more examples given to facilitate understanding. The introduction to Wei et al.'s framework imparts

important knowledge for the birth of The Augmented Framework (see Section 2.4).

2.2.3.1 Narrative time in video game storytelling

As mentioned above (see Subsection 2.2.2.1), the way a story unfolds must account for the player's participation to progress in video game storytelling, which is different to the unfolding of a story in traditional media, such as literature and films. Therefore, narrative time in Wei et al.'s (2010) framework is defined as the relationship between the chronological time when the events of a story happen and the time determined by both the player and game mechanism. Wei et al.'s framework addresses narrative time using four components: order, speed, frequency and polychrony which are introduced below.

Order

Order is the ordering of events as progressed by both the player and the game mechanism against a chronological timeline (Wei et al., 2010, p. 5-6). When the two timelines are inconsistent, the player experiences a nonlinear narrative, such as in the frequently used method of flashback; order can create various influences on the player's game experience, such as directing the player's attention. For example, in *Need for Speed: Most Wanted* (Electronic Arts Canada, 2005), the player experiences a flashback to race

with other racing-drivers and to be provoked by Razor (i.e. the antagonist) before losing to him as a fixed event. This flashback tells the player the setting and directs the player's attention to the failure outcome of the match with Razor as the motivation for the entire game.

Speed

Speed considers the influence on narrative experience exerted by the diversity between the length of time an event in the story lasts and the length of time for progression by both the player and game (Wei et al., 2010, p. 6-7). Speed is frequently used because it is hard to present every minor event that occurs in a story, so any presentation is influenced by the effect of speed. Speed is a useful tool to build up the causal relation between events, which can, though is not limited to, facilitate calling the player's psychological response. Ellipsis is the device used to refine story content (i.e. to skip the unnecessary but still show the meaningful). For example, in the flashback at the start of *Need for Speed: Most Wanted*, a duration of six days is concentrated into four moments: "Six Days Ago", "Four Days Ago", "2 Days Ago" and "Present Day". Parts of the story insignificant towards the goal of the game and the role of the antagonist are skipped to keep the pace moving.

Frequency

Frequency deals with the relationship between the number of times an event happens in a story and is experienced by the player (Wei et al., 2010, p. 7). In video games, frequency is widely used as the device of game mechanism rather than a narrative method. Singular, repetition and iteration are the types of frequency. Singular corresponds to the condition that the number of times an event experienced by the player is equal to that of the event happening in the story; repetition is when an event is presented to the player more than the number of times the event happens in the story; iteration happens when similar events are presented as one. In some cases, frequency can emphasise the implication brought by an event. For instance, in *Fallout 4* (Bethesda Game Studios, 2015), when the player moves within Vault 111 after his or her partner is murdered and baby kidnapped, the player meets similar corpses killed by the murderer within the same event. The repetitive corpses remind the player of the rescue, revenge and misfortune which are tied together as the theme of the story.

Polychrony

Polychrony covers determinate and indeterminate orders and positions of events on a timeline (Wei et al., 2010, p. 7-8). Wei et al.'s framework uses polychrony to analyse narrative variation influencing the player's experience, especially when it is impossible to determine the relative positions of events on the chronological timeline while the positions do

contribute to inferencing the plot and structuring the story for the player. It should not be confused by the component, order, which focuses on the influence on the player's narrative experience led by the difference of ordering between the chronological story timeline and the timeline as experienced by the player; while there is a rising number of games providing nonlinear story with/without multiple in-game plotlines, since the integration of interactivity and plot plays an increasingly dominant role in the gaming experience, polychrony analysis becomes more and more significant. *The Elder Scrolls V: Skyrim* (Bethesda Game Studios, 2011) provides countless side quests allowing the player to freely pick a challenge in a different sequence in each play; each sequence contributes to the player's understanding to setting, plot inference, event interpretation and emotions, etc., in a different way, building a unique comprehension and interpretation of the story.

The subsections above introduced the narrative time portion of Wei et al.'s (2010) framework. The following subsections cover the portion of narrative space and its components.

2.2.3.2 Narrative space in video game storytelling

Narrative space in video games partially inherits the traditional narrative theory (see Subsection 2.2.1.2) but also accounts for player interaction. For

example, from the perspective of the camera, only the part of the space, which the camera records must be designed in films; while in games, any corner of the space, which the player may discover has to be considered and designed accordingly. Therefore, narrative space in video games refers to the space of a game in which both the player and game progress a series of events (Wei et al. 2010, p. 4). Wei et al.'s narrative space components are topographical layouts, spatial oppositions, mobility of characters and objects, paths and axes, on-screen and off-screen space, acoustic space, spatial segmentation, perspective and the screen interface.

Topographical layouts

Topographical layouts focus on the type of spatial models, which determines the quality of the player's spatial navigation and the pattern of communication with events (Wei et al. 2010, p. 8-9). For example, linear layout (Adam, 2010) relatively highly restricts the player's freedom to move within a space, so the order of events in gameplay is fixed. A typical game using linear layout is *Super Mario Bros* (Nintendo Co., Ltd. & Systems Research & Development Co., Ltd., 1985) where, in a single game level, the player can only move forward (i.e. to move the virtual camera rightward). Network layout gives the player more power on spatial navigation, which creates possibilities for the player to experience narrative variation, and for the game designer to control the pace of the player's interaction with events.

In *Dragon Nest* (Eyedentity Games, Inc., 2011) the network layout limits the player's ability to wander about so that the player's game experience comes more from challenging quests tied with events.

Spatial oppositions

Spatial oppositions take game space as a static map and seeks the physical contrasts between physical objects or concepts, such as a castle versus a lighthouse, or over-ground space versus underground space (Wei et al. 2010, p. 9). Spatial oppositions have the power to influence the player's decision-making, and the ones that have meaning in narrative can provide the player with an emotional experience. In *Left 4 Dead 2* (Valve Corporation, 2009), the spaces inside and outside of saferooms give the player a different level of fear; players generally are cautious outside of safe rooms.

Mobility of characters and objects

Mobility of characters and objects focuses on across which spaces of the game world a character or object can move, in order to understand the changes of the player's experience brought about by the movements (Wei et al. 2010, p. 10). The higher mobility a character or object has, the more serious a role it can play to the narrative and game mechanism. For instance, *The Elder Scrolls V: Skyrim* provides characters that have various range of mobility: tied to towns or villages, such as the citizens that are treated as a part of the environment of a town. An example of a character with high

mobility is Lydia, a non-playable character assistant for hire who will follow, protect and carry items for the player. In this case, the player can challenge harder quests with Lydia's assistance, which implies a series of different experiences in further gameplay.

Paths and axes

Paths and axes consider how much freedom a track that links two locations in space allows the player to move along and to what extent the plot and events rely on this track (Wei et al. 2010, p. 10). Paths and axes should not be confused with topographical layouts. A topographical layout decides the overall structure of physical space of the game world, while paths and axes are a track physically linking two locations in the space; Paths and axes are also provided with spatial and temporal functions, such as direction and time passing allowed. The design of Paths and axes can further influence events and plot development. For example, in *The Elder Scrolls V: Skyrim*, using picklock or the corresponding key (which may need to be acquired) to open a locked door is left up to the player's discretion.

On-screen and off-screen space

On-screen and off-screen space discusses the spatial information that is or is not shown to the player through a screen-based display (Wei et al. 2010, p. 10-11). Visual information presenting space and the part of space the player cannot see should be examined by this component. Visual

information can decide narrative style and further affect the player's emotions. The lighting in the dungeons of *The Elder Scrolls V: Skyrim* is relatively dimmer than over-ground spaces, which can incur a higher level of alertness by the former than the latter.

Acoustic space

Acoustic space analyses the effect of auditory information, such as background music, sound effect, and character voice (Wei et al. 2010, p. 11). Sound design can create tension to influence the player's emotions and also facilitate presenting the off-screen space leading to the player's mental work structuring the off-screen space. In *Resident Evil 5* (Capcom Co., Ltd., 2009), the background music is generally terrifying, and zombies sometimes make sounds that help the player locate them without seeing them.

Spatial segmentation

Spatial segmentation seeks the influence on game experience by dividing space into smaller ones (Wei et al. 2010, p. 11-12). Events and presentational features can follow the division so as to manage plot development, form the styles of the smaller spaces and contrast between them. The space of *World of Warcraft* (Blizzard Entertainment Inc., 2004) is divided and designed accordingly to the adventure and growth of the player's character along with the unfolding story, each segment is of a different environmental and

cultural style, designed based on the setting, and provides appropriate quests and enemies to help the character gain experience and level up.

Perspective

Perspective covers psychological (i.e. who interprets story) and visual (e.g. first-person or third person camera view) point of view (Wei et al. 2010, p. 12). The choice of perspective effects the player's experience, especially emotional experience. The combination of the perspective of a character and first-person camera view can enhance the psychological perspective, drawing the player closer to the game world for a more immersive experience. Some games allow the player to freely change both psychological and/or visual perspectives, such as *Grand Theft Auto V* (Rockstar North Ltd., 2013): the player can switch between three main characters who are protagonists in each of their own stories, which allows the player to relate the stories to each other and build a more comprehensive story world.

The screen interface

The screen interface focuses on game experience changes influenced by screen layout between the camera view and interface (Wei et al. 2010, p. 12). The screen layout of *Silent Hill: Homecoming* (Double Helix Games, 2008) provides an immersive experience through hiding any interface unless the

player's calling, however, the calling interface makes game pace dilatory, so that the narrative tension becomes weaker.

2.2.4 Existing storytelling video games

For a better understanding of the utility of Wei et al.'s (2010) framework, the following subsections use Wei's framework to examine four existing storytelling video games, including *The Last of Us*, *The Witcher 3: Wild Hunt* and *The Walking Dead*.

2.2.4.1 *The Last of Us*

The Last of Us (Naughty Dog, Inc., 2013) is famous for its exquisite narrative design, which focuses on the relationship development between the two protagonists, single father Joel and orphan Ellie, during their adventure in which they support each other, and fight side by side to survive in the United States, ruined by certain infectious fungi. For an ensured storytelling outcome, *The Last of Us* uses a relatively restricted time-and-space structure.

The ordering is highly linear, in which mostly the player has to follow the chronological order of events: from Joel losing his daughter till he saves Ellie from a human trial; several flashbacks occur at a low level through photos, letters and audio recordings, etc., which have limited effects on narrative experience and are the only opportunities for the player to break

the linearity. Speed is at the game's control: the game world throughout most of the time runs in real-world speed to enhance realism and achieve a fluent game experience; ellipsis is used in cutscenes, for example, the timeline goes straightly to twenty years later after Joel's daughter killed, leading to a coherent and concentrated plot outcome. Singular is the most common device used in this game, and the player cannot re-experience an event within one traversing, excluding the time when the player's character dies in combat and then re-challenges it.

The Last of Us strongly relies on a linear topographical layout to limit the player in strolling about but focusing on the main line of the narrative, and to give more opportunities to presenting dialogues and cutscenes, along with the tracks consisting of the layout for managing events to build up the plot and a fluid experience. There are dozens of open and bright or closed and dark areas along the journey, which constitute the spatial opposition of the game, where an uninfected human or infected human haunts respectively; the opposition gives the player different emotional experiences through the implication of the opposition supported by the story and spatially environmental design cooperating with the story. *The Last of Us* fixes visual perspective to third-person, in order to keep the player distant from a character and maintain the integrity of the character's role in the player's impression, making the relationship development more credible; the game provides psychological perspective changes which help

the player understand the events better through various angles as references which structures a more solid and comprehensive world for the story; again, the psychological perspective changes are compulsory, the player has no power to shift the camera between characters at will.

The Last of Us is analysed using Wei et al.'s (2010) framework in the paragraphs above, the analysis shows that the narrative time and space of *The Last of Us* limiting the player's in-game freedom to achieve the designers' expected storytelling outcome.

2.2.4.2 *The Witcher 3: Wild Hunt*

The Witcher 3: Wild Hunt (CD Projekt Red, 2015) is an action role-playing game presenting an open and wild world coupled with rich narratives. The plot development relies on the player's choices and this is one of the features identifying the game as a successful piece. A wide variety of plot chains, branches and corresponding consequences present the world's dynamics and causality, and the time-and-space structure is designed to support this identity.

At an overall level, *The Witcher 3: Wild Hunt* orders events chronologically from the protagonist foreseeing the antagonist in a dream to their battle at the story conclusion. The dream includes one of the flashbacks used in the game, situating the player in the world by showing setting, characters and

their relationships; what makes this flashback special is that the dream combines the flashback, where the protagonist recalls the days with his fellows, with a flashforward in which he foresees an upcoming crisis brought about by the antagonist killing all the fellows of the protagonist; to protect his people from the crisis, forming the character's internal motivation, the protagonist starts his adventure. *The Witcher 3: Wild Hunt* presents an open world with hundreds of quests that the player can freely choose, sequence and challenge. To ensure the plot remains within control, this game sets up compulsory events which are taken as main quests with the rest as side quests. The plot develops from the quests by the player's management and their decision-making within the quests, whether through dialogues or combats, decisions lead to different outcomes. For example, the player needs to decide whether to help the protagonist's friends to overcome their difficulties; the decision leads to the outcome of the friends aiding the protagonist's last battle with the antagonist, which further dooms the story ending.

The spatial design also corresponds to the world's open setting, dynamics and causality, but cooperates with the plot to ensure storytelling outcome. *The Wither 3* uses multiple topographical layouts for different levels to balance the world's interactivity and narrative. To the game's overall level, it is a linear layout in which main quests are the unidirectional tracks which the player navigates across different maps. At the local level, the maps are

open rather than linear, where the player can wander about and manage the local quests. Each map is a segment of the game world space, attached with increasing difficulty and groups events, characters, sub-settings and presenting differing spatial designs for a rich narrative experience.

This subsection uses Wei et al.'s (2010) framework to examine the narrative time and space of *The Witcher 3: Wild Hunt*, which shows that time and space designs structure the world as open, dynamic and causal. A precise balance between interactivity and narrativity is presented through giving the player freedom at local level, while limiting it at the overall level, for a managed narrative experience without a lack of freedom.

2.2.4.3 *The Walking Dead*

The Walking Dead (Telltale, Inc., 2012) is an adventure game focusing on plot and character development, which presents the world of a zombie apocalypse in the US State of Georgia with a limited time-and-space structure, using many cutscenes and restricted interactivity. This game holds a main plotline while allowing the player to make choices within dialogues and actions to experience different sub-plots.

The events are basically in chronological order, staying with the protagonist until he dies, through which the player experiences a clear and continuous narrative. Flashbacks occur at a low level, for instance, through the audio

messages from the heroine's parents expressing the changes of their mentality reflecting on the corresponding situations. The game runs in real-world speed which enhances realism; dialogues and combats are often tied to a countdown, which firstly hurries the player in making choices to boost tension, and secondly functions as an option: the player can wait for the countdown to end by remaining silent in any conversation. Regarding polychrony, a wide variety of plot branches are provided to the player who has the power to decide other characters' issues of leaving, staying, living or dying, and even the way the protagonist ends himself. Interacting with characters is one of the means to influence plot development. Some characters can be the driving force helping the protagonist resist zombie attacks and/or bring about special events. Some events are orderly fixed, for instance, the protagonist is bitten by a zombie when trying to find the missing heroine, which leads to his death at the end by a means that the player decides.

The space is structured into linear layout assembled with unidirectional tracks where the player can occasionally navigate at will but must often follow the protagonist's movements. The protagonist and the heroine move across the space, other characters have different mobility depending on the plot and the player's decisions. The game provides a cinematic experience through the use of many cutscenes, and camera movements are highly restricted or guided by the game, in order to achieve the developers'

expected narrative experience, such as the tension created by showing police vehicles screaming past. The picture of the game is normally presented in a yellow and dark tone, to render a burdensome and hopeless atmosphere. The screen interface is designed as cooperative to the cinematic experience. The interface occupies a minor amount of space within the frame, ensuring interactivity and reducing the player's distraction by the interface.

This subsection uses Wei et al.'s (2010) framework to examine *The Walking Dead*, which demonstrates the emphasis of this game, which provides a causal and cinematic experience highly relying on limiting the player's ability with temporal and spatial mobility, but valuing decision-making as a feature that influences plot outcome.

2.2.5 Summary

This section presents Wei et al.'s (2010) framework to assist the future development of The Augmented Framework as the answer of RQ2: *how can Wei et al.'s (2010) and Ryan's (2015) frameworks be combined for examining how presence arises in VR narrative games?*

This section firstly clarified the roles of narrative, story and storytelling: narrative reorganises a story for better storytelling outcomes. The section secondly introduced the basics of narrative time, space, plot, and

highlighted the uniqueness of video games as a storytelling form for its interactivity, on which knowledge of Wei et al.'s framework is built; furthermore, the section discussed how interactivity makes the player's role in the unfolding of story different to the traditional mediums; the effects of interactivity on time, space and plot are given before the introduction to the framework, because of their theory putting the player into consideration. The section then introduced Wei et al.'s framework. Through the ensuing discussion, the definitions of narrative time and space, as well as their components, are given, with each component followed by at least one example to aid understanding. To comprehend the utility of the framework through practice, three outstanding storytelling video games are chosen and examined; within the examinations, each game is covered by narrative time and space analyses with a portion of the components considered in each aspect. The examinations show that the game narrative time and space designs become clearer after the analysis with Wei et al.'s framework.

2.3 VR storytelling and presence

This section introduces and discusses VR storytelling to facilitate the modification of Wei et al.'s (2010) framework, adapting it for VR. The difference between VR storytelling and traditional forms, such as films, are demonstrated in terms of narrative time and space. This section also

investigates Ryan's (2015) framework for the creation of The Augmented Framework, as the answer to Research Question 2. Existing VR storytelling examples are examined using Ryan's framework to further facilitate understanding.

2.3.1 VR storytelling

VR storytelling uses VR as the platform to present a story, such as in forms of films and video games. The reader in VR plays a more active role compared to in traditional storytelling forms, such as books and films (Aylett & Louchart, 2003; Henrikson, Araujo, Chevalier, Singh & Balakrishnan, 2016), and even becomes a part of a story (Shin, 2018). There are at least two properties of VR storytelling supporting this phenomenon: immersion (see Subsection 2.1.2.2) and interactivity (see Subsection 2.1.2.3). VR allows a story to be told with a high degree of immersion using wide FOV, FOR and head-based rendering to form a 360-degree canvas wrapping the reader's vision; the interactivity of VR allows the reader to have more control over the camera, such as to look and move around. The two properties spatially situate the reader inside the space where the story happens and provides the reader with more opportunity for participation. These two properties induce presence. The reader even becomes the character and lives in the narrative space (Leap Motion, 2016).

2.3.1.1 Narrative space and VR interactivity

VR “involves a shift from time-based narration to spatial narration” (Leap Motion, 2016). Since VR provides the reader with free visual representation, the reader has a larger space to explore, and the narrative space design must be developed to compliment and utilise this change, in order to enhance the reader’s narrative experience. What has been changed is mostly the presentational techniques, leading to conventional filming principles being infeasible in VR storytelling. Video game storytelling can also be affected by this change, especially those that provide a cinematic experience, such as through the use of cutscenes or limiting camera interactivity. This subsection introduces the narrative space changes that influence the adaptation of Wei et al.’s (2010) framework for VR.

Different from conventional filming strategy, VR storytelling should limit camera transitions (Henrikson et al., 2016). Since transitions teleport the reader within VR environment, their frequent use can potentially make the reader feel disoriented. If the transition is seen as an instant displacement of the camera, then the storyteller should avoid any camera techniques involving non-instant displacement, such as fly-through. A storyteller non-instantly displacing a camera can cause the reader’s “sense of self motion” to mismatch the motion state in the real world, leading to sickness (LaViola Jr, 2000, p. 47). Thus, VR Storyteller has less control over camera displacement, and camera orientation is no exception. In VR storytelling the

reader can freely turn the camera. The freedom in turning the camera helps to avoid the mismatching of motion state. The freedom leads to content viewed by the reader being less definite, as in traditional storytelling forms. The visual output of a VR system generally has no border defining the reader's view, whereas traditional storytelling designs visual layout presentations according to a square-shaped frame. There are at least two effects: framing becomes conceptual, off-screen space is relatively less (Henrikson et al., 2016), and these two effects correspond to the screen interface and on-screen and off-screen space of Wei et al.'s framework.

2.3.1.2 Narrative time and VR interactivity

Narrative Time in VR storytelling is not as dominant as narrative space. To some extent, narrative time compromises to the effects brought about by VR interactivity. There are two notable effects. Firstly VR tends to present a narrative using a linear and continuous narrative time in order to avoid transitions, because transitions require camera manipulation, thus increasing the risk to cause the reader to experience disorientation and/or sickness. Secondly, similar to video game interactivity, VR gives the reader the ability to manipulate the camera and the camera responds to the reader's commands in real-time. Within the same duration, the reader has the power to choose what to view.

2.3.2 Ryan's framework

This research has discussed narrative, VR and presence and these are combined in the following subsections. To examine how narrative induces presence in VR narrative games, it is necessary to first understand how presence comes from a VR narrative. To aid this understanding, the following subsections outline the components of Ryan's (2015) framework. Ryan's framework is developed from the concepts of presence, immersion and interactivity. Within this framework, the content, strategy and discourse of a narrative are treated on the basic level - text. Using text as a medium for immersion the reader must go through a mental simulation turning text into a story world, resulting in four types of response of the reader: spatial immersion, the reader's absorption into settings, environments and locations, as well as the pleasure in exploring the narrative space; spatio-temporal immersion, the sense of being spatially and temporally close to the scene; temporal immersion, the reader's desire to know what happens next; emotional immersion, the feelings of the reader towards characters, their conflicts and consequences. Presence rises from a high level of any type of immersion.

Generally, a VR storytelling game presents a narrative through multiple means: sensory information, text and interactivity, thus, an introduction to four types of immersion in VR inevitably involves discussion of sensory

information, text and interactivity. The following subsections introduce Ryan's (2015) framework, combined with the concepts of immersion and interactivity outlined in the earlier sections. Notably, Ryan (2015) uses the word of transportation as a synonym of presence.

2.3.2.1 Spatial immersion

One of the most direct and effective ways to enhance presence perceived by the reader is spatial immersion. Spatial immersion is defined as the effect resulting from the reader reacting to the depicted setting, environment and location (Ryan, 2015, p. 86-93, 201-202, 246-248). Presenting the space of a narrative through VR can easily trigger spatial immersion: visuals "transport" the reader "almost instantly"; movement tracking of the physical body making the movements of the reader fluent in virtual space; visual synchronisation between the reader's eyes and the virtual camera imitates the way humans view the real world. Ryan suggests increasing spatial immersion via text in various ways, such as enriching the depiction of setting and atmosphere, simplifying that of the landscape, giving a place an appropriate name and mentioning concrete detail.

2.3.2.2 Spatio-temporal immersion

Spatio-temporal immersion is the spatial and temporal distance between a story and the reader (Ryan, 2015, p. 93-99), the shorter the distance, the

higher the spatio-temporal immersion. The near zero distance represents the story world in the reader's mind strongly, like the narrative. Regarding shortening the distance, the reader needs to be able to comprehend the narrative from different angles, and Ryan (2015) introduces the concept of using narrative strategies to make contrasts, such as narrating a story using the shift from past tense to present, and from different perspectives. For example, in *The Last of Us*, the personal traits of and the relationship between Joel and Ellie become increasingly evident when the story is told from both of their perspectives. Ryan also claims that the present tense is always more immersive than the past; the narrator's perspective (close to where the story happens) is more immersive than a far one, for example, the perspective standing between two people arguing is more immersive than God's-eye-view and acting as one of the people is more immersive than standing between them. Active participation in the narrative is how presence achieves the highest level. Acknowledging the reader's participation is a useful technique to increase spatio-temporal immersion. For instance, in VR animation *Henry* (Dau, 2015), the protagonist sometimes looks at the reader, leading to the reader's illusion that the protagonist knows the presence of the reader.

2.3.2.3 Temporal immersion

Temporal immersion is the reader's absorption into the plot and/or events by the desire to know (Ryan, 2015, p. 99-106, 200-201, 248-249). Temporal immersion happens when the reader enters the process that keeps burying the assumptions towards uncertainty on a plot, while exposing the truth and generating more truth and assumptions. Temporal immersion relies on how a plot and events are structured and how the narrative is presented. There are three kinds of the phenomenon of the desire to know representing temporal immersion: suspense, curiosity and surprise. Surprise is the "*punctual*" (Ryan, 2015, p. 100) realisation, when the reader experiences surprise towards characters' fates, and surprise has the power to drive the reader toward reviewing past events to find clues for revealing the truth. Suspense and curiosity, on the other hand, are "*durative*" (Ryan, 2015, p. 100). Suspense is the thirst for the future plot and/or events, and on the contrary, curiosity is for the past. The intensity of suspense is determined by two parameters: firstly, suspense increases when the range of uncertainty decreases; secondly, suspense gradually increases in the following order of suspenseful targets: who did it, why/how did it, what will happen next.

2.3.2.4 Emotional immersion

Emotional immersion refers to the experience arising from the emotional involvement of the reader because of the reaction towards the fates of characters in a narrative (Ryan, 2015, p. 106-114, 202-204, 249-250). Generally, the reader experiences emotions towards the conflict between characters and their behavioural consequences. Ryan classifies emotions that the reader can experience into three types: subjective reactions (i.e. reacting to and judging characters and the things relating them), empathetic emotions (i.e. entering the characters' consciousness and sharing affects with them, such as feeling happy for the character), and self-centred emotions (i.e. reacting for the reader him/herself, such as fear). For example, in *Henry*, the reader feels happy for the protagonist when he eventually finds a friend to hug, which is an example of an empathetic emotion. Ryan points out that self-centred emotions and presence inextricably link to each other. Finally, emotional immersion is also influenced by the genre or style of the narrative.

2.3.2.5 Interactivity and epistemic narrative

Narratives in video games have different genres, and each genre has features that need to be treated appropriately to achieve the highest quality experience. In Ryan's framework, plot types and their interactive strategies are analysed; the epistemic narrative is one of them. Epistemic narrative

relies heavily on temporal immersion, the desire to know as the driving force affecting the player to keep exploring the narrative. The effective narrative strategy of epistemic plot lets the player land in the middle (though this can vary) of the chronological timeline of the events, experience what happens at present while time moves on, leading to the discovery of events that happened in the past, and letting the two parts of the story complement each other. The charm of the epistemic narrative is the intellectual challenge of finding solutions. Therefore, clues left in the scenes are necessary to such an epistemic game, which requires the functions of navigation, object interaction such as picking up and examining objects, interviewing a non-player character (NPC), and of course combat against enemies, as supplementation.

2.3.3 Existing VR storytelling examples

Aiming at comprehending the utility of Ryan's framework, the following subsections discuss how four types of immersion rise and induce presence in three VR storytelling examples, including *Teleportation*, *Henry* and *Resident Evil 7*. The three examples are in three VR storytelling forms slightly different to each other due to their level of interactivity, and the nature of the forms will be described within the examination of each example. These examples are examined based on the reader's perspective as presence is inherently based around the reader's personal perspective.

The examples involve introducing a part of their narrative strategy, content and discourse. Each of the uses of narrative is followed by a discussion of how the reader potentially feels as a result and which type of immersion is induced. The end of each example examination discusses how presence is derived from the sense of immersion. Each example examines three or four types of immersion.

2.3.3.1 *Teleportation*

Teleportation (Plapinger, Vance & Ashton, 2015) is a 360-degree film within which the reader can change camera orientation in the VR environment to look around. However, like a typical 360-degree film, *Teleportation* does not tie the camera position in the VR environment to the reader's position in the real world so the reader cannot make corresponding position changes in *Teleportation's* VR environment. *Teleportation* presents the narrative that protagonists abuse a machine for teleporting to random places.

There are several strategies generating immersion. As a visual-dominant form of storytelling, the reader is instantly immersed by the images. Several places with realistic style and real names are shown to the reader, leading to spatial immersion. After several times of continuous group teleportation forming a convention, one protagonist suddenly disappears from the group. The reader is surprised by the convention being broken, and temporal

immersion emerges. When the rest of protagonists decide to look for the missing group member as the ending, suspense arises for the reader about how they teleport themselves to the desired location, because at each time of teleportation the protagonists are brought by the machine to a random place. Suspense is how this film induces temporal immersion. The reader may be worried about the disappearance of the protagonist and imagining how flustered the missing person feels, however, this empathetic emotion can be lowered by the genre, which is comedy.

In conclusion, spatial immersion induces the reader's presence in the narrative through the images surrounding the reader, giving them the illusion of being teleported to the narrative space. Another significant type of immersion in *Teleportation* resulting in presence is temporal immersion. The plot development drives the reader's absorption, which decreases the reader's attention on the real world, leading the player to a feeling of being in the narrative.

2.3.3.2 *Henry*

Henry is a VR film within which the reader can freely move the head, so the reader of a VR film has more power to explore the narrative space compared to a 360-degree film. *Henry* provides the reader with the narrative that Henry, a hedgehog, at his lonely birthday party wishes to have a friend to

hug. The reader experiences presence through the four types of immersion coming from the sophisticated narrative design of *Henry* examined below.

The story happens in Henry's treehouse, which is well designed in fairy-tale style. Combining with head tracking, the reader can explore Henry's house and find concrete details supporting Henry's traits and the plot, such as the bed being needled with Henry's quills, meaningful photos including a cactus representing Henry, a flower implying the vulnerability of others compared to Henry. A strong spatial immersion comes from the form of the storytelling, that is the narrative space surrounding the reader, their ability to navigate within the narrative space, the pleasure derived from exploring the space and the implications drawing the reader's attention to comprehend the narrative.

Henry uses a couple of narrating strategies inducing spatio-temporal immersion. The setting and plot are narrated in the past tense, while the story happens in the present tense for the reader. The shift of tenses from the past to the present increases the level of spatio-temporal immersion. Henry sometimes looks at the reader, and his body language highlights the reader's presence in the narrative time and space.

Henry is a socially meaningful narrative. The reader feels respectively sad and happy for Henry before and after he finds a friend to hug, thus emotional immersion comes from empathy. Because of the social meaning,

the reader wonders what will happen to Henry, so they experience temporal immersion. The desire to know happens in two forms: the suspense of 'how did it happen' when the reader is told Henry's situation is altered by his birthday wish, and the surprise when Henry's situation is at its worst and the conflict reaches its peak, but eventually improves when Henry finds a turtle as a friend.

In conclusion, the reader experiences presence not only from the spatial benefit of VR storytelling but also from the absorption on the narrative spatial design, narrating strategies, and social meaning triggering the reader's emotions and driving the reader to wonder what happens next in the narrative.

2.3.3.3 *Resident Evil 7*

Resident Evil 7 (Capcom Co., Ltd., 2017) is an *epistemic* VR storytelling game within which the player can not only freely view the narrative space but also interact with characters, objects, and even affect plot development leading to different consequences. *Resident Evil 7* presents the narrative that the protagonist, Ethan, receives a message from his wife, Mia, who has been presumed dead for three years so that Ethan starts the adventure to discover the truth of whether his wife is alive. This game induces presence through strong spatial, spatio-temporal and emotional immersion.

Resident Evil 7 induces strong spatial immersion in various ways. Firstly, the player is instantly immersed by the gloomy and creepy environment which they can explore. There are tons of objects with various levels of meanings available to be examined; to some extent, the atmosphere and plot of *Resident Evil 7* are told through examinable objects. Two examples are given as the following. For the atmosphere, the decaying food in the kitchen of the mansion implies how degenerate the house is. For the plot, the photo of the antagonist, Eveline, written with the word "E-001" revealing her identity. With the ability to view and explore, the player's attention is drawn to the narrative space.

The narrative is told through various perspectives, apart from Ethan, for example the player is asked to control a cameraman and to experience his death because of visiting the mansion. Through this control, the player can learn what happened at the player's present time and uses the experience to refer to the player's situation. Spatio-temporal immersion thus increases since the player starts to be increasingly closer to the core of the narrative. Spatio-temporal immersion also comes from the player's interactions with characters, such as in combat.

The player experiences strong and long-lasting self-centred emotions, such as fear, because of the genre and interactions. *Resident Evil 7* also presents the narrative with social meanings, leading to a range of empathetic

emotions. For example, Eveline captures and controls some other characters, including Mia, with a bioweapon. Eveline wants a family, especially a mother, and she kills visitors for protecting the control over the “family”. The reader experiences complex emotions for Eveline’s naivety, misfortune, grimness and greed.

In conclusion, presence comes from the spatial immersion led by the reader’s action and pleasure when exploring the narrative space; spatio-temporal immersion induces presence through implying danger approaching the player through time. Emotional immersion rises to a high intensity, as within the game the player experiences significant self-centred emotions. Most importantly, the examination of *Resident Evil 7* demonstrates more clearly the reader’s participation in the narrative leading to a stronger presence, as compared to the first two VR storytelling examples.

2.3.4 Summary

This section aids in the understanding of VR storytelling and presence. The understanding is part of the preparation for answering RQ2: *how can Wei et al.’s (2010) and Ryan’s (2015) frameworks be combined for examining how presence arises in VR narrative games?*

This section introduces the changes to narrative time and space for VR storytelling. Within the introduction, framing and off-screen space are found less useful to VR than the traditional storytelling forms, such as films. These findings will guide the adjustment of Wei et al.'s (2010) framework for the future development of The Augmented Framework. This section also outlines Ryan's (2015) framework: the four types of immersion. Each type of immersion is a different category of the phenomenon of the reader's experience of narrative, and presence comes from the phenomenon. Any examination should be based on the reader's perspective. The definitions of immersion, strategies to induce immersion for presence are given. Additionally, the design thinking of epistemic narrative games is introduced, which then guides the design of the self-produced VR narrative game for the use of the experiment in Chapter 3. Three VR storytelling examples in different forms are introduced and examined using Ryan's framework. The examination illustrates the merits significant to raising presence. In VR storytelling, spatial immersion becomes dominant. From 360-degree films to VR storytelling games, the intensity of spatio-temporal immersion tends to increase. It is hard to see the trends of emotional immersion and temporal immersion because of the lack of source and the differences of genre. The utility of Ryan's framework is clear. Therefore, Wei et al.'s framework and Ryan's framework are ready to be combined as the answer to Research Question 2 within the next section.

2.4 Proposing an augmented framework

This section proposes The Augmented Framework to address Research Question 2. The need for the modification of Wei et al.'s (2010) framework is first discussed. The modification to the components of Wei et al.'s framework is implemented towards the characteristics of VR. This section secondly discusses the need for the modification of Ryan's (2015) framework and how to combine Wei et al.'s and Ryan's frameworks effectively. The Conclusion subsection summarises the modification and combining and illustrates the finished Augmented Framework with detailed documentation about the components, structure, function and utility.

2.4.1 Narrative time and space and game interactivity in VR

This subsection discusses extending Wei et al.'s framework to consider VR interactivity. VR is the interface through which the player interacts with a narrative game written in a computer, as shown in Figure 2. What a VR system changes, compared to other systems, is the fidelity of input and output. Any changes on Wei et al.'s framework should be based on the input and output differences between VR and non-VR devices, because in this research Wei et al.'s framework is transferred between these systems.

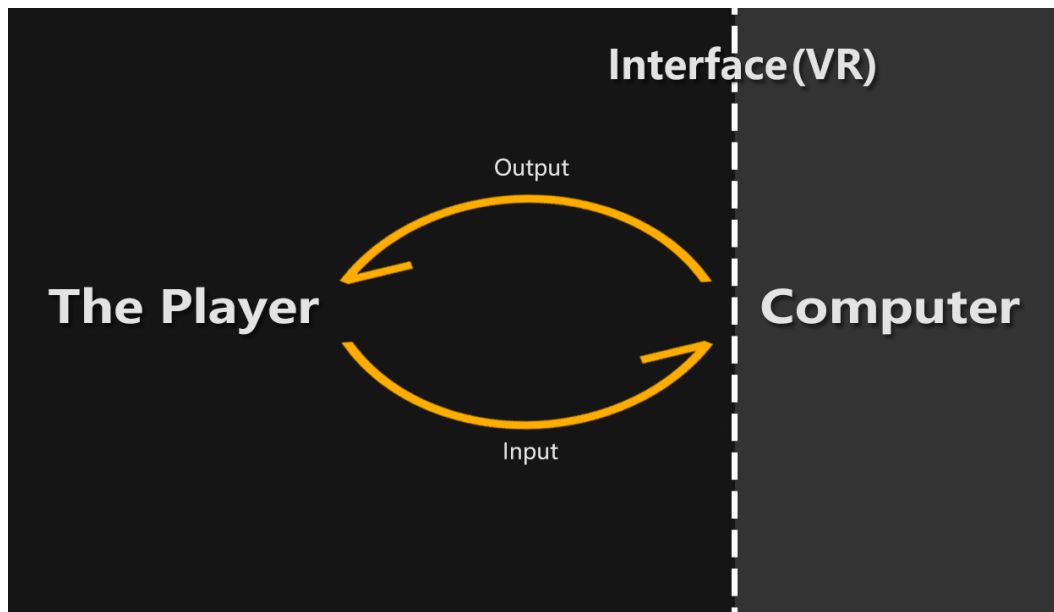


Figure 2 - VR as an interface

Input is the way the player influences the narrative of a video game in general. The characteristic of a VR input system allows the user to perform more natural actions compared to the abstract input system, such as a keyboard and a mouse. However, it is the algorithm of a game written in the computer, which gives the player's ability to change time, space and plot of the narrative. The characteristics of a VR input system does not fundamentally change the algorithm's capacity of providing the player with the power to change the world of a narrative. In short, VR does not change the fact that both the player and a video game play a role in revealing a narrative (see Subsection 2.2.2.1). Therefore, VR input does not require changing Wei et al.'s framework. Output difference is discussed within Subsection 2.3.1.1, as well as the criteria to the VR storyteller, leading to the need for change to the screen interface as well as on-screen and off-screen

spaces. Thus, the screen interface and on-screen and off-screen spaces are the only components to be changed. The change of the two components is discussed in the following subsection.

2.4.2 Adapting Wei et al.'s framework to VR

This subsection discusses the modification of Wei et al.'s framework for VR. As a visual interactive media, the interface in VR remains useful to present information and to support the player's communication with the system. Therefore, The Augmented Framework keeps this component but renames it to the *VR interface*, because usually a VR display has no square-shaped defining borders restricting the player's vision compared to traditional displays, such as a television and a computer monitor. This distinction results because traditional screen and related design techniques are replaced in VR. Renaming the component as the VR interface extends Ryan's screen interface design to VR and clarifies that the examination is VR-oriented. The VR interface examines the player's experience influenced by the interface in VR, for example, too much interface covering the player's sight may jeopardise immersion.

On-screen and off-screen space examines the visual presentation of narrative space. Since a VR display does not define the border of the player's vision, the concept of the screen remains useless. Off-screen space

becomes less significant because of the reduced camera control by the storyteller, and the player's ability to look around at any time; while the concept of off-screen space remains useful since the narrative space includes parts that the player cannot view except in other ways, such as listening and imagining. The Augmented Framework should drop the concept of the screen and pay less effort on the artistic techniques of camera control and/or the concept of the screen, such as a cutscene and screen framing respectively. Therefore this component is kept and renamed as visual and off-visual space; visual and off-visual space discusses the spatial information that is or is not shown to the player.

In conclusion, interface and visual examinations remain useful in VR, so the components of the screen interface and on-screen and off-screen space are kept but renamed as the VR interface and visual and off-visual space respectively, and what they examine are changed to suit VR conditions. Therefore The Augmented Framework at Wei et al.'s side covers two aspects: narrative time and narrative space. Narrative time includes the components of order, speed, frequency and polychrony. Narrative space contains the components of topographical layouts, spatial oppositions, mobility of characters and objects, paths and axes, visual and off-visual space, acoustic space, spatial segmentation, perspective and the VR interface.

2.4.3 Discussing Ryan's framework

This subsection discusses the need for change in Ryan's framework. Ryan's framework divides a narrative into space, discourse, character, events and plot, and examines how the reader reacts to these aspects in the forms of spatial, spatio-temporal, emotional and temporal immersion respectively, as well as investigates how these types of immersion induce presence. The framework is based on the concepts of immersion and presence in VR and uses the term immersion as the fidelity of mental simulation by the effect of what is described and how, and the term presence as the high fidelity. VR is all about how things are described; using VR increases the efficiency of the description (e.g. an environment with high resolution and richer details that the reader can view imparts information in a shorter time than through words), and potentially shortens the distance between what is described and the reader (e.g. the reader using VR can seem to touch a virtual object, while needing to merely imagine touching it when reading a book). Storytelling in VR can reduce the mental simulation effort and so attain high immersion, that is, presence. VR does not alter the fact that a VR narrative can include aspects of space, discourse, character, events and plot. The reasoning above is similar with the relation between a video game and a game narrative. A video game gives power to the player to influence the game narrative; however, the power does not change the fact that the game narrative can include these aspects. Besides, the categorisation of four types

of immersion remains useful to differentiate the reader's reactions to different aspects, thus provide insight into how exactly presence comes from a narrative. Therefore, any one of the types should not be altered.

2.4.4 Combining Wei et al.'s and Ryan's frameworks

This subsection discusses how to join Ryan's and Wei et al.'s frameworks. Space becomes the critical aspect in VR storytelling, spatial immersion is how the player mainly experiences presence. The components of Wei et al.'s narrative time examine the temporal relation of events. The relation can be further determined or influenced by the structure, function and presentation of narrative space. Spatial immersion is connected to the player's absorption by the narrative space. Therefore, spatial immersion should be joined with all narrative time and space components. Spatio-temporal immersion relates to how the narrative is told. Since events and plot require to be presented for narrative to unfold, any components relating to events and/or plot have the potential to trigger spatio-temporal immersion. So spatio-temporal immersion should be joined with all narrative time and space components. Temporal immersion is the player's preoccupation with the revealing of events and/or plot development that are determined by information disclosure. The components of narrative time examine the player's experience of learning information. Within Wei et al.'s narrative space, topographical layouts and spatial oppositions are

the components seemingly not relating to temporal immersion, because they treat narrative space as static and ignore all temporal factors; however topographical layouts shape plot development and spatial oppositions group events, so the two components have the potential to influence temporal immersion. Other components of narrative space can be used to disclose information, so temporal immersion should be joined with all components of narrative time and space. Emotional immersion is the player's reactions to characters' fates. Since characterisation is realised by events, plot and how they are presented, any components that involve events, plot and presentation should be kept conducive to emotional immersion. Therefore, emotional immersion should be joined with all components of Wei et al.'s framework. To summarise, each component of Wei et al.'s framework is potentially triggers the four types of immersion, so each component is inherently linked to the four types of immersion.

2.4.5 Discussion

Section 2.4 modified both Wei et al.'s (2010) and Ryan's (2015) frameworks.

This subsection summarises The Augmented Framework.

Subsections 2.4.1 and 2.4.2 discussed the need to change Wei et al.'s framework due to the immersion and interactivity features of VR (i.e. 360-degree canvas and the user's free camera control respectively) for the

combined framework. Interface and visual examinations make sense to VR but should drop the concepts of framing and the storyteller's camera control. Therefore, the components of the screen interface and on-screen and off-screen space are changed into the VR interface and visual and off-visual spaces respectively.

Subsection 2.4.3 deliberates the need for change of Ryan's framework. The research keeps the four types of immersion because VR and video game interactivities do not influence whether a narrative can include what the framework examines. Subsection 2.4.4 discusses the matching between the components of Wei et al.'s and Ryan's frameworks. Every component of Wei et al.'s framework is possible to influence the four types of immersion, so each component is linked to the four types of immersion.

2.4.6 Addressing Research Question 2

This subsection begins to address Research Question 2: *RQ2: how can Wei et al.'s (2010) and Ryan's (2015) frameworks be combined for examining how presence arises in VR narrative games?*

Wei et al.'s Framework examines video game narratives, and Ryan's Framework covers VR narratives and presence. A combination of Wei et al.'s and Ryan's Frameworks will facilitate the examination of presence in VR narrative games.

The reader understands a story through the narrative time and space. Time and space are closed to the reader of traditional storytelling forms (e.g. literature and films) but open in video games, the player and game mechanism together build the time and space of a story.

Wei et al.'s framework examines narrative time and space in video games using many components that relate the design of a game to the player's experience. An evaluation of three narrative video using Wei et al.'s framework aided the understanding of the components and demonstrated the usage of the framework of a systematic decomposition, description and analysis.

Ryan's framework evaluates the quality and performance of a narrative with a variety of given narrative techniques and experiences that induce the four types of immersion. Presence arises when immersion reaches a high level. Three VR stories were evaluated using Ryan's framework and demonstrated the mechanisms by which presence arises from immersion.

The demonstrations of Wei et al.'s and Ryan's frameworks usage lays the foundation for the usage of a combined framework.

On-screen and off-screen space and the screen interface are changed into visual and off-visual space, and the VR interface respectively, due to 360-degree canvas and the user's freedom of camera control. The four types of immersion remain because video game and VR interactivities do not

influence the number of properties of a narrative. Each component of Wei et al.'s framework can affect the four types of immersion, and the structure of The Augmented Framework, as shown as in Figure 3.

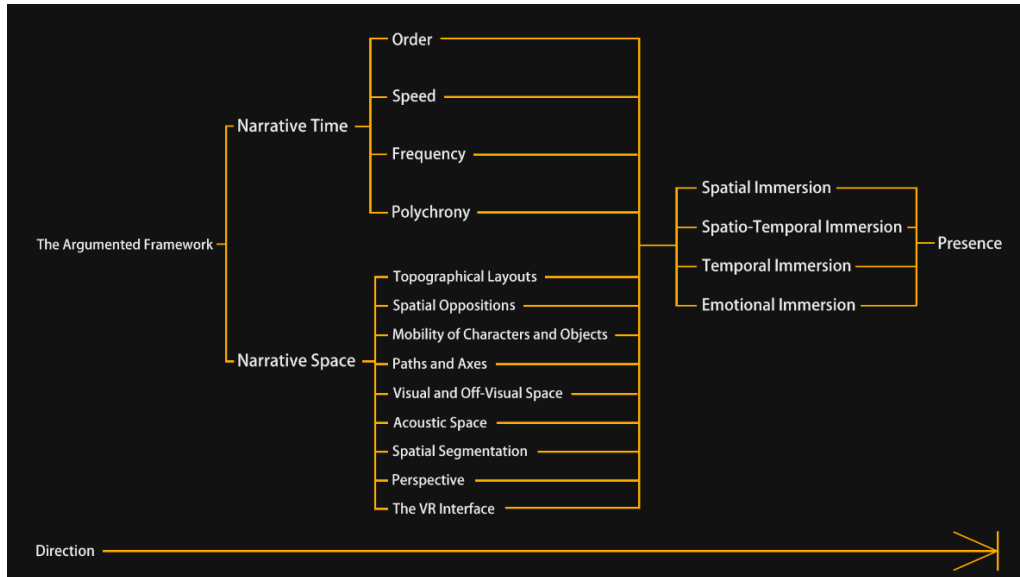


Figure 3 - The Augmented Framework

Narrative time covers order, speed, frequency, polychrony; narrative space contains topographical layouts, spatial oppositions, mobility of characters and objects, paths and axes, visual and off-visual space, acoustic space, spatial segmentation, perspective and the VR interface. Each component within narrative time and space links to the four types of immersion: spatial immersion, spatio-temporal immersion, temporal immersion and emotional immersion.

The Augmented Framework investigates how presence comes from the design of the narrative time and space of a VR storytelling game. The user of The Augmented Framework should decompose, describe and analyse a

game according to the components. The use of The Augmented Framework is the combination of Wei et al.'s and Ryan's frameworks. Each component of narrative time and space singles out certain aspects of the player's experience in a VR narrative game, and indicates how the experience induces immersion and the player's presence.

2.5 Summary

This Chapter introduced the fundamental knowledge for addressing research questions 1 & 2. For RQ1: *what is the current understanding of presence in VR*, Chapter 2 introduced the concepts of VR and presence. The introduction to VR and presence also discussed immersion, the primary factor contributing to presence, and interactivity, facilitating presence and working as a supporter of immersion. Seven VR devices are discussed for aiding the understanding on the relationships between presence, immersion and interactivity. Research Question 1 is addressed within Subsection 2.1.5.

For RQ2: *how can Wei et al.'s (2010) and Ryan's (2015) frameworks be combined for examining how presence arises in VR narrative games*, Chapter 2 investigated Wei et al.'s and Ryan's frameworks and related concepts which aid the understanding of the frameworks. Wei et al.'s framework examines video game narratives, Ryan's framework evaluates presence with narrative

experiences. The chapter adapted Wei et al.'s framework to VR for the output difference between a VR system and the conventional screen. The Augmented Framework is proposed at the end of Section 2.4. Research Question 2 is addressed in Subsection 2.4.6.

Having defined presence and proposed The Augmented Framework, Chapter 3 will apply these to the examination of a self-produced VR narrative game in Chapter 3.

Chapter 3 - Experiment

This chapter address RQ 3: *what can be learned from applying The Augmented Framework to a self-produced VR narrative game?* This chapter mainly follows practice-led research (see Subsection 3.2.1) and uses The Augmented Framework (see Subsections 2.4.6 and 3.4) to examine a portion of a self-produced VR storytelling game named as *Caillte* (see Section 3.3). The examination (see Section 3.5) demonstrates the way presence is induced from *Caillte* and the utility of The Augmented Framework.

A hypothesis (see Section 3.1) is proposed to guide the practice-led research. The methods of Abduction-2 (see Section 3.2.2) and practice-led research are introduced. *Caillte* is produced as the object to be examined. Section 3.3 documents *Caillte* to build a foundation for the evaluation. The evaluation is implemented at two levels: overall and Story Events. The various levels allow different angles of viewpoint providing multiple references for shaping the results of the evaluation into solidified findings. The chapter concludes by addressing Research Question 3 by generalising the findings.

3.1 Hypothesis

A self-produced VR storytelling game named as *Caillte* is produced to explore how The Augmented Framework illuminates how presence arises

in VR narrative games. Due to time limitations, *Caillte* is at demonstration level: sound, a game mechanism judging winning or losing and the corresponding endings are not provided, so The Augmented Framework is adjusted to the limitations of *Caillte*.

Caillte provides a narrative experience using the following game activities: visual activity (i.e. viewing the topographical space), physical activity (i.e. interacting with the game space via manipulating VR headset and controllers) and mental activity (i.e. reading texts, filling the gaps of and reacting to the narrative). The activities correspond to most of the components of The Augmented Framework.

Therefore, the hypothesis is: *what can be learned about by examining Caillte using The Augmented Framework?*

3.2 Methodology

This section outlines the methodology applied to address the hypothesis. This section first introduces Abduction-2 and practice-led research coupled with their brief backgrounds, utilities and effects. The practice-led research leads to the birth of *Caillte*, low-level documentation records what is designed in *Caillte*, and provides a rationale for the design. The various levels that the examination is based on are introduced and outlined.

3.2.1 Practice-led research

Practice-led research is highly focused on the process of making and the outcome of the making (i.e. artefact), a type of research commonly used in the field of art and design; the artefact plays the role of “collecting and preserving information and understanding” and as part of the answers to the proposed research questions (Mäkelä, 2007, p. 163). The artefact requires to be theoretically contextualised and then interpreted by the researcher/designer, to reveal its meaning to the corresponding research, because a single artefact is an object that cannot transfer knowledge (Mäkelä, 2007, p. 157). Thus, the practice-led research leads to two components as the preparation for the examination: the artefact and the text interpreting the artefact. The interpretation should build the foundation for the examination (e.g. explaining how *Caillte* components contribute to the examination) and provide materials to be examined (e.g. what is designed, in terms of inducing the player’s narrative experience).

3.2.2 Abduction-2

Abduction-2 provides the theoretical basis for addressing the hypothesis. Abduction-2 is one of the forms of Abduction that is “the basic reasoning pattern in productive thinking” (Dorst, 2011, p. 523). Abduction is introduced first in order to aid in understanding of Abduction-2.

Abduction derives from the reasoning pattern that works towards discovery: WHAT (thing) + HOW (working principle) leads to RESULT (observed). This equation is utilised to predict the third component by knowing the “WHAT (thing)” and one of another two.

As a design may have an impact on society, designers and researchers start paying attention to the value of a product. Thus, “VALUE (aspired)” replaces “RESULT (observed)” to be the outcome of the process, and the equation becomes: WHAT (thing) + HOW (working principle) leads to VALUE (aspired).

Abduction-2 is utilised for the case when “VALUE (aspired)” is known, while other two are unknown: ???(thing) + ??? (working principle) leads to VALUE (aspired). This case challenges to create a “thing” and a proper “working principle” which lead to “VALUE (aspired)” (Dorst, 2011, p. 524).

The method for addressing Abduction-2 is to create a WHAT and a HOW and then examine their effect on producing the VALUE.

In regards to this experiment, the VALUE is presence and the HOW is The Augmented Framework. This leaves a WHAT, the object to be examined, and so the VR narrative game *Caillte* fulfils the role of the WHAT.

WHAT + HOW = VALUE

Caillte + The Augmented Framework = Presence

This experiment produced *Caillte* for *HTC Vive* (see Subsection 2.1.3.6) because the *Vive* hardware has immersive capabilities. *Caillte*, as a self-produced game, can be more specific to the topic of how narrative time and space induces presence, and this allows the examination to avoid distraction by factors meaningless to this research. Also, a self-produced VR narrative game yields greater insight than examining an off-the-shelf game. The following subsection documents *Caillte* in terms of design features relevant to the examination.

3.3 The demonstration game: *Caillte*

The following subsections provide brief documentation for *Caillte*, and this subsection is first to give the overview of the game.

Caillte presents a story that is set within Arthurian Legend (see Appendix) to provide VR game narrative time and space to be examined. The plot type of the story is chosen to be epistemic (see Subsection 2.3.2.5). The player in *Caillte* is situated in a three-dimensional VR environment (see Subsection 2.1.1.1) where the story happens. The player can explore the environment and discover clues. The environment and clues convey narrative information. Exploring, discovering, reasoning, imagining and reacting towards the environment and clues are the main ways through which the player experiences the narrative.

3.3.1 The setting

The setting is about Avalon's conspiracy and infiltration of Britain: Morgause (Leader of Avalon) sends Viviane (Lady of the Lake, an elf) on the errand of enticing Merlin (the half-demon Wizard) to raise a King (Arthur) for Britain, under the pretext of bringing peace, but as a means to controlling the land in the end.

The minor characters are: Gareth, a Round Table Knight and the boss of the player character "The servant", the future child of Merlin and Viviane; Fergus a knight in the search party; and Truid, the god in Avalon's religion.

3.3.2 The plot

Key characters from Arthurian legend remain similar to those in *Caillte's* plot, but play different roles, such as Morgause and Viviane being the initiators of the conspiracy, and Arthur and Merlin being the targets of the infiltration. The plot type of *Caillte* is designed to be epistemic so that the examination can track the player's narrative experience based on the player's every discovery.

3.3.3 The game story

The game story is the chronologically related events taken from the Arthurian Legend, extended and shifted into the game, and the plot is the

causal relation linking the events. Since epistemic plot is chosen, the design follows Ryan's (2015) suggestion to place the player in the middle of the timeline, so that the player experiences a tense shift between past and present events.



Figure 4 – Top view of The Island and The Dungeon

The game story starts with Morgause's decision to murder Merlin before attacking Arthur because she wants to eliminate Arthur's most capable supporters and eventually murder Arthur to gain control of Britain. The game story is: by Morgause's order, Viviane persuades Merlin to go to The Island (shown as Figure 4) with her so that she may murder him, and Merlin is easily persuaded because of his love for her; Viviane is touched by the pursuit but worried about the love and their future child's bloodline (i.e. elf and half-demon); she, therefore, traps Merlin into a void using the spell learned from Merlin rather than killing him; while Merlin is locked in the void, Viviane attacks and captures a search team consisting of knights coming to the island in search of Merlin; she imprisons and uses the people

for human trials in The Dungeon (shown as Figure 4) to investigate how to infuse both her and Merlin's power into a human body, for the purpose of saving her future child; meanwhile Morgause is not happy with Viviane's disobedience and comes to warn Viviane; when the trials are successful, Viviane disappears from The Dungeon for the next stage of her plan; Britain's battles against the Franks, and the people of Britain are anxious that they will lose the battle because of the lack of knights, and so a servant is sent to find Merlin and the lost knights to help Britain win the battle.

3.3.4 The game name: *Caillte*

The game name was decided based on and after the narrative design. Being lost in desire and its effect is the topic this narrative tries to express. Therefore, the game is named as *Caillte*. *Caillte* is a word meaning "lost" that represents Merlin, lost in his desire for loving Viviane which causes his disappearance from Britain and leading him to be trapped by her, threatening the future of Britain. *Caillte* is taken from the Irish language because Avalon is a shrine in Celtic mythology and is where Arthurian Legend begins.

3.3.5 The servant's events

The reproducing of the game story involves the player's participation (see Subsection 2.2.2.1). The design situates the player as the servant of a Round Table Knight, to shorten the distance between the player and the story. Therefore, the player reveals what happens between Merlin and Viviane from the servant's perspective. The following paragraph describes the events discovered based on the servant's perspective and coupled with their locations, as shown in Figure 5.

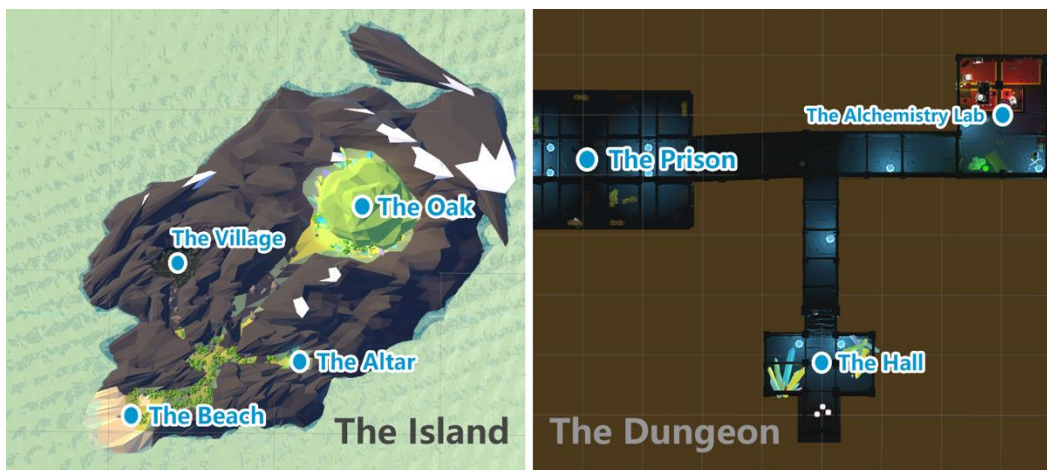


Figure 5 – Locations in The Island and The Dungeon

Caillte starts as that the servant arrives at The Beach and knows that he is nominated by Sir Gareth to be sent to The Island to look for Merlin with a search team consisting of knights. Merlin's disappearance worries Arthur, because he needs Merlin to help release the anxiety of Britain regarding the lack of knights for the upcoming battle in France; the servant finds The Village ruined and the dead bodies of the search team members; the servant discovers a human body sacrificed at The Altar as well as many crystals and

a giant oak tree at The Oak; the servant reveals The Dungeon, with more dead bodies and first arrives at The Hall; the servant discovers that Viviane has detained the knights in The Prison; the servant uncovers that Viviane is playing dual role as a supporter of Arthur while also harming his people; the servant learns that Viviane infuses her and Merlin's power in the knights' bodies at The Alchemy Lab for a specific reason: to create a future child.

The events above give a brief overview of a typical player experience. However, not all players will experience the story as outlined above and the potential alternatives are explored in the following sections.

3.3.6 Interactivity

The interactivity in *Caillte* allows the player to explore the game space, discovering and examining clues. The interaction design partially follows Ryan's (2015) suggestion towards the epistemic plot. The interactivity of *Caillte* is supported by both *HTC Vive* and the game design. The player can naturally look around and navigate by walking or using teleportation within the game space. *Caillte* provides the player with the ability to interact with virtual objects, such as to grab objects, to hold objects, and to open doors. Reading is one of the key ways of how the player learns about the

narrative of *Caillte*. There are texts attached to objects that are activated when the player is in close proximity.

3.4 The Augmented Framework

The Augmented Framework (see Subsection 2.4.6) is briefly stated here to aid the reader. Acoustic space is removed from the framework because *Caillte* does not have sound.

3.4.1 Component removal

Since there is no sound in *Caillte*, The Augmented Framework removes the component of acoustic space from consideration. While sound can be an important contributor to presence, including sound would have required more time than was available.

3.4.2 Augmented Framework overview

The following subsections present the definitions of the components in The Augmented Framework.

3.4.2.1 Order

Order is the ordering of events progressed by both the player and the game mechanism against a chronological timeline.

3.4.2.2 Speed

Speed considers the influence on narrative experience exerted by the diversity between the length of time an event in story lasts and the length of time to progress by both the player and game.

3.4.2.3 Frequency

Frequency deals with the relationship between the number of times of an event happens in a story and number of times it is experienced by the player.

3.4.2.4 Polychrony

Polychrony covers determinate and indeterminate orders and positions of events on a timeline.

3.4.2.5 Topographical layouts

Topographical layouts focus on the type of spatial models, which determines the quality of the player's spatial navigation and the pattern of communication with events.

3.4.2.6 Spatial oppositions

Spatial oppositions take game space as a static map and seeks the physical contrasts between objects or concepts, such as a castle versus a lighthouse or over ground space versus underground space.

3.4.2.7 Mobility of characters and objects

Mobility of characters and objects focuses on which spaces of game world a character or object can move across or between, to understand the changes of the player's experience brought by these movements.

3.4.2.8 Paths and axes

Paths and axes examine how much freedom a track that links two locations in space gives the player to move within and to what extent plot and events rely on this track.

3.4.2.9 Visual and off-visual space

Visual and off-visual space discusses the spatial information that is or is not shown to the player.

3.4.2.10 Spatial segmentation

Spatial segmentation seeks the influence on game experience by dividing spaces into smaller units.

3.4.2.11 Perspective

Perspective covers psychological and visual points of view.

3.4.2.12 The VR interface

The VR interface examines how the player's experience changes depending on the influence of interface design in VR.

3.4.2.13 Spatial immersion

Spatial immersion is defined as the effect resulting from the reader reacting to the depicted setting, environment and location.

3.4.2.14 Spatio-temporal immersion

Spatio-temporal immersion is the spatial and temporal distance between a story and the reader.

3.4.2.15 Temporal immersion

Temporal immersion is the reader's absorption on the plot and/or events by the desire to know.

3.4.2.16 Emotional immersion

Emotional immersion refers to the experience arising from the emotional involvement of the reader as a result of the reaction to the fates of characters in a narrative.

3.4.2.17 Presence

Presence refers to "a user's subjective psychological response to a VR system".

3.4.3 Levels of focus

The components of narrative time and space can be used to focus on different levels of narrative design. For example, order can be focused on the relative order of two events and can be used to examine the overall order of events, while topographical layouts see the space as a single object and, thus, should be discussed at the highest level. The example indicates that order is flexible on different levels of examination and topographical layouts concentrate on only the overall level. The examination should be

circumstantial in order to cooperate with the component flexibility for a specific outcome. Therefore, the examination of *Caillte* is implemented in two levels: overall and Story Events. Overall is the level of focus on the overview of a specific kind of effect in *Caillte*. All the components of narrative time and space within The Augmented Framework can be examined on overall level. Story Events is the level which divides the game story into groups of events; there are four Story Events, with each Story Event consisting of various smaller events. The following components are utilised on the Story Events level: order, speed, frequency, polychrony and visual and off-visual space.

3.4.4 The four Story Events

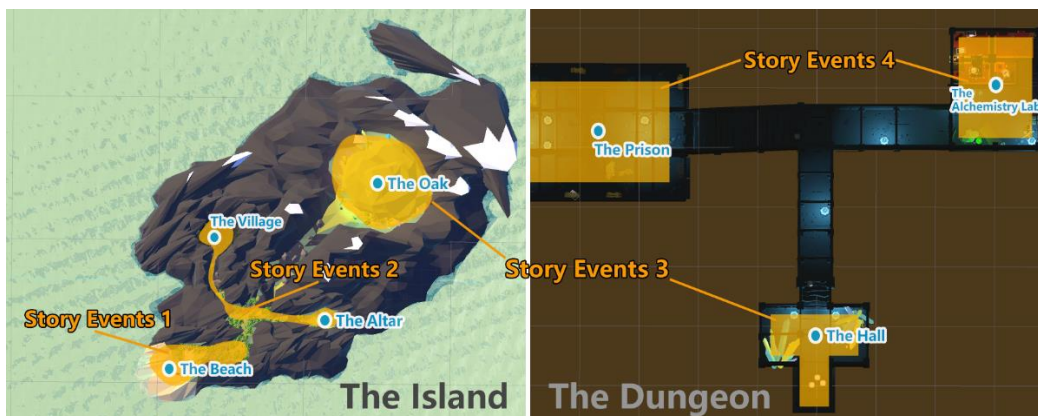


Figure 6 – Areas of the four Story Events in The Island and The Dungeon

There are four Story Events that separate the player's traverse as the servant in *Caillte*, as shown in Figure 6. Story Events 1: the servant's landing, represents the events within The Beach where the servant is situated; Story Events 2: the vanishing of the knights, includes the events that happen at

The Village and The Altar, the servant finds a ruined village and learns the knights were ambushed; Story Event 3: oak and plot, groups the events at The Oak and The Hall, Story Event 3 involves the servant transferring from The Island and The Dungeon, the servant senses mystery by finding the giant oak and crystals, as well discovering a plot as brewed upon finding The Dungeon; Story Event 4: human trials, groups the events at The Prison and The Alchemy Lab, the servant within Story Event 4 learns the reason the knights are dead exposing Viviane's conspiracy.

3.4.5 Horizontal and vertical analysis method

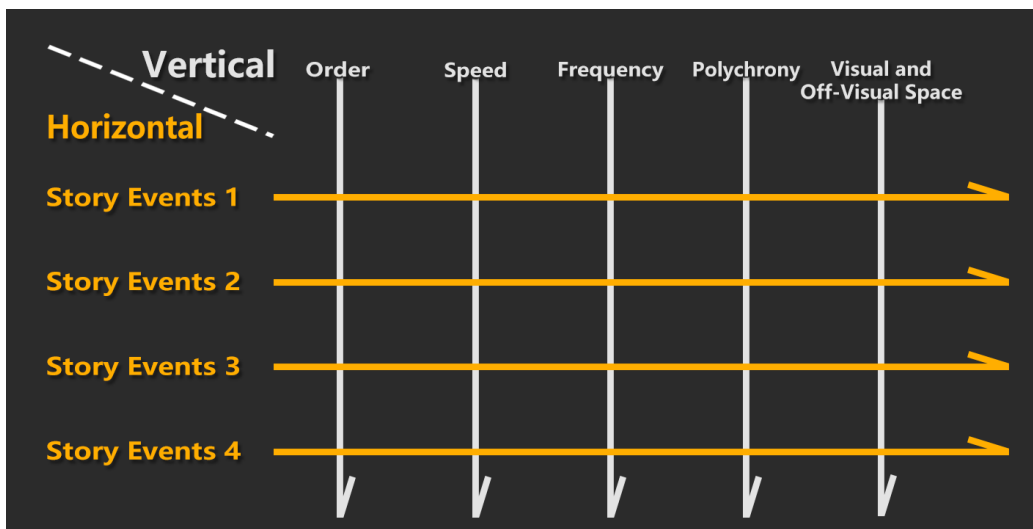


Figure 7 – Directional diagram of horizontal and vertical analyses

The examination of order, speed, frequency, polychrony and visual and off-visual space is not only implemented at the Story Events level but also in different directions for acquiring a greater insight. As shown in Figure 7, there are two directions employed: horizontal and vertical. Horizontal

analysis focuses on Story Events, and each Story Events contains the evaluation of the five components. Horizontal analysis allows the comparison among the ways for inducing presence within a specific piece of the narrative experience. Vertical analysis concentrates on each of the five components, and each component includes the evaluations of the four Story Events. Vertical analysis compares the effects of each component within each of the four Story Events, so the role of the components can be clearly shown.

3.4.6 Examination structure overview

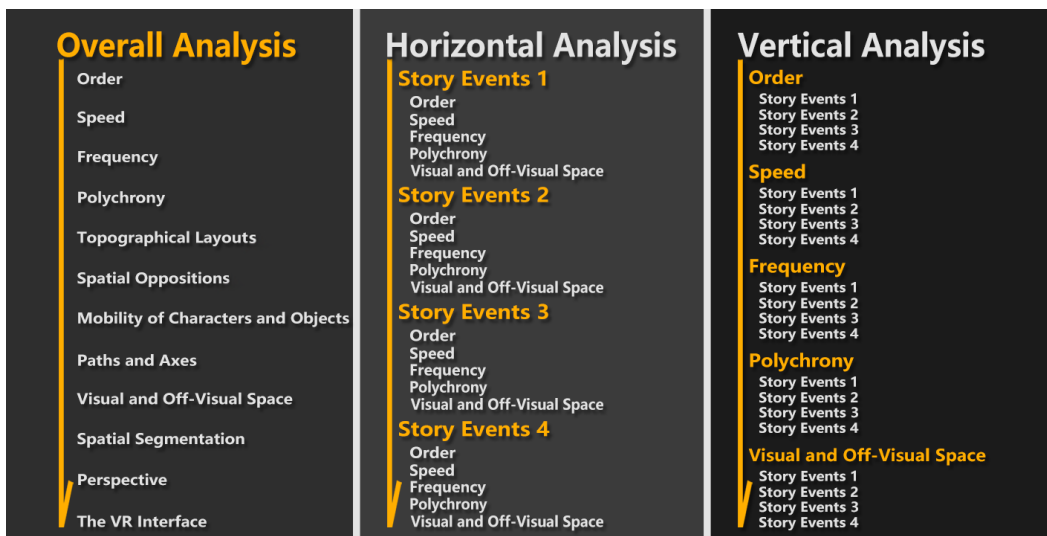


Figure 8 – Examination structure diagram

As shown in Figure 8, the examination of *Caillte* overall includes the components of order, speed, frequency, polychrony, topographical layouts, spatial oppositions, mobility of characters and objects, paths and axes, visual and off-visual space, spatial segmentation, perspective and the VR

interface. The examination of Story Events employs horizontal analysis, the components of order, speed, frequency, polychrony and visual and off-visual space are evaluated within each of the four Story Events. The examination also employs vertical analysis, where the components of the four Story Events are evaluated within each of order, speed, frequency, polychrony and visual and off-visual space.

3.4.7 Examination process

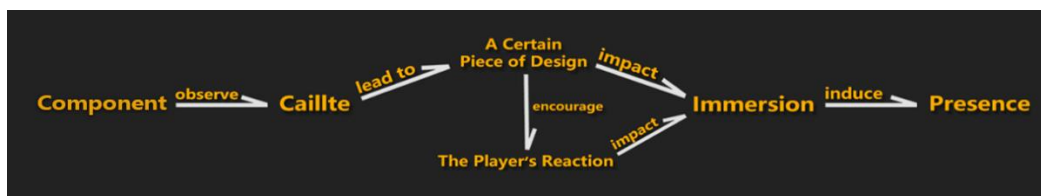


Figure 9 – Examination process

The Augmented Framework examines the way presence is induced, by what and how, in the narrative time and space of *Caillte*. The examination follows a process designed for *Caillte's* conditions, and Figure 9 illustrates the flow of the process. The process illuminates how *Caillte's* different types of immersion induce presence.

3.5 Implementation

This section implements the examination of *Caillte* using The Augmented Framework.

3.5.1 Overall analysis

The following subsections examine *Caillte* on an overall level. The examination of *Caillte* is implemented through the full checklist and the examination process of The Augmented Framework. The examination includes the further documentation of *Caillte* regarding the components, and the documentation is evaluated in regards to how presence is influenced. A summary highlights the findings of the examination.

3.5.1.1 Order

This subsection focuses on order in *Caillte* overall. As shown in Figure 10, there are seven events in two different orders: chronological and in-game; chronological order is how the story unfolds, the order the player experiences does not necessarily match the chronology, there is the possibility of the player experiencing the same events in another order (see Subsection 3.5.1.4); the contents of the events are listed within the figure.

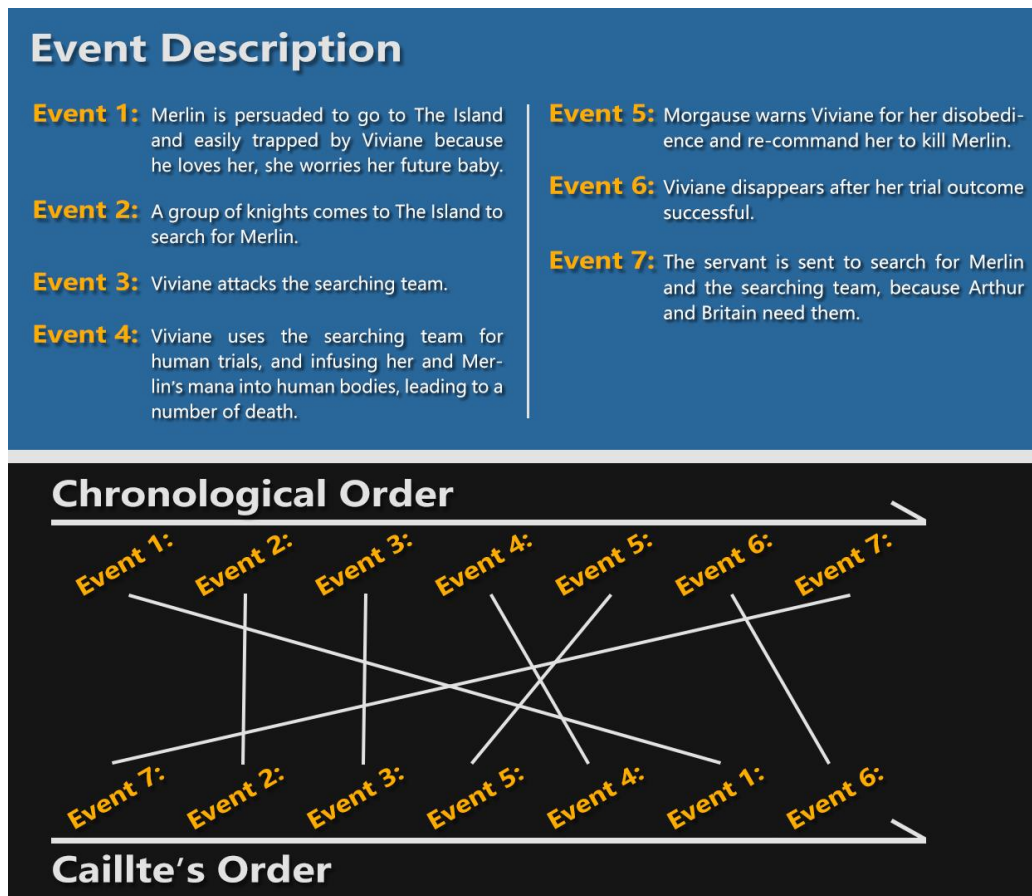


Figure 10 – Event description, chronological and Caillte's orders. Event description shows Caillte's story divided into seven events and what happens in each event, the two orders illustrate how each order sequence its events and how different the two orders are.

Chronological order places the player at the start of the timeline of *Caillte*, so that the player experiences the type of suspense of wondering what will happen next; while the order the player experiences causes the player to experience why and/or how suspense through showing that Merlin is missing but revealing the reasons and the events that caused it later; according to Ryan (2015), the suspense of what will happen next has a stronger positive impact on temporal immersion than why/how suspense, thus chronological order of *Caillte's* story has a higher temporal immersion than the order the player experiences in terms of the type of suspense.

The range of uncertainty in chronological order is the largest since anything can happen in the next moment; the range of uncertainty in the order the player experiences is limited to Merlin's going missing, which is relatively narrow. According to Ryan (2015), a smaller range of uncertainty produces a higher extent of temporal immersion, so the chronological order of *Caillte's* story produces lower temporal immersion than the order the player experiences, in terms of the range of uncertainty.

The relative positions of event 7 highlight another difference between the two orders of *Caillte* overall. Event 7 links the fates of Merlin and the knights with the fates of Arthur and Britain. What happens to Merlin and the knights will further influence what happens to Arthur's and Britain's future, beyond the game story of *Caillte*. Therefore event 7, to some extent, makes the player experience the suspense of what will happen next. The difference of the positions of event 7 leads to different times for the start of the experience and the different durations of the experience in the two different orders in *Caillte*. Chronologically, the suspense of what will happen next, led by event 7, appears at the end, while in *Caillte* the suspense emerges at the start and lasts until the end of the experience.

According to Ryan (2015), temporal immersion contributes to presence, and therefore the order the player experiences in *Caillte* induces presence through temporal immersion but in a different way compared to the

chronological order: the player may experience presence through the why/how suspense with the lower range of uncertainty, while chronological order provides the suspense of what will happen next with the broadest range of uncertainty. It is difficult to judge which order induces a higher intensity of presence since both have advantages and disadvantages. Additionally, the order of *Caillte* overall also leads to temporal immersion appearing in different times and durations, and presence possibly varies correspondingly.

3.5.1.2 Speed

This subsection examines speed on *Caillte* overall. The examination focuses on the speed of the player's action in *Caillte* and the events of the game story.

The player using *Vive* acts in *Caillte* in real-world speed: the player's virtual camera's and controllers' movements correspond to the player's head and hand movements respectively, so that the player performs fluent movements in the 3D environment of *Caillte*; according to Ryan (2015), the player's fluent movement has a positive impact on spatial immersion.

Caillte is designed to present the events of the game story partially. The partial presentation, or ellipsis (see Subsection 2.2.3.1), determines what and how much information of an event is to be revealed, which regulates the range of uncertainty and the type of suspense in *Caillte*. For example, in

one possibility that the player in *Caillte* reveals the group of knights has been murdered by a ghost using magic at The Village and discovers a stone carved with the name “Morgause” at The Altar; these revelations may let the player assume that Morgause killed the knights. Ellipsis in *Caillte* leaves a small range of uncertainty using the words “ghost” and “magic”, so that the player may try to link them with someone who has similar features (i.e. “ghost” and “magic” linked with the mystique of The Altar), leading to the suspense of who did it, which, according to Ryan (2015), has a positive impact on temporal immersion.

Speed of *Caillte* overall has spatial immersion and temporal immersion which, according to Ryan, contribute to presence. Spatial immersion is created by the high fluency of the player’s actions in the 3D environment, while Temporal immersion is generated through the use of ellipsis regulating information disclosure in *Caillte*, leading to the player’s preoccupation on *Caillte*’s plot.

3.5.1.3 Frequency

This subsection examines frequency on *Caillte* overall. The design of frequency of *Caillte* influences all types of immersion.

Repetition is widely used in *Caillte*. Mostly the information of an event is divided into multiple clues; each clue is a bridge bringing the player closer

to the event; the player can visit the event more than once through the discovery of multiple clues, so repetition occurs. The use of repetition in the form of multiple clues has an influence on the four types of immersion in *Caillte*: for reproducing an event the player has to physically look for, examine and mentally process a clue, which requires active participation in the *Caillte* game world; each clue is a concrete detail linked to an event and discloses key information about the event; the dead bodies of the knights are clues as well, and the multiple corpses in *Caillte* may horrify the player (causing self-centred emotion) at a higher extent, which may stimulate the player to experience more empathetic emotions towards their misfortune, with the multiple corpses exaggerating the ruthless side of Viviane and vividly showing the consequences, leading the player to form a judgement of Viviane; according to Ryan, the additional participation, concrete detail, information disclosure and the player's reactions have positive impacts on spatio-temporal immersion, spatial immersion, temporal immersion and emotional immersion respectively. The other types of the use of frequency, such as singular and iteration, are rare and have a relatively a minor influence on the narrative.

The use of frequency of *Caillte* overall, or repetition, multiplying the existing layers of immersion, according to Ryan (2015), presence may be increased with each multiplication. Presence induced by spatio-temporal immersion through the player's participation may become more durative since

repetition here requires more participation. Presence may also come from repetition in *Caillte* from the other three types of immersion, such as through the role of clues as a concrete detail, as a means to decrease the range of uncertainty and as a representation implying the atmosphere and the characteristic of Viviane.

3.5.1.4 Polychrony

This subsection examines polychrony on *Caillte* overall. The design of the game mechanism of *Caillte* on clue searching generates narrative variation, further influencing immersion.

The player can freely discover the clues in a variety of orders in *Caillte*, while there is no text variation tied with the clues corresponding to the order difference, resulting in only a limited number of orders to express *Caillte*'s narrative properly. For example, the player is expected to first learn about what role the player is and what the setting is in the story. However, it is possible to discover that the knights have been attacked as the first event within one traverse of *Caillte*, which can delay learning about the role and setting. *Caillte*'s narrative needs to be interpreted through the lens of the role and setting, whereas the freedom allows the player to temporally avoid learning the role and setting, which could lead the player to fail to interpret the clues adequately so that the corresponding types of immersion are

diminished. According to Ryan (2015), knowing the role and setting has a positive impact on spatio-temporal and spatial immersion respectively, and such a delay can lead to spatio-temporal and spatial immersion not being generated at the right time or not being maintained as would be achieved by knowing the role and the setting while continuing the game play in *Caillte*.

According to Ryan (2015), the damage of the spatio-temporal immersion and spatial immersion by delaying knowing the role and setting respectively may negatively impact on presence. The player's freedom of ordering clue discovery, coupled with no text variation, is the primary cause leading to the decrease of presence in *Caillte*.

3.5.1.5 Topographical layouts

This subsection examines topographical layouts of *Caillte*. *Caillte* uses a mixed topographical layout, which has mixed effects on immersion.

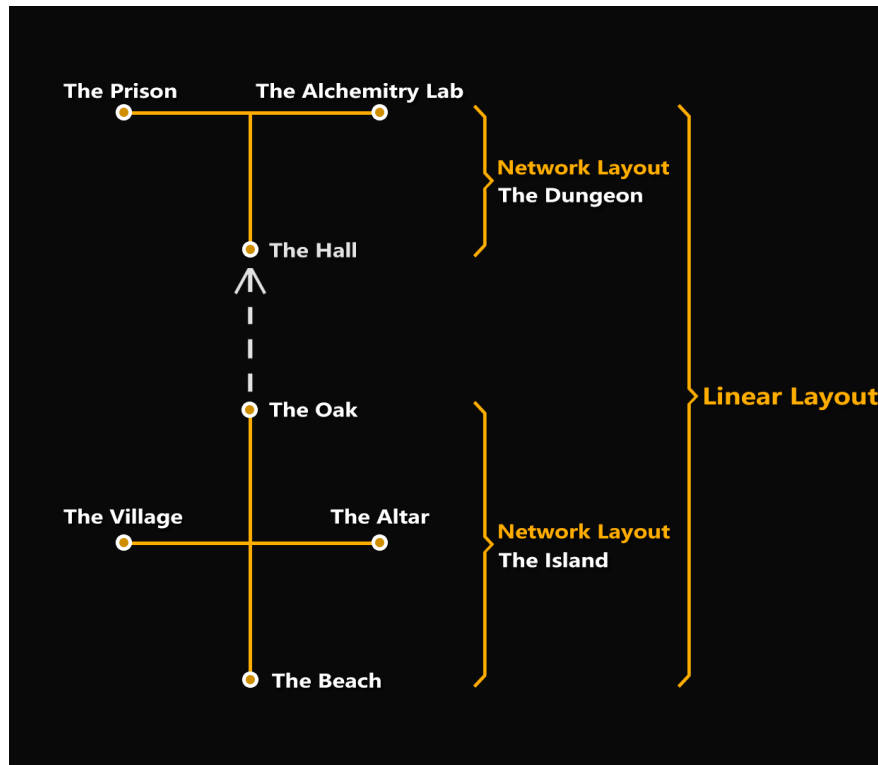


Figure 11 – Mixed layout illustration

As shown in Figure 11, in view of the overall topography it is a linear layout: when *Caillte* starts, the player is located at The Beach of The Island, then when the player finishes discovering the clues within The Island, The Dungeon is the only one place to visit next, and the player can only achieve The Dungeon by first arriving at The Hall through The Oak of The Island. In general, *Caillte* uses linear layout to centralise the locations where the events happen and limit the player's ability to wander about in *Caillte*. The centralisation and limitation to some extent decreases the duration of clue exploring, thus ensuring the clues are discovered more frequently in *Caillte*; because a clue can bring immersion, according to Ryan (2015), immersion appears more frequently.

The Island and The Dungeon use network layout individually. The use of network layout is partially responsible for the player's freedom in *Caillte* to discover the clues in various orders. Within each of them, the player can freely navigate so that various orders of clue discovery become possible in *Caillte*. Therefore, the player's freedom of ordering clue discovery is contributed by the design of network layout.

Mixed topographical layout in *Caillte* has advantages and disadvantages. The use of linear layout in *Caillte* allows the player to more frequently discover clues which, according to Ryan (2015), allows presence to become more dominant because the player's preoccupation obtains a higher percentage towards the whole duration of game traverse of *Caillte*. The use of network layout contributes to the player's freedom of ordering clue discovery, but, according to Ryan (2015), this is responsible for the presence decrease in polychrony.

3.5.1.6 Spatial oppositions

This subsection evaluates spatial oppositions of *Caillte*. There are several parts of the space designed in contrast and the comparisons between them have narrative meanings which further influence the player's narrative experience.

The Island, in contrast with The Dungeon, is the design of outer space and inner space respectively. The inner space is designed to horrify the player since that the inner space represents death and Viviane: The Dungeon is where Viviane enslaves the knights and uses them for trials. Another difference which creates contrast is the comparison between the natural scenery of The Island (e.g. a natural landscape with vegetation, sea and rocks) and the artificiality of The Dungeon (e.g. man-made structure with rooms, walls and instruments for the trial). The artificiality represents the consequence of Viviane's slavery and murder, so the artificiality might be more horrible to the player for its meaning than the naturality of The Island. According to Ryan (2015), horror is a self-centred emotion that has a positive impact on emotional immersion.

As stated by Ryan, horror remarkably increases presence, and Viviane's ruthlessness and its consequences, highlighted by the contrast between artificial inner and natural outer spaces, is the primary cause of horror in *Caillte*.

3.5.1.7 Mobility of characters and objects

This subsection examines mobility of characters and objects of *Caillte*. The design influences spatio-temporal and spatial immersion.

There are many characters in *Caillte*: the servant is the playable character whom the player controls; other characters are the non-playable characters, including Merlin, Viviane, Arthur, Gareth, the group of knights, Morgause and the future child; the non-playable characters are not interactive.

The player can move within The Island and The Dungeon and acts as the servant in *Caillte*, so the servant has the same mobility of the player which means that the player interprets *Caillte's* narrative through the servant in any location on The Island and The Dungeon. According to Ryan (2015), the mobility of the servant contributes to the player's acting as the servant, and this mobility has a positive impact on spatio-temporal immersion. *Caillte* is mainly about Merlin, Viviane and her trials; before the servant comes to The Island, they moved within The Island and The Dungeon. Morgause can be found showing herself in The Prison of The Dungeon, as in the story of *Caillte*, Morgause plays a relatively insignificant role, so she has less mobility. Arthur, Gareth and the future child are to enrich the setting, and they have no access to The Island and The Dungeon of *Caillte*.

All the objects that can be carried are the grabbable clues. The grabbable clues cannot be brought between The Island and The Dungeon. The unavailability of carrying clues between the two places in *Caillte* is a detail inconsistent with the real world, which might be harmful to the authenticity of *Caillte*, therefore leading to spatial immersion being damaged.

According to Ryan (2015), presence in *Caillte* may come from the spatio-temporal immersion contributed by the servant's mobility; the poor design of clue mobility reduces authenticity and may decrease presence.

3.5.1.8 Paths and axes

This subsection examines paths and axes of *Caillte*. There are two different kinds of paths in *Caillte*, limited and unlimited, with both influencing immersion.

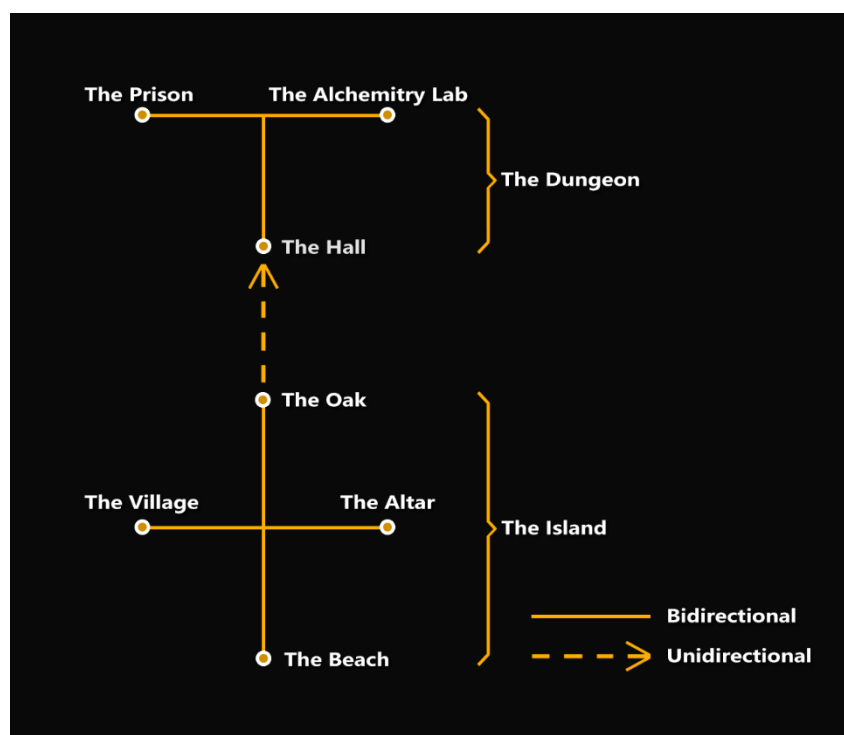


Figure 12 – Paths illustration

As shown in Figure 12, the paths in solid lines do not limit direction and number of times of passing. The player can freely navigate on these paths. Therefore, the player's freedom of ordering clue discovery is supported by the unlimited path. While the path in the dotted line, linking The Dungeon

and The Island, limits the player's passing to one-way and only one passing. This path is designed to open when the player discovers all the clues in The Island. Therefore the design of the unidirectional path stops the delay of learning the role and setting (see Subsection 3.5.1.4) happening in The Dungeon, through which the loss of immersion is prevented in The Dungeon. However, the reason why the player is not allowed to go back to The Island is not given. The impossibility of returning from The Dungeon to The Island without a proper reason is a detail inconsistent with real-world spaces. According to Ryan (2015), this detail may have a negative impact on spatial immersion.

The design of the paths in *Caillte* contributes to the player's freedom of ordering clue discovery, which, according to Ryan, is responsible for the presence decrease in polychrony; presence may decline because of the unreasonable nature of the limited path for the player.

3.5.1.9 Visual and off-visual space

This subsection focuses on visual and off-visual space in *Caillte* overall. The examination is implemented regarding the use of *HTC Vive* and visual style.

Caillte is designed for *HTC Vive*. *Vive* allows a wide FOV and a complete FOR, which may give the player the illusion of being surrounded by the space of *Caillte*. According to Ryan (2015), the visual properties of *Vive* have

a positive impact on spatial immersion. Because of the interactivity of *Vive* as a VR device and *Caillte* as a VR game, the player has full control over the virtual camera's movement and can perform natural actions (e.g. turning the head and walking around) supported by the head tracking function and high frame rate of synchronisation for both the virtual camera and the headset positions and orientations in time in *Caillte*.



Figure 13 – The overall visual style of The Island and The Dungeon

As shown in Figure 13, the visual representation of *Caillte*'s space is designed in a low-polygon style. The style balances between computation load for the real-time synchronisation and visual beauty for preoccupying the player when exploring the space of *Caillte*. According to Ryan (2015), the low-polygon style has a positive impact on spatial immersion. In general, The Island is designed to be in bright and warm colours to contrast with The Dungeon, rendered in dark and cold colours, and the contrast

distinguishes the atmospheres for inducing emotions of horror in *The Dungeon*. According to Ryan, the horror has a positive impact on emotional immersion. The detailed visual design is examined on the Story Events level.

According to Ryan, visual and off-visual space in *Caillte* induces presence through spatial immersion and emotional immersion. Regarding spatial immersion, the visual representation using *Vive* gives the player the illusion of being in the space; the low-polygon style guarantees the visual aesthetic increases the possibility of the player's enjoyment of exploring the space, and this style also prevents synchronisation latency to ensure the player's fluent movement in the space which aids with inducing presence. To emotional immersion, the contrast of the colours leading to the different atmospheric representations helps trigger self-centred emotion, further inducing presence.

3.5.1.10 Spatial segmentation

This subsection examines Spatial segmentation of *Caillte*. This component majorly influences spatial immersion through topography and visual presentation.

to Ryan (2015), and an authenticity decrease may have a negative impact on spatial immersion.

Spatial segmentation of *Caillte* is responsible for the various visual styles of the locations corresponding to the story. The variety of visual styles may preoccupy the player in *Caillte* and, according to Ryan (2015), the preoccupation with the visual styles has a positive impact on spatial immersion. The variety also gives the opportunity to highlight the atmosphere inducing emotions, such as horror.

According to Ryan, presence may vary correspondingly to the intensity change of spatial immersion, led by the enhancement and/or damage to the authenticity of the narrative space of *Caillte*, as well as the player's concentration on the visual styles; Spatial segmentation is also responsible for presence through facilitating atmospheric design.

3.5.1.11 Perspective

This subsection examines perspective of *Caillte*. This component is evaluated regarding visual and psychological points of view.

Visually, the player views *Caillte* through the first-person perspective. First-person perspective using the *HTC Vive* headset may give the player the illusion of personally participating in *Caillte*, rather than using a third-person perspective or God's-eye-view through which an avatar acts on

behalf of the player. According to Ryan (2015), the illusion of personal participation has a positive impact on spatio-temporal immersion.

Psychologically, the player takes on the servant's perspective in *Caillte* and is entrusted with the mission to locate/rescue Merlin and the knights. Acting as the servant and being tasked with this mission are designed to let the player participate in the narrative of *Caillte*, according to Ryan (2015), this has a positive impact on spatio-temporal immersion. The mission design intends to give the illusion that the player's outcome further influences the servant's, Arthur's and Britain's respective fates. This illusion generates the suspense of what will happen next in regard to these fates. According to Ryan, the use of suspense has a positive impact on temporal immersion.

Since the player is in the first-person perspective in *Caillte* and acting as the servant, the player may feel more self-centred emotions (e.g. horror), enhanced by the spatial closeness between the player and *Caillte*, and the narrative meanings (e.g. the player acting as the servant belonging to Britain thus bearing hostility toward Viviane). According to Ryan (2015), the combination of the first-person perspective and taking an active role in the story (as the servant) may further impact positively on emotional immersion.

Perspective in *Caillte* is majorly responsible for spatio-temporal immersion through the use of first-person perspective leading to the illusion of more participation in the game, and through the design of acting the role of the servant, shortening the distance between the player and the narrative. Perspective in *Caillte* also produces temporal immersion through the suspense towards the future of the fates. According to Ryan (2015), the spatio-temporal immersion, temporal immersion and emotional immersion have positive impacts on presence.

3.5.1.12 The VR interface

This subsection evaluates the VR interface of *Caillte*. Reading texts is how the player learns about the narrative in *Caillte*, so there are textboxes presenting texts. The textboxes of *Caillte* are designed to hide until the player triggers the pop-up function of the textboxes detecting the collision between the controller (as shown in Figure 15) and clue attached with a textbox, or the distance between a location to the player's headset.

Augmented Framework. The design of *Caillte* involves all four types of immersion. Advantages and disadvantages of the design are found through the examination. This subsection summarises the significant results discovered in the examination of *Caillte* overall regarding presence. The summaries are listed by the four types of immersion, as well as the assistance or harm of designs on achieving presence.

Within spatial immersion, *Caillte* induces presence using *HTC Vive* visually presenting *Caillte's* space, covering the player's vision and supporting the player's fluent actions, as well as preoccupying the player with the low-polygon visual style of the space.

To spatio-temporal immersion, *Caillte* induces presence using the first-person perspective, allowing the player to participate the story as the servant, and through the design of multiple clues extending the player's active participation.

Regarding temporal immersion, *Caillte* leads to the player's sense of presence through managing the order of the events, what and how much information is presented, through which suspense target and range of uncertainty changes.

With respect to emotional immersion, *Caillte* induces presence by giving the meanings related to Viviane in topographically spatial design, including spatial contrast and visual style. The combination of acting as the servant

hostile to Viviane and using the first-person perspective is also found to trigger horror as a source of presence.

To the designs playing an assistant role of inducing presence in *Caillte*, the representation of multiple clues gives more chance for presence to be induced; the design of linear layout makes presence inducing more frequent in *Caillte*; the segmentation of subspaces and locations of *Caillte* gives the opportunity to design various visual styles.

There are aspects of design in *Caillte* that may be considered as harmful to presence. The various orders of clue discovery coupled with no text variation have the potential to misguide the player, due to the topographical designs of *Caillte* contributing to the freedom. Two details are discovered as damaging presence: topographically spatial discontinuity and mobility/passing limitation without proper reasons for justification between The Island and The Dungeon.

3.5.2 Horizontal analysis

The following subsections examine the four Story Events in *Caillte*. The examination is implemented using the components of order, speed, frequency, polychrony and visual and off-visual space. The horizontal examination of *Caillte* follows the examination process of The Augmented Framework. The examination includes the further documentation of *Caillte*

regarding the components, and the documentation is evaluated towards how presence is influenced. A summary highlights the findings regarding influencing presence. The four Story Events are listed as the following: Story Events 1: the servant's landing, Story Events 2: the vanishing of the knights, Story Event 3: oak and plot, Story Event 4: human trials.

3.5.2.1 Story Events 1: the servant's landing

The following subsections examine *Caillte* within Story Event 1. Story Events 1 involves The Beach of The Island. When *Caillte* starts, the servant first arrives at The Beach of The Island which is the location where the servant settles down and departs for his journey. The player learns about their role and the setting in the story of *Caillte*. The servant experiences the following events in Story Events 1: Event 1: a knight is killed and a part of his bone left at The Beach; Event 2: the servant is nominated by Gareth and sent to The Island to search for Merlin and the knights, because Arthur and Britain are in peril; Event 3: the servant navigates to The Island with a small boat and food supply. There are four clues telling about the events: The Boat, The Parchment 1, The Barrel, The Human Bone 1. The following paragraphs report the texts attached to each clue.

The Boat: "Don't tell me this old tub is going to get me past the sea again, plus Merlin such a garrulous old man. Just imagining have made me sick!"

The Parchment 1: "We've lost contact with Merlin for years and for more than a month with the knights and servants sent to search for Merlin. You, my loyal servant, must find them and bring them back. People are reckoning we will lose the battle in France because of the lack of knights! You must hurry! Only Merlin can appease people's anxiety, and the battlefield is needing more knights! As more as possible! Go to the Island, that's their last known place. You should remember this is your great opportunity for promotion! Don't disappoint me! If you humiliate me before my dear King, Arthur, you'd be ready for it... Sir Gareth"

The Barrel: "Luckily, I brought enough food with me, but should never have brought those stinky cheese!"

The Human Bone 1: "Where're the other pieces...Something happened here...Damn! I knew it's never good to serve a knight!"

Order

Chronological order in Story Events 1 is shown as the following: Event 1, Event 2, Event 3. There are various orders that the player can experience in Story Events 1 because the clues can be discovered in different sequences, the following order is one possibility: Event 2, Event 3, Event 1.

The difference between the two orders is the positions of Event 1. Event 1 as the first discovered in chronological order may bring a broader range of uncertainty than in the order the player experiences: before knowing the

player's role and the setting, a human bone can bear more assumptions than the sequence in which the player first knows they are a servant looking for Merlin and knights before finding the bone. According to Ryan (2015), the example of the order the player experiences has a smaller range of uncertainty than chronological order, the smaller range of uncertainty has a higher positive impact on temporal immersion than the range of uncertainty experienced in chronological order.

According to Ryan (2015), presence comes from the temporal immersion led by the small range of uncertainty of the order the player experiences towards the bone belongingness.

Speed

The events of Story Events 1 of *Caillte* are presented using ellipsis, and each clue shows the outcome of the corresponding event.

The Parchment 1 communicates in a straight-forward manner the player's role and mission in *Caillte*. The straight-forward communication may reduce distraction so that the player's attention might be directed to playing as the servant and the task of searching for Merlin and knights. According to Ryan (2015), this attention on the role and task has a positive impact on spatio-temporal immersion. The Parchment 1 using ellipsis directly imparts the facts about Merlin going missing and the knights searching for him, and this information structures the basis of the plot so that *Caillte* can

successfully preoccupy the player with the story. According to Ryan (2015), this preoccupation with the story has a positive impact on temporal immersion. The Human Bone 1 hints at an unusual death without revealing who it belongs to and how it happened to be there, the obfuscation of the cause may allow the player to experience the suspense of wondering why, how and who did it which, according to Ryan (2015), has a positive impact on temporal immersion. The Boat and The Bone provide concrete details about the servant navigating to The Beach and surviving with just enough food. These details increase the authenticity of *Caillte*, which has a positive impact on spatial immersion according to Ryan (2015).

Presence is induced by spatio-temporal immersion, temporal immersion and spatial immersion in speed of Story Events 1: the spatio-temporal immersion is produced by the player's attention directed to the role and task using ellipsis upon The Parchment 1; the temporal immersion is facilitated by the player's preoccupation with the story of *Caillte* when the information about Merlin and knights is highlighted using ellipsis; the temporal immersion also rises from the suspense about The Human Bone 1, using ellipsis to hide the truth; spatial immersion is further generated by the details of the servant's navigation, which increases the authenticity of *Caillte*.

Frequency

The Boat and The Barrel are the clues which reveal information about Event 3.

The double clues require the player's participation more than once. Ryan (2015) asserts that this additional participation has a positive impact on spatio-temporal immersion. The Boat and The Barrel separately present the details of the navigation, the corresponding spatial immersion thus appears in different time.

Polychrony

There is a variety of discovery sequences of the clues within Story Events 1, two of them are given for an examination. The first sequence is The Parchment 1, The Barrel, The Boat, The Human Bone 1. The second sequence is The Barrel, The Boat, The Human Bone 1, The Parchment 1.

The first sequence order allows the player to be aware of the role and setting in *Caillte* at the start so that the goal of discovering Merlin and the knights is clear, and the player's subsequent findings are interpreted as progressing towards the goal. By the contrast, in the second sequence order, The Parchment 1 establishing the goal is discovered last, so that the player cannot properly interpret the other clues until discovering The Parchment 1. The proper interpretation towards the clues is how immersion is

generated in *Caillte*, thus within the second order, before examining The Parchment 1, there is no immersion to be gained from the other clues.

According to Ryan's (2015) theory, presence is partially lost in the second sequence order since the correct interpretation of The Barrel, The Boat and The Bone cannot be achieved by the player.

Visual and off-visual space

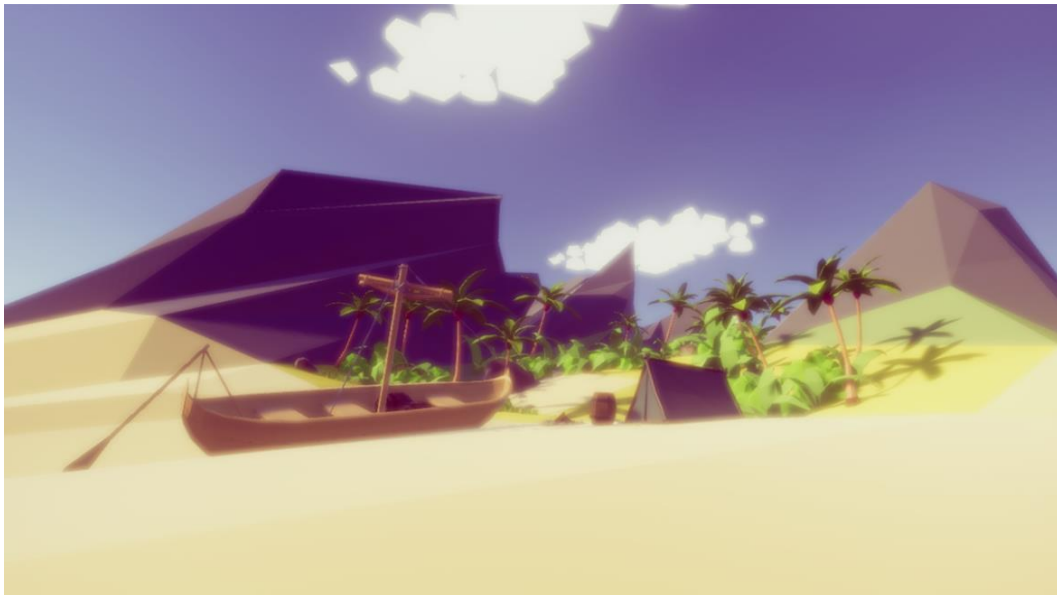


Figure 16 – The visual style of The Beach

As shown in Figure 16, The Beach is where the servant arrives and settles down, so The Beach is designed as natural and warm with water, sand and tropical plants of bright colours, corresponding to the settling. The player may find The Beach relaxing and enjoy exploring it for the beautiful views which, Ryan (2015) argues, has a positive impact on spatial immersion.

Summary

The subsections above examined presence within Story Event 1 of *Caillte*.

The following paragraph summarises the significant findings.

Regarding spatial immersion, presence in Story Event 1 benefits from the player's enjoyment on the environmental beauty of The Beach; the concrete details of the servant's navigation increase *Caillte*'s authenticity inducing presence. To spatio-temporal immersion, presence is induced by the understanding the role and setting, as well as the player's additional participation as the servant by the effect of repetition. For temporal immersion, presence inducement is facilitated by the ordering of events in Story Event 1, the range of uncertainty becoming smaller once the player learns about their role, task and the setting, so that they are able to interpret the meaning and significance of the other clues, such as the bone; presence is also encouraged by the straight-forward communication about the disappearance of Merlin and the knights, presence also comes from the player's attention on the suspense brought by The Human Bone 1 using ellipsis to obscure the truth. There is no emotional immersion discovered within Story Event 1.

3.5.2.2 Story Events 2: the vanishing of the knights

The following subsections examine *Caillte* within Story Event 2. Story Events 2 includes The Village and The Altar of The Island. The Village and The Altar are two locations further into The Island from The Beach. The Village is built by the group of knights as a base for seeking Merlin, but is destroyed by Viviane. The knights are kidnapped by magic. Viviane uses The Altar to worship Truid and to curse Morgause. One knight is sacrificed at The Altar during the religious ritual. The servant experiences the following events in Story Events 2: Event 4: the group of knights builds The Village to settle down and begin seeking Merlin; Event 5: people at The Village are attacked by magic, with some dying in the battle and the rest going missing; Event 6: a man is sacrificed for a religious ritual at The Altar. There are seven clues revealing information about these events: The Stone, The Sacrificed Body, The Book 1, The Human Bone 2, The Tombs, The Diary 1, and The Diary 2. The following paragraphs report the texts attached to the clues.

The Stone: "Mor...gau....se? Who is Morgause?"

The Sacrificed Body: "A man's body entwined with vines?! What kind of sacrifice is this?! Paganistic?!"

The Book 1: "I can't understand these scriptures....."

The Human Bone 2: "One more human bone, definitely not from the same body. So weird....."

The Tombs: "Is it dug up?! Who'd destroy everything even tombs?! Is it too late to say no I don't want to be here to Sir Gareth?! Can I say no to him?"

The Diary 1: "The third day: We've finally reached this island and encamped here. The sailing burdened us, but we must be starting looking for Merlin soon, don't have time to waste..... The fourth day: there is a giant oak and a tree hole with furniture in it, someone must be living on this island. The ninth day: We have searched every single corner on this island but can't find Merlin. There seems a tunnel in the tree hole. Some people will be setting off to investigate the tunnel tomorrow."

The Diary 2: "The tenth day: People came back from the tunnel saw Fergus has been killed by something like a piece of shadow, swords and knives can't do any harm to it. Such an honourable man doesn't deserve to die like this. May the god bless his unfortunate soul. The twelfth day: Since the first attack, people missing every night, I don't know for how long we can survive."

Order

Chronological order in Story Events 2 is shown as the following: Event 4, Event 5, Event 6. There are various orders that the player can experience in

Story Events 2 because the clues can be discovered in various different sequences, the following order is one possibility: Event 5, Event 6, Event 4.

The difference between the two orders is the positions of Event 4. Event 4 reveals the truth that the knights are seeking Merlin, and what they experience at The Village. Since Story Events 1 lets the player link the bone found at The Beach with Merlin and the knights, the player who experiences the latter order, in which Event 4 occurs last in the sequence, may continue experiencing the suspense of wondering whom the dead bodies belong to in Story Event 2, until of course Event 4 is revealed; chronological order uncovers the truth at the start of Story Events 2. According to Ryan (2015), therefore, temporal-immersion in the order the player experiences may last longer than chronological order.

According to Ryan, the order the player experiences induces presence for longer than chronological order for the truth is revealed at a different time in the sequence.

Speed

The clues of The Diary 1 and The Diary 2 are presented using ellipsis so that significant events and their causal relations are given in straight-forward manner. This may reduce distraction to help the story preoccupy the player, as Ryan (2015) suggests, so the preoccupation with the story has a positive impact on temporal immersion. There are two clues designed to be

connected by the player to piece together their mysteries: Diary 2 reveals the unusual existence of “a shadow”, and the name Morgause shown by The Stone at The Altar for worshipping Truid. The act of making connections invites the player’s skills of reasoning and critical thought which indicates that the player is focused on the story. According to Ryan (2015), the player’s focus on the story has a positive impact on temporal immersion. Diary 1 and 2 provide exposition of the setting of The Village: built by the knights and destroyed by a shadow. The setting may aid the player’s understanding of The Village which, according to Ryan (2015), has a positive impact on spatial immersion.

According to Ryan (2015), presence benefits from the temporal immersion led by the player’s preoccupation on the story by the effect of the straightforward presentation of The Diary 1 and 2, and the design of abducting the player’s reasoning towards who killed the knights; presence also comes from the spatial immersion through aiding the player’s understanding of The Village.

Frequency

There are repetitive clues in Story Event 2: The Human Bone 2, The Tombs and The Sacrificed Body. These clues represent the misfortune and death of the knights, as well as the ruthlessness of the murderer, and the player may have empathetic emotion and judge the murderer’s behaviour. The clues

impact the atmosphere of The Village and The Altar, so that the player may feel horror. According to Ryan (2015), the judgement, empathy and self-centred emotions have positive impacts on emotional immersion.

According to Ryan (2015), presence is induced by the emotional immersion enhanced using repetition exaggerating the evilness of the murderer, misfortune of the knights and the horrible atmosphere.

Polychrony

The clues can be discovered in many orders, two of them are given for the examination in this subsection. The first order is The Stone, The Diary 2, The Book 1, The Human Bone 2, The Tombs, The Sacrificed Body, The Diary 1. The second order is The Diary 1, The Stone, The Sacrificed Body, The Book 1, The Human Bone 2, The Tombs, The Diary 2.

There are two significant differences between the two orders. One difference is that The Stone and The Diary 2 are the first items discovered in the first order, while in the second order The Stone and The Diary 2 are discovered as the second and the seventh items. These two clues are designed to let the player reason for temporal immersion, in the first order the temporal immersion appears at the start, while in the second order since the player discovers The Diary 2 in the end, the temporal immersion emerges accordingly. Another difference is the positions of The Diary 1 in the two orders: in the first order The Diary 1 is discovered as the last item,

in contrast, it is found as the first item in the second order. The Diary 1 reveals the identity of the knights, and knowing about the knights at the start of the second order directly influences the player to assume that the dead bodies belong to the knights; while in the first order the identity is revealed at the end, the dead bodies origin and identities have a broader range of uncertainty before the discovery of The Diary 1. According to Ryan (2015), therefore, the second order has a higher positive impact than the first order on temporal immersion.

According to Ryan, presence in polychrony of Story Events 2 is induced at different times by the temporal immersions of discovering The Stone and The Diary 2 in the two different orders; presence also comes from the temporal immersion brought about by The Dairy 1, the freedom of changing the order of discovery leads to temporal immersion varying, and presence changes correspondingly.

Visual and off-visual space

There are two locations involved in Story Event 2 with different visual designs: The Village and The Altar.



Figure 17 – The visual style of The Village

The Village is designed to be a place full of death, corruption and chaos and it consists of ruined houses, broken guard towers, fences, boxes, barrels and tombs, as shown in Figure 17. One house collapses and another two start decomposing. The vegetation is all dead. Barrels and boxes are located in the middle of the area in a disorderly fashion. Tombs are dug up, and dead bodies disappear. The hue of the topography cooperates with the story. All objects within The Village are rendered in dark and low-purity colours. Most of the area of The Village is covered by shadow. In short, all the design upon The Village facilitates a creepy atmosphere to emphasise the consequence of Viviane's actions, and to horrify the player; this may heighten the player's tendency to judge Viviane for her behaviour, and feel sorry for the knights, due to the experience of horror in this atmosphere. According to Ryan (2015), the horror, empathy and judgement have positive impacts on emotional immersion. As The Village is a crime scene,

the player may enjoy exploring the location to search for evidence, and according to Ryan (2015), this enjoyment also has a positive impact on spatial immersion.



Figure 18 – The visual style of The Altar

As shown in Figure 18, The Altar is designed to be mysterious: a dark altar sits in the middle and the word “Truid” is carved on the body of the altar; there is a stone table with a book and a candle on the altar platform, as well as a hibachi with no fire but some charred remnants of a sacrifice; besides the table, there are two hibachis with blue fires burning. The objects of The Altar are intact and animate, which may give the player the feeling that The Altar is well-maintained. The blue fires are intended to symbolise the present tense, so that the player may think that the events occurred recently and the murderer is still somewhere on The Island, which results in feeling more immersed through a sense of belonging to the same timeframe.

According to Ryan (2015), the present tense has a positive impact on spatio-temporal immersion.

According to Ryan (2015), presence in visual and off-visual space of Story Event 2 comes from emotional immersion, spatial immersion and spatio-temporal immersion: the emotional immersion is generated by The Village's visual design tied with the story that The Village and the knights are attacked; the spatial immersion results from the pleasure of exploring The Village for criminal traces; the spatio-temporal immersion is generated by the design of the unusual fire, making the player feel being part of something happening in the present - here and now.

Summary

The subsections above examined presence within Story Event 2 of *Caillte*.

The following paragraph summarises the significant findings.

Regarding spatial immersion, the information about the history of The Village aids the understanding of the location, and presence may raise from the enjoyment supported by that understanding when exploring The Village; the player's desire to discover criminal traces further enhances and promote the reasoning of the player when exploring The Village. To spatio-temporal immersion, the player may feel more involved by the story when seeing the blue fire representing the present tense, placing them closer to the action. Concerning temporal immersion, presence is maintained until

the truth is revealed; presence can also be induced by the straight presentation of key story elements, resulting in the the player's preoccupation with the story; the player's freedom to determine the order of discovery leads to temporal immersion appearing at different times, so that presence may further be influenced. Concerning emotional immersion, presence can be induced by the multiple corpses highlighting the characteristics and consequences of Viviane, as well as the creepy atmosphere. Visual design also enhances the atmosphere through the use of hue and brightness, coupled with the way these aesthetic choices support the plot.

3.5.2.3 Story Events 3: oak and plot

The following subsections examine *Caillte* within Story Event 3. Story Events 3 involves The Oak of The Island and The Hall of The Dungeon. The Oak is the last location to visit within The Island. It is where Merlin is trapped and also the entrance to The Dungeon. Since Merlin is trapped, he tries to return using his magic, leading to a flow of magic being teleported to The Oak, so that the oak tree massively grows and many crystals appear. The Hall is the first location to visit within The Dungeon, where the knights are being used for human trials. One knight dies at The Hall. In Story Event 3, the servant experiences the following events: Event 7: a knight fails to escape from The Dungeon, so he leaves a letter and dies at The Hall; Event

8: Morgause sends a letter warning Viviane against her disobedience and commanding her to kill Merlin immediately. There are two clues which reveal these events: The Parchment 2 and The Letter. The following paragraphs report the texts attached to the clues.

The Parchment 2: "How dare you disobey my order! You should be thankful you haven't caused losses to Avalon! Never let me find you with your little plot again! Kill Merlin immediately, or you will be on trial for your disobedience! Morgause"

The Letter: "If I didn't make this, tell Beatrice from Cornwall I love her..."

Order

Chronological order in Story Events 3 is shown as the following: Event 7, Event 8. There is only one order that the player can experience: Event 8, Event 7.

The first event in each order within Story Event 3, has a different effect: chronological order may let the player understand that The Dungeon is merely a place where more corpses showing up, while the order the player experiences influences the player first to connect the disobedience of Viviane with the killings. According to Ryan (2015), the player's reasoning about the disobedience and the killing involves them in the story and has a positive impact on temporal immersion, so the level of temporal immersion is being influenced at the beginning of the order the player experiences,

while no influence on immersion is experienced at the start of chronological order.

When knowing the second event in each order, the player understands that there is not only killing but also a plot behind the killing, so that the player may review their experience to seek more evidence for revealing that plot, meanwhile the player's understanding on The Dungeon is aided. According to Ryan (2015), the review of the experience has a positive impact on temporal immersion, and aiding understanding on The Dungeon has a positive impact on spatial immersion. Therefore, in chronological order, the temporal immersion and spatial immersion are enhanced. Meanwhile, in the order the player experiences, the player can only experience Event 7 and The Dungeon after knowing Event 8, so that the misunderstanding of the killing does not occur, thus the player's understanding of The Dungeon is aided since that the player enters The Dungeon, and the corresponding spatial immersion is enhanced by temporal immersion, itself aided by Event 8 in the order the player experiences.

According to Ryan (2015), presence varies subtly in the two orders of Story Events 3, since the two orders both promote similar spatial immersion and temporal immersion. The difference emerges from the time interval of the appearance of the two types of immersion, and whether the player

misunderstands the killings and is lead toward a different understanding of The Dungeon for a short period.

Speed

The Parchment 2 and The Letter reveal the outcome of the story using ellipsis. The Parchment 2 discloses the information that Merlin's life is in danger but that the killer has not yet killed him. The Parchment 2 is designed to set up the suspense of who is the killer, for what purpose Viviane is disobeying orders, whether Merlin has been killed, and how and why she killed the knights. These suspense targets direct the player's attention to key plot elements while searching The Dungeon and, according to Ryan (2015), the various stimulations of suspense have a positive impact on temporal immersion, with the temporal immersion lasting until the truth is discovered. The Letter is left next to the dead knight who wrote it in The Hall, and The letter shows how the writer responds to the killing, insinuating how other knights may react to their misfortune. The Letter may not only lead to the player's empathising with them but also stimulates the player's desire to know who the killer is and what their motivations are. According to Ryan (2015), the empathy and the player's desire to know have positive impacts on emotional immersion and temporal immersion respectively.

Ryan's (2015) theory also suggests that presence is induced by the temporal immersion resulting from the obscured truth of whether Merlin is alive, whom the killer is, what is motivating her killing spree, and for what reasons she disobeys Morgause; presence is also induced by the emotional immersion through empathy when the player feels pity for the knights.

Frequency

The dead writer in The Hall can be seen as a repetition if the dead bodies in Story Events 1 and 2 are considered. The dead writer of The Letter brings the atmosphere of The Village to The Dungeon leading to horror which, according to Ryan (2015), has a positive impact on emotional immersion.

According to Ryan (2015), presence is induced by the emotional immersion when the player is horrified by the atmosphere implied by repetitive dead bodies.

Polychrony

There is only one order of clue discovery: The Parchment 2, The Letter 1, because the player must finish discovering the clue in The Oak, before travelling to The Hall through the one-way and once passing entrance (see Subsection 3.5.1.8). Thus, the order is the only possibility. Therefore, any examination of polychrony within Story Event 3 cannot be implemented.

Visual and off-visual space

Story Events 3 involves two locations: The Oak of The Island and The Hall of The Dungeon.



Figure 19 – The visual style of The Oak

As shown in Figure 19, The Oak is designed as an unusual location with a giant oak tree and many crystals. The tree grows on rocks with tenacious vitality and covers almost all of the surrounding valley with its leaves. Countless colourful crystalline structures emerge from the ground and rocks, radiating from underground, with the tree at the centre. The unusual sizes and colours may lead to the player's pleasure of exploring The Oak, according to Ryan (2015), the player's enjoyment when exploring a space has a positive impact on spatial immersion.



Figure 20 – The visual style of The Hall

As shown in Figure 20, The Hall is fully covered by stone bricks; two giant columns support the ceiling; the high artificiality of The Hall coupled with the story elements which inform that The Dungeon might be part of the killing, allows the player feel spatially involved and in danger; there are two hibachis with blue fires burning, the blue fire implying the present tense that makes the player feel a sense of belonging to the same time as the murderer, and according to Ryan (2015), this involvement in the present through the use of tense have positive impacts on spatio-temporal immersion. There are crystals protruding from The Oak area and the positions and orientations of the crystals may help the player comprehend that The Dungeon is located beneath The Oak. The Hall is designed to be dark and cold for facilitating the foreboding atmosphere, to be frightening, and enhance the player's feeling of horror which, according to Ryan, has a positive impact on emotional immersion.

The Oak induces presence through the spatial immersion led by the player's enjoyment of exploring the supernaturally large oak and surrounding crystals; The Hall induces presence through the spatio-temporal immersion that makes the player feel being spatially and temporally involved, and presence also rises from the player's horror for The Hall's atmosphere led by the low brightness and blue hues.

Summary

The subsections above examined presence within Story Event 3 of *Caillte*. The following paragraph summarises the significant findings.

To spatial immersion, presence may be induced by the enjoyment of exploring The Oak area for its strange features; the player's exploration in The Hall, while understanding that The Hall is involved in the murder, may enhance the experience of the exploration leading to presence. Regarding spatio-temporal immersion, presence is designed to be induced by the implication of spatial and temporal closeness through The Hall's high artificiality, its story and the burning blue fire that symbolise potential present danger. Temporal immersion happens when the player concentrates on the truth related to Merlin, the knights' death and the murderer, and the player's concentration may lead to presence. Regarding emotional immersion, presence might rise from the pity for the knights and

the horror generated by the creepy atmosphere brought by the visual design and the dead writer of *The Letter*, revealing *The Dungeon's* involvement.

3.5.2.4 Story Events 4: human trials

The following subsections examine *Caillte* within Story Event 4. Story Events 4 involves *The Prison* and *The Alchemy Lab* of *The Dungeon*. *The Prison* is where the knights are held captive after they have been kidnapped, and where Morgause shows herself to Viviane. *The Alchemy Lab* is where Viviane does the human trials on the knights. She fuses together her and Merlin's power, taken from the crystals, and injects the powerful concoction into the knights to see if a body can bear the power. The servant experiences the following events in Story Events 4: Event 9: discovering that Merlin loves Viviane, and Viviane trapped Merlin to protect him from Morgause; Event 10: The knights are brought to and kept in *The Prison*, and used for experiments; Event 11: One of the knights overheard and discovered that the murderer is Viviane while she is being warned by Morgause; Event 12: Viviane fuses her and Merlin's power into human bodies to see if they can survive the ordeal. There are eight clues revealing these events: *The Parchment 3*, *The Message*, *The Diary 3*, *The Diary 4*, *The Experimental Journey 1*, *The Experimental Journey 2*, *The Experimental Journey 3*, *The Experimental Journey 4*. The following paragraphs report the texts attached to the clues.

The Parchment 3: "Is it Viviane? That sounds like her voice...I recognise her voice...Because I was standing next to my dear King Arthur receiving Excalibur...It can't be! But why she attacked and used us?! It was her giving my dear King Excalibur, and she should be with us! No!.....She was arguing with another woman cursing and blaming Viviane for she ruined a plan. What plan?! What's all this about?!....."

The Message: "Save us! We are being used for magic experiments, and what is waiting for us, in the end, is death ---- burned by black magic! I curse you, you witch, go to hell!!!"

The Diary 3: "I'm so sorry I have deceived you... Forgive me. I had to... It was to protect you from Morgause, hope she'll never know where you are...I never expected you were easily tricked into showing me the spell, are men in love all such foolish....."

The Diary 4: "Too odd, there are crystals growing where I trapped Merlin, and sending out Merlin's power..... How can you teleport power from there to here? I'm afraid you're trying to teleport back to this world. While those crystals are what I need for your power."

The Experimental Journey 1: "The man for the first experiment spontaneously combusted. Was it me? Was it too much power infused into the body? Seems it must be treated with more care because he is a mortal."

The Experimental Journey 2: "Again... Is this either about the individual condition or our power can't be fused at all? I'll need more bodies tomorrow."

The Experimental Journey 3: "They all died in the same way as expected. There was resistance from their bodies while receiving power, and perhaps different organs need different ways to accept the power. Their hearts no longer beat after power finished infusing at the end. While the good news is no more spontaneous combustion occurring. I must speed up in case she finds my work."

The Experimental Journey 4: "Bodies can bear the power for longer, but our child must bear the fusion permanently."

Order

Chronological order in Story Events 4 is shown as the following: Event 9, Event 10, Event 11, Event 12. There are however various orders that the player can experience in Story Events 4, because the clues can be discovered in different sequences, and the following order is one possibility: Event 12, Event 10, Event 11, Event 9.

The order the player experiences shows Event 12 at the start so that the player may experience the suspense of whether or not the human bodies being experimented on are indeed the missing knights which, according to Ryan (2015), has a positive impact on temporal immersion; while

chronological order shows Event 10 as the beginning, Event 10 reveals that the knights are being used for human trials, so the temporal immersion does not exist in chronological order.

The order the player experiences may cause the player surprise when they learn that Merlin is alive, while chronological order may not. The order the player experiences exposes the player to Event 11 before Event 9, and without knowing about Event 9, Event 11 may make the player reason and assume that Merlin is likely murdered, because Viviane has murdered the innocent knights, however then Event 9 disproves the assumption, so that surprise appears. According to Ryan (2015), surprises have a positive impact on temporal immersion. In contrast, chronological order first reveals Event 9, resulting in the understanding that Merlin is alive and protected, so that the idea of Merlin having been killed is eliminated.

Presence in order of Story Event 4 is induced by the temporal immersion when the player questions whether the human bodies belong to the knights and also through the player's surprise when their assumption that Merlin has been murdered is destroyed by the truth (Ryan, 2015).

Speed

By the effect of ellipsis, each clue presents a part of an event of Story Event 4 to the player. The partial presentation offers suspenseful wonderings to the player, such as who trapped Merlin and how the knights are being used

and abused, stimulated by The Diary 4 and The Parchment 3 respectively. The partial presentation requires the player's critical thinking to link the information revealed by the clues and reasoning to piece together the narrative. According to Ryan, the acts of linking and reasoning have positive impacts on temporal immersion. The following shows one possibility of the player's reasoning towards the narrative: Viviane uses the knights (revealed by The Parchment 3) for magical trials (The Message), so that it is Viviane who wrote the experimental journeys and diaries located where the trials were performed; Merlin is trapped (The Diary 4) by Viviane using a magical spell to protect him from Morgause (The Diary 3), because Morgause wants Merlin dead (The Parchment 2 in Story Events 3); Viviane was ordered to murder Merlin at the beginning, but did not obey the order (The Parchment 2 in Story Events 3), possibly for their love (The Diary 3); a woman cursed and blamed Viviane for the plan being ruined (The Parchment 3), so the woman should be Morgause because Viviane hides Merlin rather than killing him; Morgause cannot do anything but be angry because only Viviane knows where Merlin is, and without that knowledge Morgause's plan cannot be realised.

According to Ryan (2015), the speed of Story Events 4 uses ellipsis for hiding some information and leaving suspense to the player, leading to temporal immersion which aids inducing presence; presence also arises

from the temporal immersion when the player links the clues and uses reasoning to understand the narrative.

Frequency

The Experimental Journey 1, 2, 3 and 4 are the outcomes of Event 12, and the clues are the repetition of Event 12. The Experimental Journey 1 through 4 require the player's to exert more effort for discovery compared to, for example, showing Event 12 using a single clue. The more participation the player has, the better the positive impact upon spatio-temporal immersion (Ryan, 2015).

There are repetitive discoveries of human bones in *The Prison* and *The Alchemy Lab*, with the human bones helping to exaggerate the creepy atmosphere and suggest the consequences of Viviane's actions and her role in the story. This repetition may induce the player's empathy to the adversity of the knights, horror towards the atmosphere, and judgement of Viviane's actions and their consequence. According to Ryan (2015), these factors have positive impacts on emotional immersion.

Presence in frequency of Story Events 4 is induced by the additional spatio-temporal immersion and the emotional immersion (Ryan, 2015). Both types of immersion are the effect of repetition: the additional spatio-temporal immersion in *Caillte* is produced by the player's participation in revealing Event 12 through discovering the repetitive clues, an effect which is reduced

when dealing with a single clue, and the emotional immersion is achieved by the player's empathy, horror and judgement encouraged by the repetitive discovery of human bones.

Polychrony

The clues of Story Event 4 can be ordered in various ways. There are two possible orders: The Parchment 3, The Message, The Experimental 1, 2, 3 and 4, The Diary 3, The Diary 4; The Message, The Diary 4, The Experimental 1, 2, 3 and 4, The Parchment 3, The Diary 3.

The two orders for the discovery of The Message and The Parchment 3 may have different effects. In the first order, the player learns that Viviane is using the knights for human trials, so the player may assume that "another woman" is Morgause, as she is the only other female character known before Viviane; whereas in the second order, the player may assume that it is Morgause who did the trials and trapped Merlin, however the player's incorrect assumption would be broken by The Parchment 3, possibly causing the player to be surprised by learning the truth. According to Ryan (2015), the element of surprise has a positive impact on temporal immersion.

Another difference between the two orders is brought about by the ordering of the discoveries of The Diary 3 and 4. In the first order, the player learns that Viviane trapped Merlin in order to protect him, whereas in the second order the player first learns simply that Merlin is trapped, so they may

assume that Merlin is trapped for human trials as well and/or may be dead; the player may then be surprised by the discovery of The Diary 4, revealing Merlin is trapped to be protected and, thus, is still alive. Presence in polychrony of Story Events 4 is induced by the temporal immersion generated by the two surprises, and the surprises are made when the player's incorrect assumptions about who is performing the trials and trapped Merlin, and that Merlin is dead, are broken (Ryan, 2015).

Visual and off-visual space

There are two locations involved by Story Events 4: The Alchemy Lab and The Prison.



Figure 21 – The visual style of The Alchemy Lab

The Alchemy Lab is where Viviane experimented on the knights. As shown in Figure 21, The Alchemy Lab is a chamber that is full of furniture, books, laboratory supplies and experimental traces. Because of

the fullness and variety of articles, the player may enjoy exploring The Alchemy Lab and, the enjoyment of this activity has a positive impact on spatial immersion (Ryan, 2015). There is a dead body lying on a test-bed, burned and blackened to the bone, which the player may find horrifying and deem Viviane brutal.

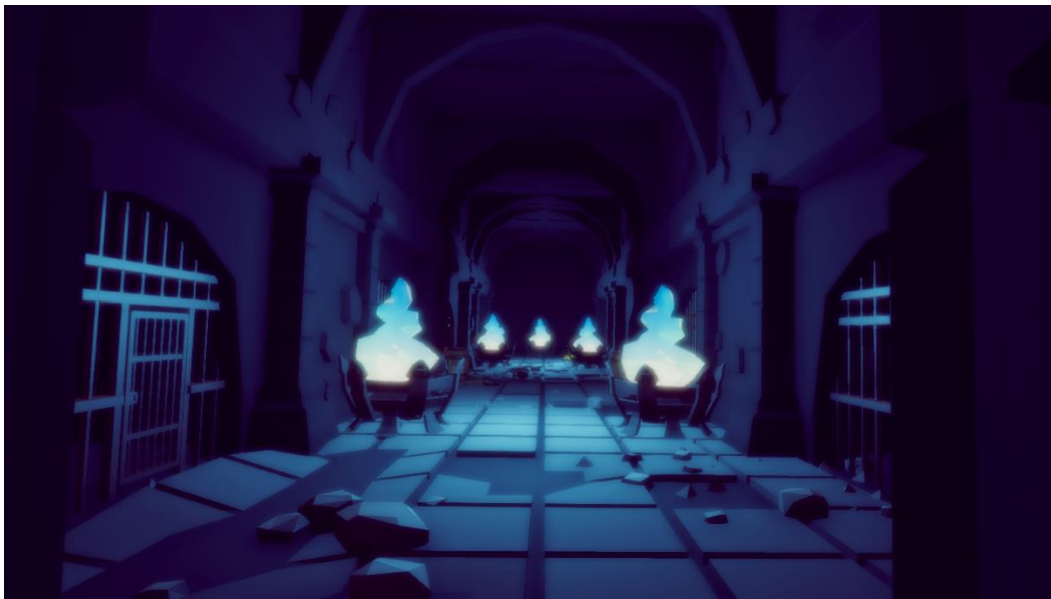


Figure 22 – The visual style of The Prison

The Prison is where the knights were held captive. As shown in Figure 22, The Prison is divided into multiple small cages, with each including wooden planks as beds, and some cages holding dead bodies in them. The cages are connected by a corridor covered by stone bricks and including blue fire hibachis. The blue fire represents present tense implying that the owner or occupant of The Dungeon might still be around. The light source in The Prison is dark and cold, and this light aids the creation a creepy atmosphere, so the player may find The Prison horrible. According to Ryan

(2015), the use of present tense and the player's feeling of horror have a positive impact on spatio-temporal immersion and emotional immersion, respectively.

Presence in visual and off-visual space of Story Events 4 is induced by spatial immersion, spatio-temporal immersion and emotional immersion: the spatial immersion results from the player's enjoyment of exploring the articles of The Alchemy Lab; spatio-temporal immersion results from the present tense represented by the design of blue fire hibachis; the emotional immersion is encouraged by the player's horror and judgement towards the burned body and Viviane respectively, and by the player's horror induced by the light design of The Prison.

Summary

The subsections above examined presence within Story Event 4 of *Caillte*. The following paragraph summarises the significant findings.

Presence is induced by spatial immersion when the player experiences pleasure in exploring The Alchemy Lab for its articles, through spatio-temporal immersion generated by the additional participation of discovering the repetitive clues revealing Event 12. and using present tense, represented by the blue fire hibachis. In terms of temporal immersion, presence is led by the player's connecting clues and applying reasoning to the information to reveal the truth covered by the use of ellipsis, therein

consolidating the narrative; presence also rises when the player doubts that the bodies belong to the knights, is surprised to find out Merlin is alive rather than murdered, and that the person who has trapped him is not Viviane but Morgause. When the clues partially present the narrative this generates suspense which reinforces the presence being induced. This is further aided by the player feeling horrified by the repetitive unearthing of dead bodies, the burned/sacrificed body, the dark light of The Prison, and when the player judges Viviane for the consequence of her actions. All of these affect a state of emotional immersion, inducing presence (Ryan, 2015)

3.5.2.5 Summary

The horizontal analysis examined order, speed, frequency, polychrony, and visual and off-visual space in the four Story Events of *Caillte* using The Augmented Framework. *Caillte* has both positive and negative impacts on immersion, and presence varies corresponding to the impacts on immersion. This subsection summarises the significant findings by the four Story Events.

In Story Events 1 of *Caillte*, presence is induced by the spatial immersion that is produced when the player enjoys the visual design of The Beach and when *Caillte's* authenticity increases through the details of the servant's navigation; presence is also encouraged by the spatio-temporal immersion

resulting from the player's focus on the role and task they play in the narrative, as well as from the extra participation generated by the double-clue representation. Temporal immersion induces presence in Story Events 1 when the order of events is managed in such a way that decreases the range of uncertainty, such as when ellipsis obscures the truth about The Human Bone 1, causing the level of suspense to rise, and finding out whom the bones actually belong to. Emotional immersion was not found in Story Events 1 of *Caillte*.

In Story Events 2, presence arises in the four types of immersion. Spatial immersion begins when the player enjoys exploring The Village, and this enjoyment is enhanced by the player's understanding of The Village and the desire to discover crime scene evidence in the environment. Spatio-temporal immersion is produced when the player senses being in a dangerous situation, implied by the blue fire representing the present tense. Presence is induced by the temporal immersion inherited from the suspense of the bones of Story Events 1, and ended by the truth revealed in the order the player experiences; presence also comes from the temporal immersion when the player's attention is guided to key story elements using ellipsis. Emotional immersion induces presence in Story Events 2 when the player emotionally reacts to the repetitive corpses, emphasising Viviane's role and the consequences of her actions as well as the horrible atmosphere of The

Village, an atmosphere which is enhanced by the hue and brightness of the visual design.

The four types of immersion induce presence in Story Events 3. Spatial immersion arises because of the player's enjoyment of exploring The Oak area due to its unusual and interesting environment, and because of the player's understanding of the murder which enhances the experience of exploring The Hall. Spatio-temporal immersion leads to presence when the player feels being spatially and temporally close to the source of the incident, and the feeling is encouraged by the visual style of The Hall, the story and the blue fire representing present tense. Temporal immersion arises when the player learns the truth about Merlin and Viviane's relationship, a truth which is at first obscured using ellipsis. Emotional immersion arises from the player's empathy for the knights and their horror at the atmosphere of The Hall, which is generated by the visual design of The Hall and enhanced by finding the dead writer of The Letter, which reveals that the killing involves The Dungeon.

In Story Events 4 of *Caillte*, presence occurs through each of the four types of immersion. Regarding spatial immersion, the player enjoys exploring The Alchemy Lab and discovering the articles therein. Spatio-temporal immersion occurs when the multiple clues presenting Event 12 results in the player's additional participation, and the blue fire hibachis imply

present tense. Temporal immersion happens when the player links the clues and applies reasoning to the narrative in order to reveal the truth hidden by ellipsis; temporal immersion also arises when the player concentrates on the suspense surrounding Merlin and the knights, led using ellipsis, and when the player is surprised to learn that Merlin may survive but is trapped by Viviane, rather than Morgause. Presence is also induced by the emotional immersion when the player is horrified by the repetitive corpses, scorched body and the low lightness of The Prison.

3.5.3 Vertical analysis

The following subsections vertically analyse the roles of order, speed, frequency, polychrony and visual and off-visual space in *Caillte*. Each component is examined by the four Story Events of *Caillte*. The examination follows the process of The Augmented Framework. A summary highlights the findings of how each component influences presence.

3.5.3.1 Order

The following subsections examine the role of order in the four Story Events of *Caillte*. Each Story Events shows the corresponding chronological order and one possible order the player could experience. The role of order can be understood by considering the comparison between the two orders in

each Story Events, and their subsequent effects. A summary highlights the significant findings of the examination of order.

Story Events 1: the servant's landing

The events in Story Events 1 are: Event 1: a knight is killed and a part of his bones left at The Beach; Event 2: the servant is nominated by Gareth and sent to The Island to search for Merlin and the knights, because Arthur and Britain are in trouble; Event 3: the servant navigates to The Island with a small boat and food supply.

Chronological order in Story Events 1 is shown as the following: Event 1, Event 2, Event 3. The order the player can experience is listed as the following: Event 2, Event 3, Event 1.

Event 1 is at different positions in each of the two orders. Chronologically Event 1 is the first event revealed, before the lesson of Event 2, which reveals information about the setting and the player's role and mission in it. The knight's bone presents a large range of uncertainty. In contrast with chronological order, the order the player experiences shows Event 1 last in the sequence of Story Event 1, so the player learns of Event 1 after experiencing Event 2. Event 1, therefore, presents a smaller range of uncertainty: whether the bone belongs to one of the knights or Merlin. The smaller range of uncertainty has a higher positive impact on temporal immersion (Ryan, 2015).

Presence is induced through the temporal immersion the player experiences during Event 2 and before learning of Event 1, because the bone can be interpreted using the role, mission and setting.

Story Events 2: the vanishing of the knights

The events in Story Events 2 are: Event 4: the group of knights builds The Village to settle down and begin seeking Merlin; Event 5: people at The Village are attacked with magic, some die in the battle and the rest end up missing; Event 6: a man is sacrificed in a religious ritual at The Altar.

Chronological order in Story Events 2 is shown as the following: Event 4, Event 5, Event 6. The order the player can experience is listed: Event 5, Event 6, Event 4.

Event 4 is placed as the first in chronological order while as the last in the order the player experiences. Event 4 uncovers that the knights came to The Island seeking Merlin and were attacked so that the uncertainty range of the bones origin left by Story Events 1 is eliminated, ending corresponding temporal immersion. Chronological order reveals Therefore the temporal immersion lasts longer in the order the player experiences than it would in chronological order.

Presence benefits more from the order the player experiences than it would in chronological order for Story Events 2, because the mystery around the bone is revealed at a different time.

Story Events 3: oak and plot

There is Event 7 and Event 8 presented in Story Event 3. Event 7 is that a knight fails to escape from The Dungeon, so he leaves a letter and dies in The Hall; Event 8 reveals that a letter from Morgause to Viviane warning her for against disobedience and commanding her to kill Merlin immediately.

Chronological order in Story Events 3 is shown as the following: Event 7, Event 8. The only order the player can experience is listed: Event 8, Event 7.

The player may first misunderstand that The Dungeon is simply the location of more corpses when experiencing Event 7 in chronological order, and then from Event 8 the player may assume that there is a plot behind the killings based on Story Events 1, 2 and 3. The player starts revisiting their previous experience in order to prove their assumption correct and understand The Dungeon better. Revisiting their earlier experience to better understand The Dungeon has positive impacts on temporal and spatial immersion respectively (Ryan, 2015).

Event 8, as the first event in the order the player experiences, allows the player to understand sooner that there is a plot behind the deaths in Story Events 1 and 2, so the player may start reviewing the experience sooner. According to Ryan (2015), this review has a positive impact on temporal immersion. The order the player experiences presents Event 7 after Event 8,

so the player is not likely to misunderstand that The Dungeon is where the killing continues, which allows the player to comprehend The Dungeon well upon arrival there. The player's comprehension of The Dungeon has a positive impact on spatial immersion, though the temporal immersion and spatial immersion increase separately.

Presence is subtly influenced by the two differing orders of Story Events 3 in *Caillte*. The spatial immersion of the two orders are similar, as well as the temporal immersions, while the difference is that the two types of immersion in chronological order rise in unison, but separately in the order the player experiences.

Story Events 4: human trials

The events of Story Events 4 are: Event 9: discovering that Merlin loves Viviane, and Viviane has trapped Merlin to protect him from Morgause; Event 10: The knights are kidnapped and held captive in The Prison, and used for the human experiments; Event 11: The knights discover that the murderer is Viviane by overhearing when she is being warned by Morgause; Event 12: Viviane fuses her and Merlin's power into human bodies to see if they survive the ordeal.

Chronological order in Story Events 4 is shown as the following: Event 9, Event 10, Event 11, Event 12. The order the player can experience is listed: Event 12, Event 10, Event 11, Event 9.

Event 12, as the first event in the order the player experiences, leaves the player with the suspense that the human bodies are the knights, which has a positive impact on temporal immersion (Ryan, 2015). In contrast, chronological order presents Event 12 at the end, and the suspense is eliminated by Event 10 revealing that the knights used for trials, resulting in the temporal immersion being lost in chronological order.

Event 11 is placed before Event 9 in the order the player experiences, so that the player experiences Event 11 and may assume Merlin as likely killed, allowing the player to be surprised when that assumption is shattered by Event 9 revealing the truth about Merlin being alive and protected. This surprise has a positive impact on temporal immersion (Ryan, 2015), but does not occur in chronological order.

Presence through the order of Story Events 4 arises from the temporal immersion led by the suspense of whether the experimental bodies are the missing knights, and by the surprise provided by learning the truth about Merlin's survival and protection, rather than his having been killed.

Summary

The subsections above examined presence by the effect of order in the four Story Events of *Caillte*. The following paragraph summarises the significant findings.

Order of *Caillte* influences presence through temporal immersion. In Story Events 1, temporal immersion is produced in the order the player experiences, because the order reveals the setting and the player's role and mission before finding the bone, so that the player can interpret the bone appropriately. In Story Events 2, the temporal immersion from the order the player experiences in Story Events 1 lasts longer than in chronological order due to the corresponding truth being revealed later. In Story Events 3, Event 7 and 8 are shown in different sequences, so that the corresponding immersions appear at different times. In Story Events 4, temporal immersion is generated by the ordering of events leading to the suspense of bodies belonging to the knights who were experimented upon, and the surprise resulting when the player's assumption that Merlin is dead is disproved by revelation of the truth - that he was trapped to be protected and therefore survives.

3.5.3.2 Speed

The analysis of Speed in the four Story Events follows.

Story Events 1: the servant's landing

The incident of Merlin and the knights having gone missing are given in straight-forward manner by The Parchment 1 using ellipsis. The revelation about the incident forms the basis of the plot development in *Caillte*, and

the straight-forward exposition may increase the clarity of the plot so that it can preoccupy the player more effectively. The player's preoccupation on the plot has a positive impact on temporal immersion.

The Parchment 1 directly informs the player that they are the servant and ordered them to find the missing Merlin and knights. The straightforwardness may help the player concentrate on their role and mission, and this concentration has a positive impact on spatio-temporal immersion (Ryan, 2015).

According to Ryan (2015), presence derived from speed in Story Events 1 is encouraged by temporal immersion and spatio-temporal immersion. The temporal immersion is facilitated by the clear expression about Merlin and the knights going missing which means the player's distraction is reduced and the preoccupation with the plot achieved with ease. The spatio-temporal immersion is enhanced by the straight-forward expression about the player's role and mission in order for the player to perform the role and mission without distraction.

Story Events 2: the vanishing of the knights

The Diary 1 and The Diary 2 using ellipsis explain that the knights arrived on The Island, built The Village and were then killed by a shadow. By the straightforward communication of these facts, distraction may decrease so that the player's preoccupation with the story becomes more organic,

positively impacting on temporal immersion (Ryan, 2015). Learning that The Village was built by the knights aids the player's understanding of The Village, and this improved understanding has a positive impact on achieving spatial immersion.

The Diary 2 and The Stone are designed to reveal the existences of the shadow and Morgause respectively; The Stone is placed at The Altar and remains mysterious, affording the player the opportunity to assume that Morgause is the shadow, because her name is also first discovered at the mysterious Altar, thus leading to the further assumption that she might be able to use magic. The player being encouraged to make such assumptions has a positive impact on temporal immersion (Ryan, 2015).

Ryan's (2015) theory holds that presence can be induced by spatial immersion and temporal immersion. Here, the spatial immersion arises from improved comprehension of The Village. Temporal immersion is produced by the straight-forward exposition about the knights and the killings, so that the story can preoccupy the player easily; the temporal immersion also emerges with the disclosure about the shadow attacking the knights and the appearance of the name Morgause, leading the player to assume the shadow and Morgause are connected.

Story Events 3: oak and plot

The Parchment 2, using ellipsis, reveals that someone wants Merlin killed and that the killer failed to murder him. There is a variety of suspense around the information contained in The Parchment 2, such as who ordered the killing, who is the killer and whether Merlin survived. The suspense surrounding these questions have a positive impact on temporal immersion (Ryan, 2015).

The Letter is left when the knight who wrote it tried to escape from The Dungeon and ended up dying, and it tells of the writer's last wishes, revealing, too, the outcome of what the writer had been through. The Letter encourages the player to associate the misfortune of the writer with the other knights. The player's skills of association may influence them to feel sorry for the knights and desire to know more about the killing. The player's empathy and desire to know generate positive impacts on the level of emotional immersion and temporal immersion respectively (Ryan, 2015).

Presence, by speed of Story Events 3, arises from temporal immersion and emotional immersion. The temporal immersion is generated using ellipsis on The Parchment 2 and The Letter which illustrate the outcomes of the corresponding events so that a feeling of suspense is created for the player. The emotional immersion arises when the player sees the outcome of the killing and feels sympathy for the knights.

Story Events 4: human trials

The Diary 4 and The Parchment 3, using ellipsis, reveal that Merlin is trapped and Viviane has imprisoned the knights respectively; this information leads to the corresponding suspenseful questions raised of who trapped Merlin, why and for what purpose the knights have been jailed. According to Ryan (2015), these stimulations of suspense have a positive impact on the achievement of temporal immersion.

Other clues use ellipsis to present the events in Story Events 4 as well. For facilitating the revelation of various obscured truths, such as, that Viviane performed the trials on the knights, trapped Merlin to protect him from murderous Morgause and the love between Merlin and Viviane. The player must link these clues and apply reasoning to form an understanding of the narrative of *Caillte*. The mental exercise of linking and reasoning have positive impacts on temporal immersion (Ryan, 2015).

Presence from the speed of *Caillte's* Story Events 4 is induced by the use of ellipsis. The player must link clues to uncover the truth.

Summary

The subsections above examined presence by the effect of speed in the four Story Events in *Caillte*. The following paragraph summarises the significant findings.

Speed in the four Story Events of *Caillte* uses ellipsis as the primary method for the presentation of events. By the effect of ellipsis, the four types of immersion are enhanced so that presence is induced correspondingly.

Spatial immersion is enhanced by the player's understanding of The Village, and this understanding is improved by the straight-forward exposition regarding the history of the knights and The Village. Spatio-temporal immersion is generated when the player focuses on their role and mission, and this focus, too, is driven by the straight-forward presentation using ellipsis. For temporal immersion, presence is enhanced by revealing the fact that Merlin and the knights are lost in peril, and what the knights have experienced in The Village, which is done without providing any insignificant information, so that the player's tendency toward distraction is reduced, and *Caillte's* story can easily preoccupy them; presence inducement is also facilitated by presenting the outcomes of the events in *Caillte* whilst also leaving a variety of suspenseful possibilities, encouraging the player to assume and reason about the narrative to try and obtain the full picture. The emotional immersion arises when the player empathises with the knights upon realising the murders have taken place.

3.5.3.3 Frequency

The following subsections analyse frequency's role in the four Story Events of *Caillte* through examining the clues which manifest the effect of frequency. A summary highlights the significant findings of the analysis of frequency's role.

Story Events 1: the servant's landing

The event of the servant's navigation to The Island is presented using two clues: The Boat and The Barrel. The representation of multiple clues provides the player more opportunity for active participation in searching for clues than would using a single clue, which offers a positive impact on spatio-temporal immersion through repetition (Ryan, 2015).

Story Events 2: the vanishing of the knights

The Human Bone 2, The Tombs and The Sacrificed Body represent the grizzly deaths of the knights. The clues are designed to encourage the player to imagine the violent event more than once. The use of imagination may stimulate the player's empathy and judgement toward the knights, and the murderer, respectively. The clues representing the deaths are also designed to exaggerate the horrifying atmosphere of The Village. The player's empathy, horror and judgement have positive impacts on emotional immersion (Ryan, 2015).

Presence might be increased by the additional emotional immersion that is created using repetition by dividing the event of the murders into a series of multiple clues, so that the player may react to the event and the atmosphere multiple times, strengthening the effects (Ryan, 2015).

Story Events 3: oak and plot

Here the dead writer represents death, like the bones and tombs in Story Events 1 and 2. The dead writer's Letter implies that the massive killing also involves the Dungeon, so The Dungeon automatically inherits The Village's atmosphere horrifying the player which has a positive impact on emotional immersion (Ryan, 2015).

Presence in frequency of Story Events 3 is induced by the emotional immersion that is created by the atmosphere of The Hall, and the atmosphere is reinforced by the use of repetition generating the implication of death and the killings, as with The Village.

Story Events 4: human trials

The event of the human trials is presented using The Experimental Journey 1, 2, 3 and 4. The division of the event produces for the player additional acts of participation through the searching for clues, which is eliminated through the use of a single clue. The player's increased level of participation has a positive impact on spatio-temporal immersion (Ryan, 2015).

Innumerable human bones are shown in *Caillte's* Story Events 4. The high quantity is designed to exaggerate Viviane's brutality and the horrifying atmosphere of The Dungeon, so the player's empathy for the knights, judgement of Viviane and feeling of horror from the atmosphere may be enriched, which have a positive impact on emotional immersion (Ryan, 2015).

Presence in frequency of *Caillte's* Story Events 4 is enhanced by spatio-temporal immersion and emotional immersion. The spatio-temporal immersion is extended by the player's additional participation generated by the repetition of dividing the event revealing the human trails into multiple clues, rather than a single clue. This emotional immersion is augmented by the tons of human bones providing another effect of repetition.

Summary

The subsections above examined presence by the effect of frequency in the four Story Events of *Caillte*. The following paragraph summarises the significant findings.

Repetition is widely used in *Caillte* and multiplies the existing immersion; presence is augmented correspondingly. Presence in *Caillte's* frequency is enhanced by the additional spatio-temporal immersion and the increased emotional immersion. The additional spatio-temporal immersion is created

by the player's extra participation when searching for multiple clues about one event, such as the clues about the servant's navigation in *Caillte's* Story Events 1 and the human trials in Story Events 4. The augmented emotional immersion is generated by the high quantity of death-related objects in *Caillte*, such as the bones and tombs. This high quantity stimulates stronger emotional reactions for the player's toward *Caillte's* narrative, with repetitive dead bodies are also used to spread The Village's atmosphere.

3.5.3.4 Polychrony

The vertical analysis continues with polychrony in the four Story Events.

Story Events 1: the servant's landing

The first order is shown as the following: The Parchment 1, The Barrel, The Boat, The Human Bone 1. The second order is listed: The Barrel, The Boat, The Human Bone 1, The Parchment 1.

The Parchment 1 presents the setting, the player's role and their mission in *Caillte*. The player learns of The Parchment 1 before The Barrel, The Boat and The Human Bone 1 in the first order, so that the player can interpret the following clues properly; while in the second order the player cannot understand The Barrel, The Boat and The Human Bone 1 correctly, because the player discovers The Parchment 1 after them. The player's inability to interpret the clues in this case cannot have a positive impact on immersion,

and therefore reduces the likelihood for achieving presence as well (Ryan, 2015).

Story Events 2: the vanishing of the knights

The first order is shown as the following: The Stone, The Diary 2, The Book 1, The Human Bone 2, The Tombs, The Sacrificed Body, The Diary 1. The second order is demonstrated: The Diary 1, The Stone, The Sacrificed Body, The Book 1, The Human Bone 2, The Tombs, The Diary 2.

The Stone and The Diary 2 are designed to encourage the player to connect the two clues forming the assumption that Morgause and the shadow are connected. This process has positive impacts on temporal immersion (Ryan, 2015). The difference between the two orders is that the temporal immersion happens early in the first order because these items are the first two discovered; while the temporal immersion happens later in the second order, as The Diary 2, necessary to making the shadow/Morgause connection, is discovered last.

The Diary 1 is designed to reduce the range of uncertainty surrounding the dead bodies' and tombs' origins. Another difference between the two orders is that The Diary 1 is discovered at the end of the first order, thus the range of uncertainty declines at a later time; while in the second order The Diary 1 is discovered at the start, so that the range of the uncertainty drops earlier, and every discovery of dead bodies allows the player to reason that

the bodies belong to the knights. Smaller ranges of uncertainty have the strongest positive impact on temporal immersion (Ryan, 2015). Therefore the temporal immersion derived from The Diary 1 is at a higher level in the second order than the first order.

According to Ryan's (2015) theory, presence from polychrony in *Caillte's* Story Events 2 is induced by temporal immersion. The intensity of temporal immersion varies in the two orders of Story Events 2, because The Diary 1 reduces the range of uncertainty and is placed at different positions in the two orders.

Story Events 3: oak and plot

The order the player can experience is shown as the following: The Parchment 2, The Letter 1. There is no second order, so polychrony in *Caillte's* Story Events 3 cannot be examined.

Story Events 4: human trials

The first order is demonstrated: The Parchment 3, The Message, The Experimental 1, 2, 3 and 4, The Diary 3, The Diary 4. The second order is listed: The Message, The Diary 4, The Experimental 1, 2, 3 and 4, The Parchment 3, The Diary 3.

The Parchment 3 reveals Viviane's experiments on the knights and that there is another woman, while The Message shows that a witch

experimented the knights. The player finds The Parchment 3 before discovering The Message in the first order, so the player understands that Viviane experiments on the knights, and Morgause is the other woman. In the second order, the player discovers The Message before The Parchment 3, in which case the player may first assume that it is Morgause who did the human trials, not Viviane. When discovering The Parchment 3 in the second order, the assumption is proven false and causes the player to experience surprise, which has a positive impact on temporal immersion.

The Diary 3 reveals that someone trapped Merlin for the purpose of protecting him; The Diary 4 reveals that Merlin is trapped and has tried to escape from the trap. The player discovers The Diary 3 before The Diary 4 in the first order, which means the player directly understands that Merlin is trapped and protected thus has survived. The second order places The Diary 4 before The Diary 3, and the player may assume that the person who trapped Merlin is hostile to him has killed him, while The Diary 3 breaks that assumption and brings the player another surprise which positively impacts on temporal immersion (Ryan, 2015).

According to Ryan (2015), the temporal immersion led by these surprises induces presence in polychrony of Story Events 4; the surprises are created when the player's assumptions are misguided by the information of The

Message and The Diary 4, and then broken by The Parchment 3 and The Diary 3, which reveal the truth.

Summary

The subsections above examined presence by the effect of polychrony in the four Story Events of *Caillte*. The following paragraph summarises the significant findings.

The examination of polychrony in *Caillte* discovered that the different orders in which the player experiences events in *Caillte* may have positive or negative impacts upon the level of immersion, leading to corresponding changes to the achievement of presence. Temporal immersion is considered as the main effect influenced by the difference in order. In Story Events 2 of *Caillte*, The Diary 1 decreases the uncertainty range surrounding the bones' and tombs' origins/identities, and the different orders lead to the uncertainty range declining at different times so that the resulting experiences have different intensities of temporal immersion. In Story Events 4, the difference of order affects whether the player experiences surprise. Presence is lost in Story Events 1 because the player cannot interpret the clues accurately, if they have discovered The Parchment 1 after other clues of Story Events 1.

3.5.3.5 Visual and off-visual space

The following subsections examine visual and off-visual space's role in the four Story Events of *Caillte*. A summary highlights the significant findings.

Story Events 1: the servant's landing

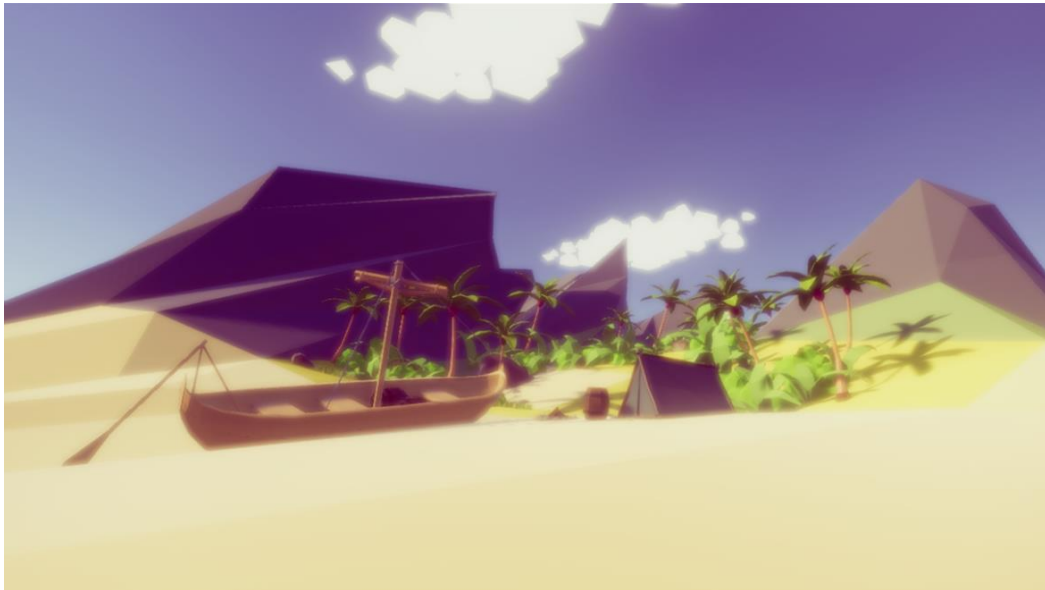


Figure 23 – The visual style of The Beach

The servant first arrives and camps at The Beach, as shown in Figure 23. The Beach is a beautiful and natural seaside which includes orange sunlight, blue water, golden sand, green vegetation and brown rocks. The Beach may give the player the sense of visual beauty, so that the player enjoys exploring The Beach. According to Ryan (2015), this enjoyment has a positive impact on spatial immersion.

Presence in visual and off-visual space of *Caillte*'s Story Events 1 is induced by the player's pleasure for the visual design of The Beach (Ryan, 2015).

Story Events 2: the vanishing of the knights

Visual and off-visual space of *Caillte's* Story Event 2 involves The Village and The Altar.



Figure 24 - The visual style of The Village

Consistent with the story, The Village is designed as a ruined, chaotic and dead place, as shown in Figure 24. All the facilities and articles are broken and disorderly, such as houses, guard towers, fences and tombs. The hue of the objects in The Village is designed in low brightness and saturation. The Village's visual style may horrify the player, which positively impacts on emotional immersion (Ryan, 2015). The Village has traces of crime scene evidence, such as tombs dug up, and the player may enjoy exploring The Village in an attempt to reveal what has happened. According to Ryan (2015), the enjoyment experienced when exploring The Village space has a positive impact on spatial immersion.

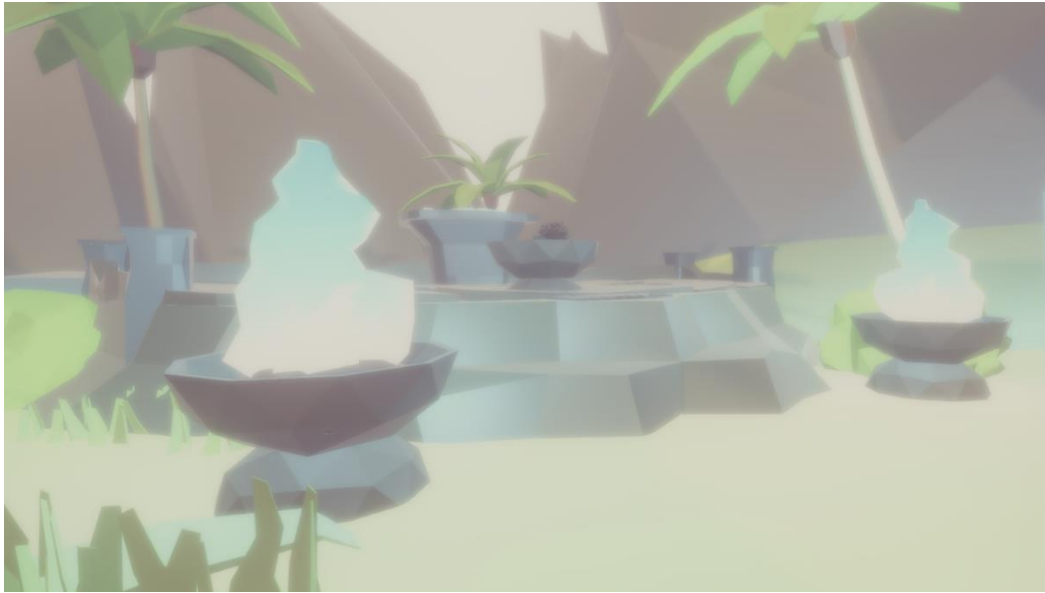


Figure 25 - The visual style of The Altar

As shown in Figure 25, The Altar is designed to create a sense of mystery in *Caillte*, and this mystery arises not only from the function of the facility (i.e. for praying and performing ritual sacrifices) but also the fact that it is well-maintained and the burning blue flames indicating recent occupants. The burning of the flames evokes the present tense which makes the player feel closer to the time of the killing which contributes positively to spatio-temporal immersion (Ryan, 2015).

Presence from visual and off-visual space of *Caillte's* Story Events 2 is induced by spatial immersion, emotional immersion and spatio-temporal immersion. The player's enjoyment generates the spatial immersion when searching for crime traces in The Village; emotional immersion arises from the player's horror felt in the atmosphere, exaggerated by the visual design of The Village, and spatio-temporal immersion is produced when the player

senses a feeling of danger due to the closeness between the time the player is there and the time the killer was.

Story Events 3: oak and plot

Caillte's Story Events 3 involves The Oak of The Island and The Hall of The Dungeon.

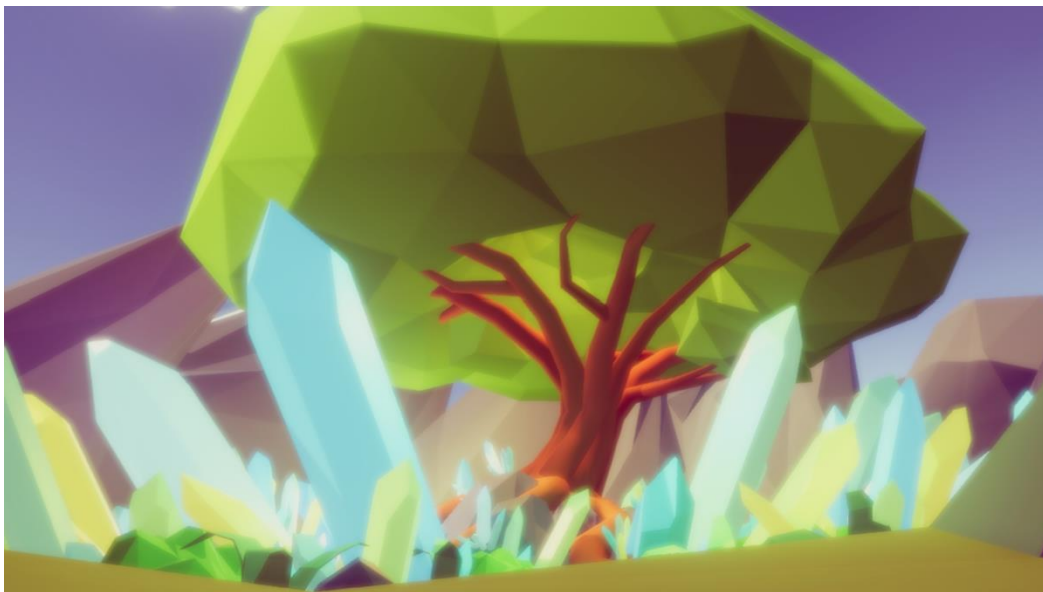


Figure 26 - The visual style of The Oak

According to *Caillte's* story, the tree in The Oak absorbed Merlin's power when he tried to teleport back to The Oak which caused the tree to grow massively, and the excess flow of power forms the crystals, as shown in Figure 26. The player may enjoy exploring The Oak for the tree's majestic greatness and the crystals' radiant colour. This enjoyment has a positive impact on spatial immersion (Ryan, 2015).



Figure 27 - The visual style of The Hall

According to *Caillte's* story, The Dungeon is where Viviane performed the human trials, and The Hall is the entrance to The Dungeon, as shown in Figure 27. The Hall is built of stone bricks, and the artificiality of The Hall may let the player feel spatially close to the killing and/or killer; the burning of the blue flames in the hibachis evokes a present tense which also lets the player feel close to the time of the killing. The senses of spatially and temporally being close to the killing/killer has positive impacts on spatio-temporal immersion (Ryan, 2015). The brightness and the hue of The Hall are designed to be dark and blue respectively, and the design may invoke a feeling of horror for the player, according to Ryan, this will positively impact on emotional immersion.

Presence from the visual designs of The Oak and The Hall is induced through spatial immersion, spatio-temporal immersion and emotional

immersion in Story Events 3 of *Caillte*. The spatial immersion arises from the player's pleasure of exploring The Oak's giant tree and colourful crystals. The spatio-temporal immersion is created by the player's feelings of being spatially and temporally close to the killing/killer, and these feelings are encouraged by the implications of The Hall's high artificiality and the burning blue fires, while emotional immersion is generated by the player's horror in The Hall's atmosphere, enhanced by the design choices of the brightness and hue.

Story Events 4: human trials

Caillte's Story Events 4 involves The Alchemy Lab and The Prison.



Figure 28 - The visual style of The Alchemy Lab

In *Caillte's* story, Viviane tested the knights in The Alchemy Lab, so it's designed as being full of furniture, books, supplies and more crime scene traces for the player to explore, as shown in Figure 28. The player may find

this exploration enjoyable because of the variety and quantity of the objects, coupled with *Caillte's* narrative. According to Ryan (2015), the player's enjoyment of exploring The Alchemy Lab has a positive impact on spatial immersion. The Alchemy Lab also has a charred human body and a pile of bones which may horrify the player and stimulate the player's empathy for the knights, further impacting on emotional immersion in positive ways (Ryan, 2015).

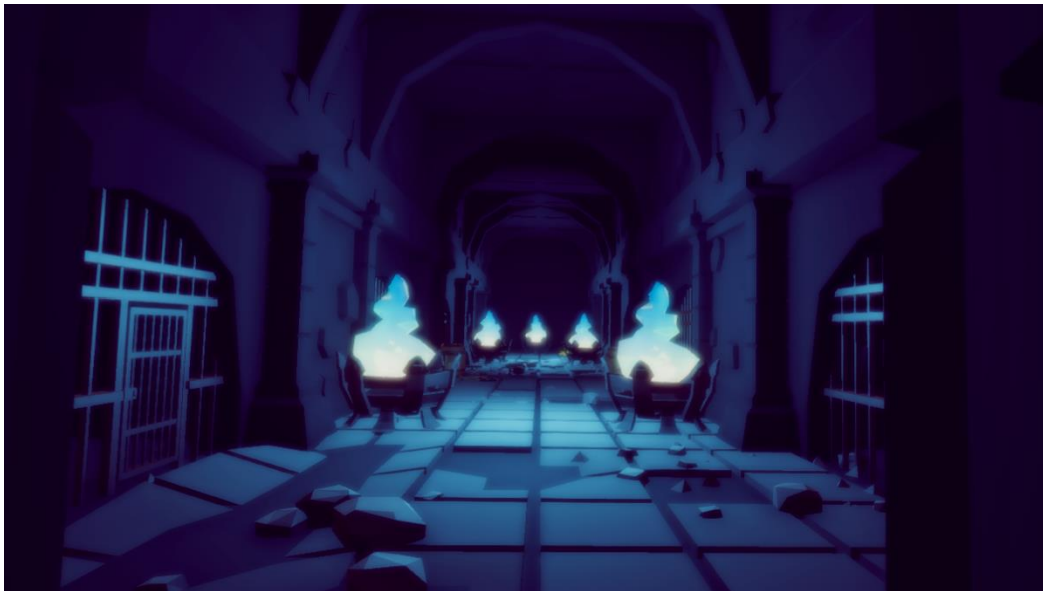


Figure 29 - The visual style of The Prison

The knights were held captive in The Prison, so that The Prison is designed as crude, dark and cold to keep consistent with *Caillte's* narrative, as shown in Figure 29. The Prison has multiple cells, which include plank beds and dead bodies, that may stimulate the player's empathy for the knights' adversity further. The brightness and hue are dark and blue, which continue the horrifying effects for the player. The player's empathy and

horror both have positive impacts on emotional immersion, Ryan (2015) claims. There are hibachis in the corridor of The Prison, and once again the burning blue fires represent the present tense leading to the player's experiencing greater spatio-temporal immersion due to the feeling of being immersed in present danger.

Presence by the visual design of The Alchemy Lab and The Hall is induced by spatial immersion, spatio-temporal immersion and emotional immersion (Ryan, 2015). The spatial immersion rises when the player enjoys exploring The Alchemy Lab for the meaning in *Caillte's* narrative, as well as quantity and variety of the objects. The spatio-temporal immersion derives from the temporal involvement resulting from the burning of the blue fires. The emotional immersion is generated by the player's horror and empathy stimulated by the dead bodies in The Alchemy Lab and The Prison, and by the horror triggered by the atmosphere of The Prison.

Summary

The subsections above examined presence through the effect of visual and off-visual space in the four Story Events of *Caillte*. The following paragraph summarises the significant findings.

Visual and off-visual space of *Caillte* induces presence through spatial immersion, spatio-temporal immersion and emotional immersion. The spatial immersions are generated in the same way, i.e. the player's

enjoyment of exploring the topography of *Caillte*: for The Beach's visual beauty, The Village's crime scene traces, The Oak's unusual tree and crystals, and The Alchemy Lab's narratively meaningful, massive and various objects. The spatio-temporal immersion happens when the temporal involvement rises through the design of the burning blue flames. The emotional immersion is generated by the player's horror in the similar atmospheres, such as The Village, The Hall and The Prison, through the design of the brightness and hues; emotional immersion is also produced by the player's horror and empathy toward the dead bodies in The Alchemy Lab and The Prison.

3.5.4 Summary

This section using The Augmented Framework systematically and critically implements the examination of *Caillte*. The examination follows the examination structure (see Subsection 3.4.6) and process (see Subsection 3.4.7). The objects examined derive from the further documentation of *Caillte* (see subsections 3.5.1 and 3.5.2).

The examination is implemented in three parts: overall analysis gives the overview of how presence arises from the components of *Caillte*'s narrative time and space; horizontal analysis shows how the player feels present in four Story Events that divide one traverse of *Caillte* into four phases.

Vertical analysis examines the roles played by the components used in horizontal analysis in Story Events. The ways presence is either induced and/or damaged by the narrative time and space of *Caillte* are described in detail, where the advantages and disadvantages of *Caillte's* design to presence inducement are found. These discoveries provide insights as to how presence is generated in *Caillte* and how to improve *Caillte* for greater inducement of presence.

3.6 Discussion

This research is about using The Augmented Framework to examine *Caillte* and gain insights which can be used to answer the hypothesis: *what can be learned about by examining Caillte using The Augmented Framework?*

The hypothesis is designed to guide commentary on The Augmented Framework by editing it according to *Caillte's* design and then applying the Framework to analyse *Caillte*. *Caillte* is a VR narrative game at demonstration level, produced for the experiment of Chapter 3. The production and examination of *Caillte* is theoretically supported by practice-led research. Abduction-2 directs the process for the editing of The Augmented Framework and the application of it to *Caillte*. With regards to the editing of the framework, acoustic space was removed for the purpose of adapting The Augmented Framework to *Caillte*. The level of examination

for *Caillte* was set into overall and four Story Events, and the examination based on Story Events was further divided into horizontal and vertical analyses for a more comprehensive examination. The examination obtained a variety of results towards how the narrative time and space of *Caillte* induces presence.

This section discusses the use of The Augmented Framework, which has several parts, including component removal, levels of focus, the four Story Events, horizontal and vertical analysis methods, theoretical basis and examination progress.

3.6.1 Sound not examined

Since *Caillte* does not include sound design, acoustic space is necessarily removed from The Augmented Framework (see Subsection 3.4.1). Sound can be an important contributor to presence, and so consideration of The Augmented Framework should take into account that acoustic space has not been examined by this research.

3.6.2 Levels of focus

Caillte's examination using The Augmented Framework is implemented on two levels: overall and Story Events. From the results within the overall analysis and the analyses based on Story Events (i.e. horizontal and vertical

analyses), the insights about order, speed, frequency, polychrony, visual and off-visual space on the two levels are different. Overall focuses on *Caillte's* general trends, where the Story Events divisions for *Caillte* tend to be relatively specific.

For example, on *Caillte's* overall visual and off-visual space, the examination discovered that the general hue contrast between The Island and The Dungeon provides emotional immersion to induce presence, while Story Events 2 concentrates on the visual design of The Village in The Island, discovered as generating emotional immersion inducing presence, and spatio-temporal immersion was discovered at The Altar, however spatio-temporal immersion was not found through visual and off-visual space overall.

For another example, the examination of order in *Caillte* overall demonstrates the way presence is induced by the ordering of the events that divide *Caillte's* story more generally than when focusing on Story Events; while order in Story Events further divides and examines the events in detail; by the effect of this further division, there are several events that were not considered in the overall analysis, but were when focusing on Story Events, such as the event that one of the knights discovers that the murderer is Viviane, so that different insights are gained by the analyses of *Caillte's* Story Events.

Therefore, compared to the overall considerations, at the level of Story Events the examination of *Caillte* becomes more detailed so that the insights generated are based on specific objects and details. Another advantage of the Story Events analysis is that Story Events are closer to the narrative space of *Caillte*, so more insight can be drawn.

Story Events focuses relatively more on the spatial pattern of the player's traverse in *Caillte* than overall, because Story Events divide the traverse into smaller parts, the player's traverse in *Caillte* has to obey *Caillte*'s topography (i.e. The Island and The Dungeon), and the player's psychological perspective (i.e. as the servant) gain relevance. The more intensive focus provides greater insights than overall analysis, for example, polychrony's examination in Story Events 3 cannot be implemented, because The Oak is the only way to travel to The Hall and the player is not allowed to move back to The Oak from The Hall, meaning that presence does not vary through the sequencing of clue discovery led by the topographical limitation in Story Events 3.

Additionally, the division into Story Events allows the researcher/designer to locate presence's position in the player's traversal of the topography. For example, the presence induced by the spatial immersion of the concrete details about the event of the servant's navigation to The Island is located at the beginning of *Caillte* at The Beach.

Overall analysis benefits the examination of *Caillte* in other ways. Apart from providing insight on the general trend around presence being induced by the narrative time and space of *Caillte*, the overall viewpoint makes the examination more efficient though helping avoid repetitive examination of details. For instance, *Caillte* is designed in a low-polygon style using *HTC Vive* as the game platform, and the benefits of the style and *Vive* are consistent, and therefore this would be needless repetitive if discussed in every Story Event.

3.6.3 The four Story Events

In *Caillte's*, the player experiences a single set of selected Story Events (see Subsection 3.4.4) but this segmentation leaves gaps where dependencies between clue discovery are not examined between Story Events. For example, polychrony at The Beach (i.e. Story Events 1) and polychrony at The Village and The Altar (i.e. Story Events 2) are examined, but there is no examination of polychrony linking The Beach and The Village, or The Beach and The Altar, as well as the three other the locations. There is a danger that some insights are missing because of these gaps.

3.6.4 Horizontal and vertical analysis methods

The research further divided *Caillte's* examination based on Story Events individual horizontal and vertical analyses (see Subsection 3.4.5). Both analyses obtained usefully different results.

Horizontal analysis (see Subsection 3.5.2) using Story Events divided presence in *Caillte* into four parts and demonstrated how presence varies in each of the Story Events. Horizontal analysis provides the insight for the differences among the four Story Events. For example, the summary of horizontal analysis shows that presence in *Caillte's* Story Events 1 does not arise from emotional immersion, but from the other three types of immersion, while presence in *Caillte's* Story Events 2, 3 and 4 is induced by all the four types of immersion.

Vertical analysis (see Subsection 3.5.3) highlights the roles of order, speed, frequency, polychrony, visual and off-visual space in *Caillte's* four Story Events, and the examination demonstrated how each of these components influences the player's manifestation of presence in *Caillte*, within the four Story Events. Vertical analysis provides insight on the difference between the roles of these components at the Story Events level; for example, temporal immersion was discovered as the only source of presence in vertical analysis of order, while temporal immersion is found as the only type that visual and off-visual space does not provide in vertical analysis.

Vertical analysis also gives insight about the connection between the role of one of these components at the overall and Story Events levels. For instance, the examination of order in *Caillte* in both overall and vertical analyses discovered presence is induced only by temporal immersion.

3.6.5 Theoretical basis and examination process

The examination produced methodical and well-grounded results, ensuring clear and reliable insights were gained.

The examination process proposed in subsection 3.6.5 was created for the examination of *Caillte*. This creation complied with the order and rule, that applying the examination of a component of The Augmented Framework to a VR game narrative at a specific level of focus, results in the player's narrative experience providing immersion that induces presence. The implementation of the examination of *Caillte* critically followed the examination process, so that the reader can find that the components of *Caillte's* design, the player's narrative experience, immersion and presence are linked together. This link guarantees the one-to-one correspondence and comprehension of the insights.

The subsections above discussed what was gleaned from *Caillte's* examination using The Augmented Framework. The discussion sought to answer the hypothesis of Chapter 3, and the hypothesis was designed to

guide the experiment to criticise The Augmented Framework. The next subsection will conclude about what is learnt from the application.

3.7 Conclusion

This chapter, using practice-led research and Abduction-2, investigated the use of The Augmented Framework by answering the hypothesis: *what can be learned about by examining Caillte using The Augmented Framework?*

Abduction-2 is the equation WHAT + HOW = VALUE. This experiment uses Abduction-2 first to create a WHAT (*Caillte*), a HOW (The Augmented Framework), for achieving the VALUE (presence). Based on the outcome of the examination using the Abduction-2 formula, this conclusion seems tenable: The Augmented Framework successfully examined how presence arose in *Caillte*.

The following paragraphs conclude four advantages and one disadvantage of the use of The Augmented Framework applied to *Caillte*.

The Augmented Framework examined *Caillte* at the overall and Story Events levels, and this difference allowed presence to be observed under different conditions. Setting overall and Story Events levels allowed the insights to be drawn both from *Caillte's* overview and details respectively, so that the lens for understanding presence inducement in *Caillte* can zoom

in and out at will, locating and comparing presence in different scales, events, times and topographical locations. The level of overall simplified the analysis and discussion of *Caillte's* overall inducement of presence, which repetitively manifested in the Story Events discussion. Therefore, establishing these levels was useful to achieve "VALUE (aspired)"; setting overall and Story Events provided a flexible lens for observing how presence arose under different conditions in *Caillte* and this supported a simplified examination.

Caillte was divided into one set of four Story Events, and the singularity of the set led to gaps among Story Events, but as these gaps were not considered by The Augmented Framework, presence could not be observed in relation to the gaps. The Augmented Framework may be improved by adding another Story Events that covering the gaps in the existing set of Story Events.

The Augmented Framework horizontally and vertically examined *Caillte*. Horizontal and vertical analyses supported the "VALUE (aspired)" (i.e. presence manifestation) by providing convenience in making connections and comparisons among the results to yield well rounded insights. Horizontal analysis supported the comparison about presence as integrations among Story Events. Vertical analysis allows the comparison between the roles of a component in overall and Story Events, and a more

detailed comparison of the roles of these components in Story Events. Therefore, horizontal and vertical analyses in *Caillte* benefited the examination by generating the insight around presence, and the components and *Caillte*.

Caillte's examination critically used the Framework's components, so that the insights about presence are comprehensive. The implementation closely followed the examination process, which provided correspondences on the causes and effects of presence in *Caillte*, which made the insights clear. Therefore, critical applying The Augmented Framework benefits generating the insights of presence in *Caillte*.

3.8 Summary

This chapter investigates the hypothesis: *what can be learned about by examining Caillte using The Augmented Framework?* For investigating the hypothesis, practice-led research is implemented. A VR narrative game is produced as the object to be examined. The Augmented Framework is edited based on the condition of *Caillte*. *Caillte* is documented in detail for the examination. The examination is implemented, critically following the components and processes of The Augmented Framework. The examination unveiled a variety of ways in which presence was induced. The use of The Augmented Framework is discussed and concluded, providing

an answer to the hypothesis. There are four advantages and one disadvantage discovered: acoustic space is first removed, thus mistakes are avoided; overall and Story Events levels are established, which makes the observation of how presence arises under different conditions; one set of four Story Events leaving gaps limited the examination in generate insights on the linkage of Story Events, thus there needs to be another set of Story Events for covering these gaps; horizontal and vertical analyses expanded insight by enabling multiple comparisons; following a theoretical basis and examination process makes the insights clear, rigorous and comprehensive.

Chapter 4 - Conclusion

This research was to understand how combining Wei et al.'s (2010) and Ryan's (2015) frameworks can provide a lens for understanding how narrative improves presence in VR games. Chapter 4 begins with a retrospective of the overall thesis, including how the first two research questions are addressed. Chapter 4 then addresses Research Question 3: the four advantages and one disadvantage of the combined framework (from Chapter 3) are revisited and generalised to improve The Augmented Framework. Research Question 3 facilitates addressing the Thesis Statement, and so Chapter 4 can then address the Thesis Statement by discussing the four advantages and one disadvantage by cautious generalisation about a self-produced VR narrative game and used to consider VR narrative games in general. Chapter 4 concludes by summarising the components, structure, and function (Research Question 2) as well as the use of The Augmented Framework (developed from Research Question 3). Chapter 4 ends with the research limitations and consideration of future research ideas, given for the purpose of remedying the limitations.

4.1 Thesis retrospective

This thesis investigated how to combine Wei et al.'s (2010) and Ryan's (2015) frameworks, and how to use The Augmented Framework for understanding the player's experience of presence in VR narrative games. The research collected information for aiding the understanding of presence (see Section 2.1), Wei et al.'s (2010) and Ryan's (2015) frameworks (see Sections 2.2 and 2.3 respectively) so that the research could implement the augmentation. The research combined (see Section 2.4) the two frameworks based on the concepts of narrative time and space and the role of VR game interactivity in storytelling. This research implemented an experiment examining *Caillte* (i.e. a demonstration VR-narrative game) to investigate the use of The Augmented Framework. The experiment discovered four advantages and one disadvantage of The Augmented Framework.

Chapter 2 collected basic knowledge of presence and VR by introducing their definitions, significant factors that contribute to presence, and existing VR technology, in order to aid the understanding of VR, presence and its contributing factors. VR has become an advanced game platform, and presence is vital to VR games because presence emerges from the player's psychological reaction to how authentic and immersive a VR game is. The research discovered two elements that influence the user's presence in VR: immersion and interactivity. Both immersion and interactivity have

components that determine the level or intensity of immersion and interactivity. The research analysed seven existing VR technologies to demonstrate the connections between presence, immersion and interactivity. The analysis facilitated choosing equipment for the experiment of Chapter 3, and the connection was used as the core of the examination of the experiment.

Chapter 2 investigated Wei et al.'s (2010) framework which examines video game narrative time and space. The research discussed the connections between time, space and video game interactivity to facilitate understanding of Wei et al.'s (2010) framework. The discussion found that a video game gives the player the power to influence narrative time, space and plot thereby placing the player's role in unfolding narrative into consideration. The research introduced the components of Wei et al.'s (2010) framework, and prepared the components for the modifying in Section 2.4. Three storytelling video game examples were examined using Wei et al.'s framework for guiding the usage of The Augmented Framework.

Chapter 2 discussed the difference of narrative time and space in VR compared to traditional storytelling forms. This difference led to altering on-screen and off-screen space, and the screen interface, to better suit the VR narrative space; narrative time did not require alteration. Chapter 2

investigated Ryan's (2015) framework and analysed three VR storytelling examples for demonstrating how the framework functions.

Chapter 2 edited and combined Wei et al.'s (2010) and Ryan's (2015) frameworks. The components of on-screen and off-screen space and the screen interface were edited into visual and off-visual space and the VR interface respectively, to adapt these concepts for a VR narrative space. The rest of the components and the four types of immersion, however, remained the same. Regarding The Augmented Framework structure, each component of narrative time and space of The Augmented Framework connects the four types of immersion, and these types of immersion help to generate presence.

Chapter 3 implemented practice-led research that used The Augmented Framework to examine *Caillte*, i.e. a self-produced demonstration VR narrative game. The Framework removed acoustic space, because *Caillte* contains no sound. The experiment established levels of focus for the examination: overall and Story Events, which segmented *Caillte* into a set of Story Events; the examination was implemented both horizontally (i.e. examining by Story Events) and vertically (i.e. examining by the components). The examination critically followed the definitions of The Augmented Framework's components. The examination in illuminating how *Caillte* induces player presence. Four advantages and one

disadvantage of The Framework were discovered. Removing acoustic space at the start avoided complexity in the following work. The focal levels of overall and Story Events provided a flexible lens for observing how presence arose. However, examining by Story Events left gaps in understanding polychrony and the relationships between clues from different Story Events. Horizontal analysis allowed the comparisons between the Story Events, and vertical analysis supports the comparisons between the roles of the components at the overall and Story Events levels, and among the roles of the components in Story Events specifically. The components and examination process made the outcome clear, comprehensive and rigorous.

4.2 Addressing the research questions

This section summarises the answers to Research Question 1 and 2, and addresses Research Question 3.

4.2.1 Research Question 1

The first research question, RQ1: *what is the current understanding of presence in VR*, is addressed in Section 2.1.5. The key concepts are:

- Presence is the psychological state of being in the VR environment.
- A high level of immersion induces presence

- Interactivity assists inducing presence
- Contemporary consumer grade devices are capable of inducing presence

4.2.2 Research Question 2

Chapter 2 addressed RQ2: *how can Wei et al.'s (2010) and Ryan's (2015) frameworks be combined for examining how presence arises in VR narrative games?*

Wei et al.'s (2010) framework examines video game narratives, and Ryan's (2015) framework examines VR narratives and presence. A combination of Wei et al.'s (2010) and Ryan's (2015) frameworks facilitates the examination of presence in VR narrative games.

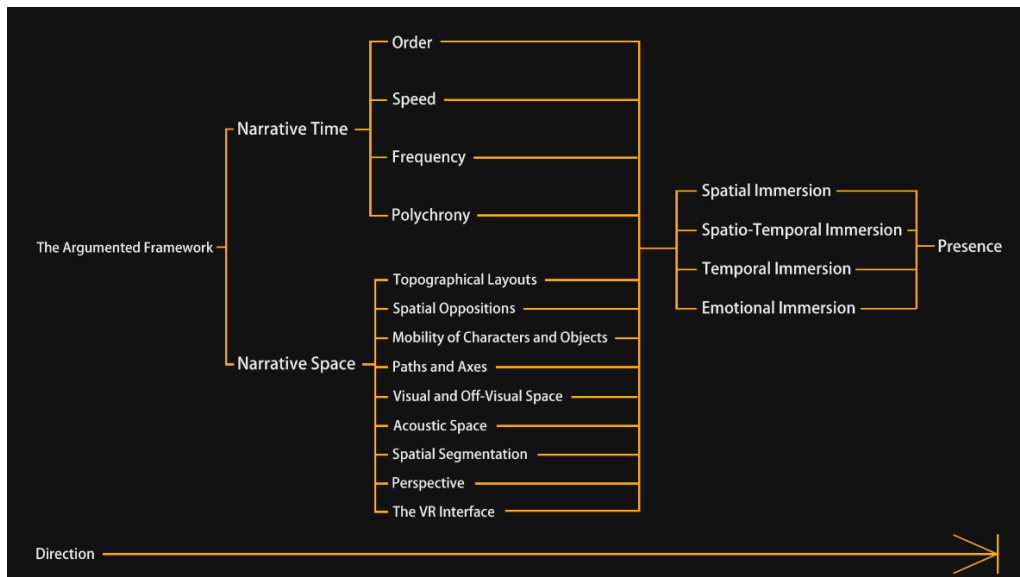


Figure 30 - The Augmented Framework

Chapter 2 combined the two frameworks to create The Augmented Framework. As shown in Figure 30, narrative time carries order, speed,

frequency, polychrony; narrative space contains topographical layouts, spatial oppositions, mobility of characters and objects, paths and axes, visual and off-visual space, acoustic space, spatial segmentation, perspective and the VR interface. Each component of narrative time and space in VR can impact the four types of immersion: spatial immersion, spatio-temporal immersion, temporal immersion and emotional immersion, and these four types of immersion induce presence.

Full discussion of Wei et al.'s (2010) and Ryan's (2015) frameworks is found in Section 2.4. The Augmented Framework is outlined in Subsection 2.4.6.

4.2.3 Research Question 3

This research implemented a practise-led experiment in Chapter 3 for gaining insight into the use of The Augmented Framework. The four advantages and one disadvantage of The Augmented Framework are discussed in the following sub-sections and then used to address RQ3: *what can be learned from applying The Augmented Framework to a self-produced VR narrative game?*

4.2.3.1 Acoustic space removed

The experiment in Chapter 3 did not consider acoustic space (see Subsection 3.4.1). A VR narrative game lacks might lack some of the properties

included in The Augmented Framework, so the examiner should check if any component of the framework should be removed.

4.2.3.2 Overall and Story Events established

The experiment of Chapter 3 established the focal levels of overall and Story Events (see Subsection 3.4.3) which made the observation of *Caillte* comprehensive (see Subsection 3.6.2). A self-produced VR narrative game is a complex system comprised of a series of designs in each of the various aspects outlined, and generally the focal levels for a self-produced VR narrative game can be set based on these aspects of the design.

When setting levels of focus, the insights of presence inducement within the game come from different dimensions, so the different levels vary the focal lens to include diverse dimensions (i.e. overview and detail), for the corresponding insights to arise. Nevertheless, an overview examination of a self-produced game can simplify the description about the overall effect repetitively manifested in the divided parts of the game, so that the researcher's, designer's, and reader's time can be saved.

A VR narrative game can be divided into smaller parts based on the events within the story. But, a VR narrative game involves topographical design so that divisions based on its topography are also feasible. Regarding the player's role, it is not always the case that a VR narrative game will situate

the player as a character that strongly influences the story and obeys the topography. A VR narrative game could present the story from God's-eye-view, and in such a case the division of a VR narrative game cannot generally consider the player's role as the basis for division.

4.2.3.3 Observation limited by gaps between Story Events

The experiment of Chapter 3 segmented *Caillte* into one four Story Events (see Subsection 3.4.4) that left gaps which were not covered by the examination, so there are potentially some missing insights (see Subsection 3.6.3). Therefore, for a comprehensive insight on a VR narrative game, a division other than Story Events may be better. Candidates for segmenting a VR narrative game for analysis include topography.

4.2.3.4 Horizontal and vertical analyses for comparisons

The experiment examined *Caillte* through overlapping horizontal and vertical analyses (see Subsection 3.4.5).

To implement horizontal analysis, the number of parts that a game is segmented into is required to be more than one, so that the researcher/designer can form comparisons of the different parts of the game. Regarding implementing vertical analysis, there should be more than one component examined and the game divided into more than one parts.

Vertical analysis can be implemented when a game is divided into more than one part and examined by at least one component, so that the effects of the component on the game's overview and detail can be analysed. There need to be at least two components involved by vertical analysis in order to compare the components in detail. Therefore, a VR narrative game should be segmented into more than one part to take full advantage of horizontal and vertical analyses, and the corresponding framework should likewise contain more than one part.

4.2.3.5 Theoretical basis and examination process

The implementation of *Caillte's* examination critically followed the components (see Subsection 3.4.2) and the examination process (see Subsection 3.4.7). For a VR narrative game, applying the theory of The Augmented Framework is necessary because the theory connects game narrative design, immersion and presence. Diverging from the theory breaks the theory inter-connections and the outcome of the examination may become invalid or ineffective.

The use of the process remains the same from *Caillte* (see Subsection 3.6.5) to VR narrative games, because the process suits game with a narrative design.

4.2.3.6 Conclusion

This subsection begins to conclude the findings of the discussion generalising the answer to the hypothesis of Chapter 3, as the answer to Research Question 3.

If a self-produced VR narrative game does not involve a component of The Augmented Framework, the component should be removed at the beginning of the preparation of the game's examination, so that the missing component does not confuse the examiner/reader in the rest of the preparation and examination. The focus of the examination of a self-produced VR narrative game should be set into overview and detail levels, so that presence inducement generated from different dimensions can be comprehensively examined; an overview examination can simplify the repetitive examination of the general effect manifesting from the various parts of the game, to save the examiner's and reader's time and energy. Events and topography are effective ways of dividing a self-produced VR narrative game into various parts. For making the examination comprehensive, a game should be divided into complementary sets of parts, to guarantee the examination covering the gaps left by each set of the parts. To achieve the advantages of horizontal and vertical analyses, the examiner should consider more than one component of The Augmented Framework and separate the game into more than one part, so that the examiner can compare the results among different parts, as well as components and levels

of focus. The examination of a self-produced VR narrative game should critically obey the set components and the examination process so that the examination obtains a rigorous and valid outcome, which can further lead to obtaining connected and comprehensive insights. The answer to Research Question 3 will be taken as the source to address the Thesis Statement.

4.3 Addressing the thesis statement

This research investigates how a combination of Wei et al.'s (2010) and Ryan's (2015) frameworks can provide a lens for understanding how narrative improves the inducement of presence in VR games. The following subsections are to address the Thesis Statement.

4.3.1 Discussion

The data from Chapter 3 is generalised to the Thesis Statement; whether the VR narrative game to be examined is self-produced may have some differences that affect the application of The Augmented Framework to other VR narrative games.

A self-production can lead to the question of the familiarity of the game: the designer of a VR narrative game might be more familiar with the game than others which can impact component removal. As discussed in Subsection

4.2.3.1, familiarity with the game to be examined is essential for understanding the need for component removal, and this understanding should be achieved before preparing the corresponding Augmented Framework, to avoid making mistakes in the preparation and examination, and so that the implementation is smooth and efficient. A person using the Augmented Framework, who is not the designer of the VR narrative game, may need to spend more time familiarising themselves with the game. Besides, this familiarity may also influence setting the levels of focus because the division of a game has to be based on a particular set of properties of the game. As discussed in Subsection 4.2.3.2, these properties can be events and topography. Therefore, the examiner may need to familiarise themselves with the events and topography in order to divide the game appropriately for comprehensive and detailed observation. The research does not find that the difference of familiarity influences other findings of Research Question 3, because the other findings do not rely on the examiner's familiarity on the game.

4.3.2 Conclusion

The Thesis Statement is addressed in this subsection by showing the structure, function and use of The Augmented Framework.

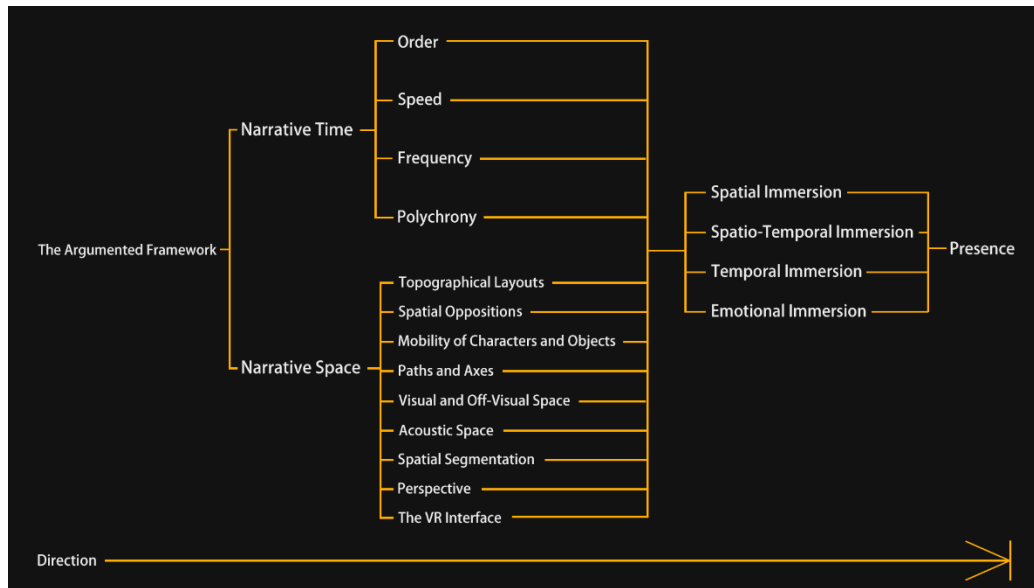


Figure 31 - The Augmented Framework

As shown in Figure 31, narrative time contains the components of order, speed, frequency and polychrony; narrative space includes the components of topographical layouts, spatial oppositions, mobility of characters and objects, paths and axes, visual and off-visual space, acoustic space, spatial segmentation, perspective and the VR interface. Each component within narrative time and space in The Augmented Framework links the four types of immersion: spatial immersion, spatio-temporal immersion, temporal immersion and emotional immersion, and these four types of immersion generate presence.

Regarding the function of The Augmented Framework, the researcher/designer can observe how the narrative time and space of a VR narrative game induces the player's presence. The Augmented Framework treats a piece of the narrative time and space design of a VR narrative game as a source that may induce presence. The components of narrative time

and space in The Augmented Framework classify, decompose and textualise the design of narrative time and space in the game. The researcher/designer collects and records the player's reactions towards the design, and connects the player's reactions to the four types of immersion that generate presence.

Regarding the use of The Augmented Framework, several strategies benefit the examination of a VR narrative game. The examiner needs to be familiar with the condition of the game. The component that is not involved in the examination needs to be removed as the first thing done in the preparation of the examination, so that the examiner is not likely to be confused by the preparation and examination of the missing component.

For a comprehensive outcome, this research suggests examining the game with different levels of focus, such as overview and detail, so that the methods for including presence can be examined in diverse dimensions. Setting different levels also makes the examination and reading more efficient, by simplifying the repetitive work of examining a general design in segmented objects.

A VR narrative game presents a story in a three-dimensional space so that at least events and topography are logical ways to segment the game. There need to be at least two complementary sets of segments, and each set needs

to cover the gaps left by the segments of another set; the gaps are where the examination of a single set of segments is insufficient.

The examination of a game benefits from horizontal and vertical analyses. Each segment is examined by the components of narrative time and space in horizontal analysis, so the examiner can compare the outcomes between these segments. Each component is examined by the segments of the game in vertical analysis, and the examiner can compare one of the components both in overview and in all the segments, or among the roles of the components in all the segments. Either axis requires the game to be divided into more than one part and more than one component to be included fully in the examination and to achieve all the advantages discovered in this research.

The examiner should critically follow the components and the examination process, so that each component should correspond to a design that provides the player with a narrative experience which leads to immersion generating presence. The critical following of this process is to guarantee a rigorous and valid result and to connect the results for providing comprehensive insights.

4.4 Limitations and future work

Due to time limitations, *Caillte*, the VR narrative game produced for the experiment of Chapter 3, does not provide sound design, so this research does not produce any insight relating sound and presence. Future research should examine a completed VR narrative game, including sound design, to gain an even more comprehensive insight about presence.

All the player's narrative experiences about *Caillte* were evaluated by the researcher so that the insight between the narrative time and space of *Caillte* and presence is limited. Future research should include observing more participants to examine their reactions to a VR narrative game and generate a larger amount of data.

Caillte is an epistemic narrative game so that temporal immersion may become more dominant than in other potential plot types. There were only two levels of focus in *Caillte's* examination, though it is possible to set more than two levels of focus, and doing so may provide better insight for future study.

The Augmented Framework does not examine how much presence the player feels from narrative time and space of a VR narrative game. To further augment the framework, future research should add a method for presence measurement to the framework.

4.5 Summary

This study was to provide a systematic framework for examining how a VR narrative game induces the player's sense of presence. Wei et al.'s (2010) framework examines narrative time and space of a non-VR narrative game, while Ryan's (2015) framework investigates how presence arises from narrative design. The study collected background information to aid the understanding of Wei et al.'s (2010) framework and Ryan's (2015) frameworks and applied them to six narrative designs (three examples for each work) for comprehending their use. This study combined Wei et al.'s (2010) and Ryan's (2015) frameworks, for linking the fields of narrative video games and the player's presence in VR. This study implemented practice-led research, to test The Augmented Framework and gain greater understanding of its potential use. Within the research, the study produced a VR narrative game and applied The Augmented Framework to the game. There are five ideas learned about The Augmented Framework application. This thesis showed how Wei et al.'s (2010) and Ryan's (2015) frameworks can be combined to examine how a VR narrative game induces the player's sense of presence.

The five lessons learned in the research: the components not involved by the object to be examined should be first removed to avoid mistakes, there should be different levels of focus (e.g. overview and detailed) to make observation both simple and to understand how presence arises under different conditions, the framework should be applied on the game that is

segmented into least two complementary sets that cover the gaps between each other for more comprehensive observation, an examination should be both horizontally (i.e. by parts) and vertically (i.e. by components) implemented for comparing results to extend insight potential, an examination should adhere strictly to the theoretical basis and examination process for clear, rigorous and comprehensive insight.

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Appendix A: *Caillte* Documentation

Author designed *Caillte* for *HTC Vive* using *Unity* (Version 2017. 1. 0f3 Personal) and *Blender* (Version 2. 78 a). The *Caillte* screenshots are taken by author.

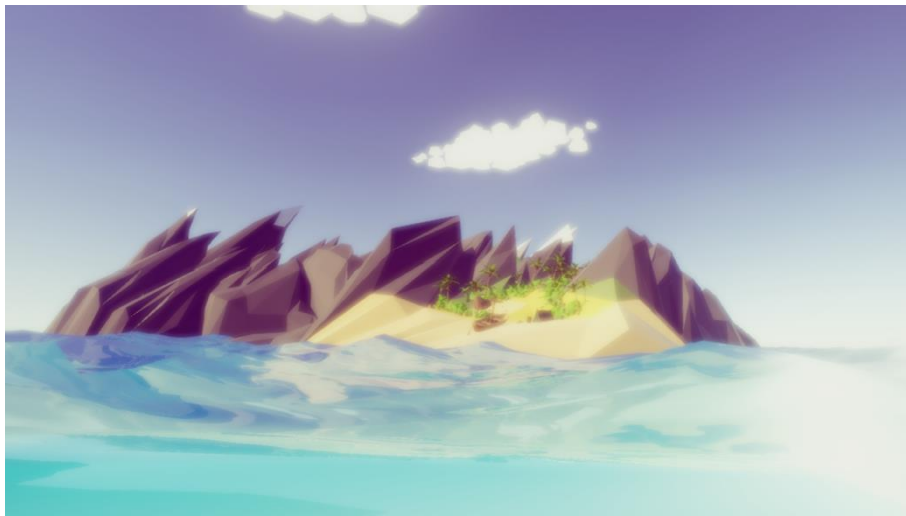


Figure 32 – The Island

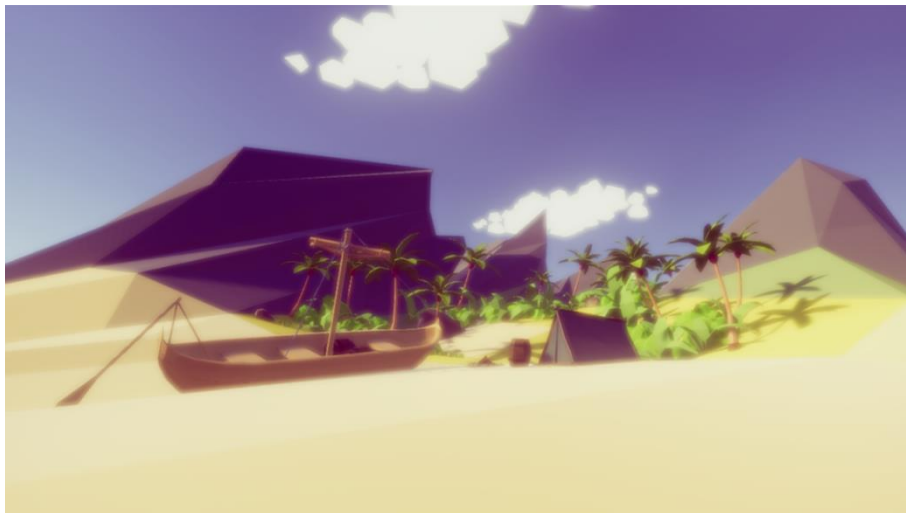


Figure 33 – Overview of The Beach of The Island in Story Events 1

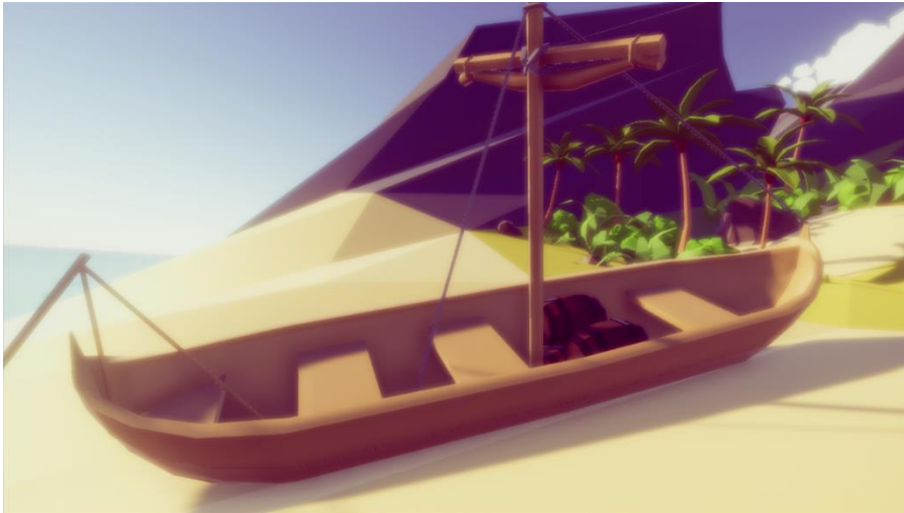


Figure 34 – Close-up of The Boat



Figure 35 – A screenshot taken in The Boat



Figure 36 – The servant's camping articles

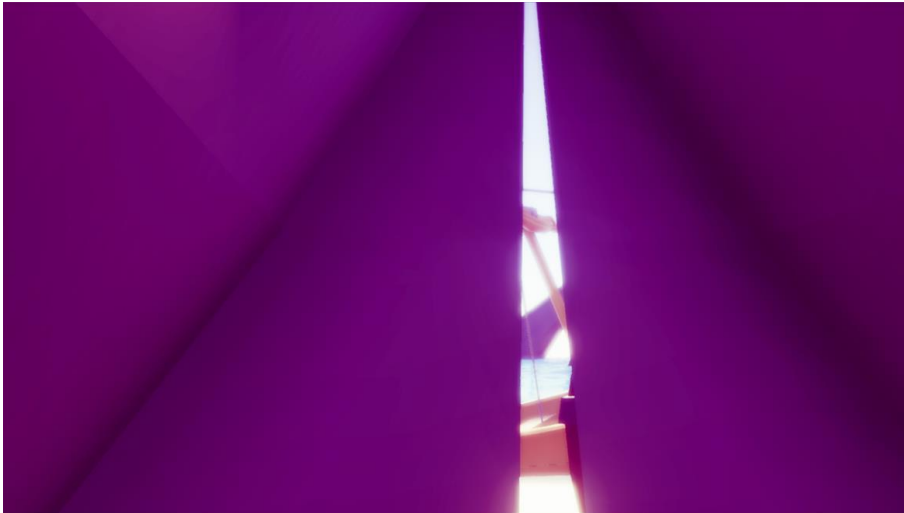


Figure 37 – A screenshot taken from inside the tent in The Beach



Figure 38 – A look of The Beach from a height

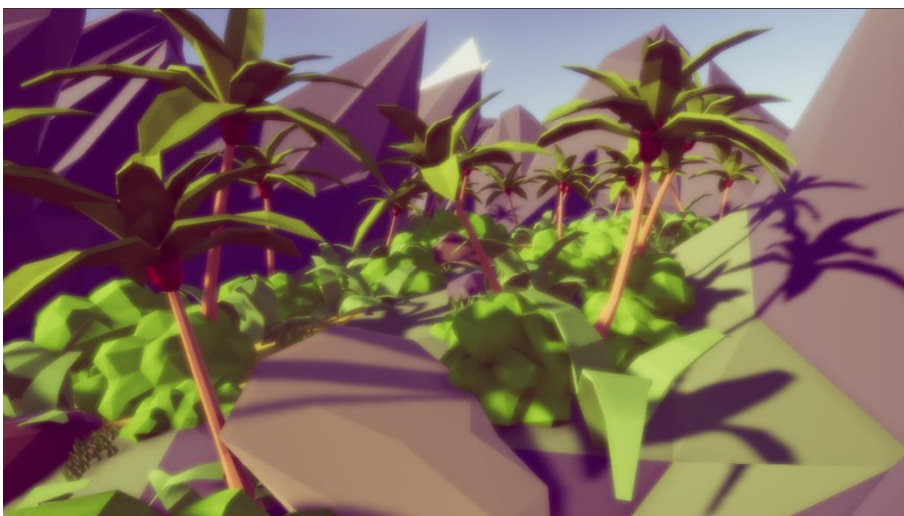


Figure 39 – The path deep inside The Island

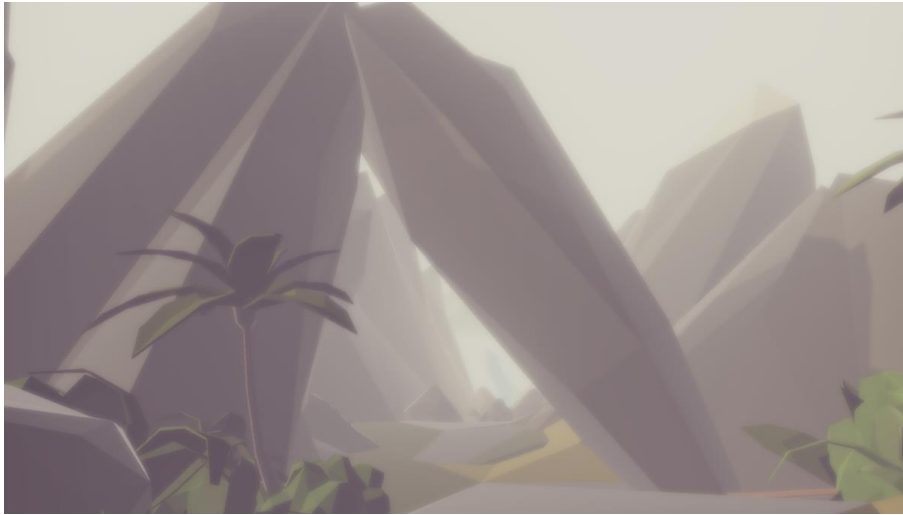


Figure 40 – The fog and rocks on the way to The Altar and The Village

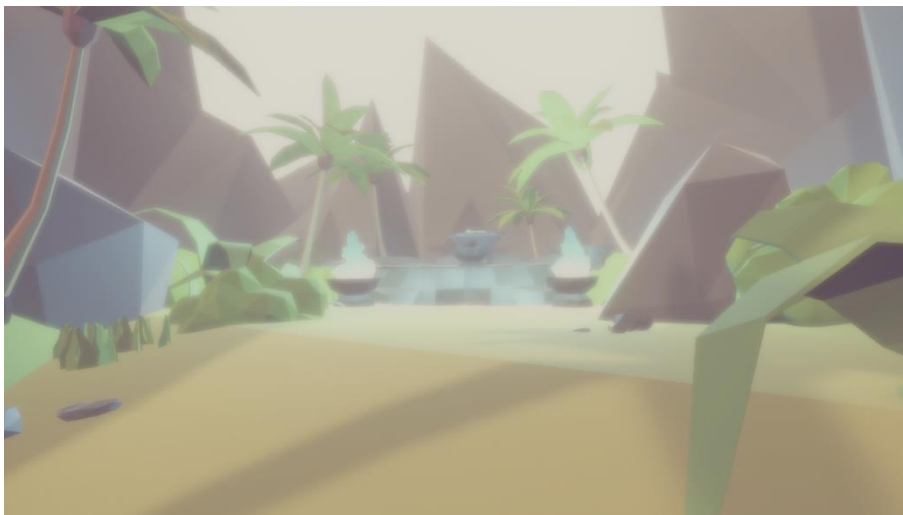


Figure 41 – The Altar of The Island in Story Events 2



Figure 42 – The Altar overview



Figure 43 – The Altar top view



Figure 44 – The Altar front view

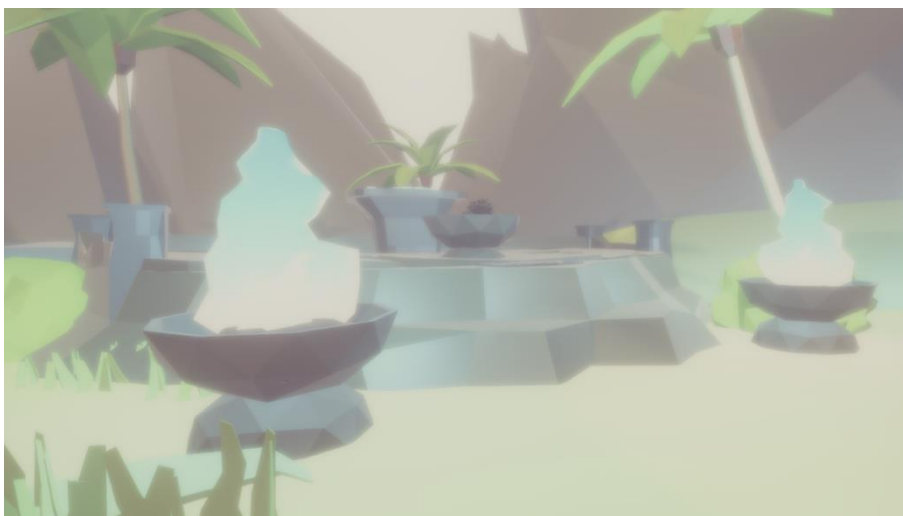


Figure 45 – Close shot of The Altar



Figure 46 – Overview of The Village of The Island in Story Event 2

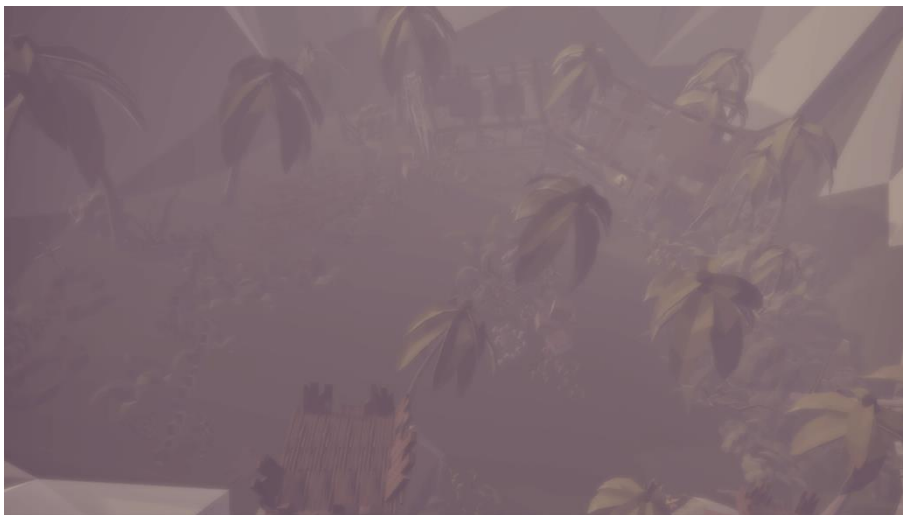


Figure 47 – Top view of The Village



Figure 48 – Close shot of one of the broken guard towers



Figure 49 – A screenshot from inside The Village



Figure 50 – Close shot of the ruined houses



Figure 51 – Another close shot of the ruined houses

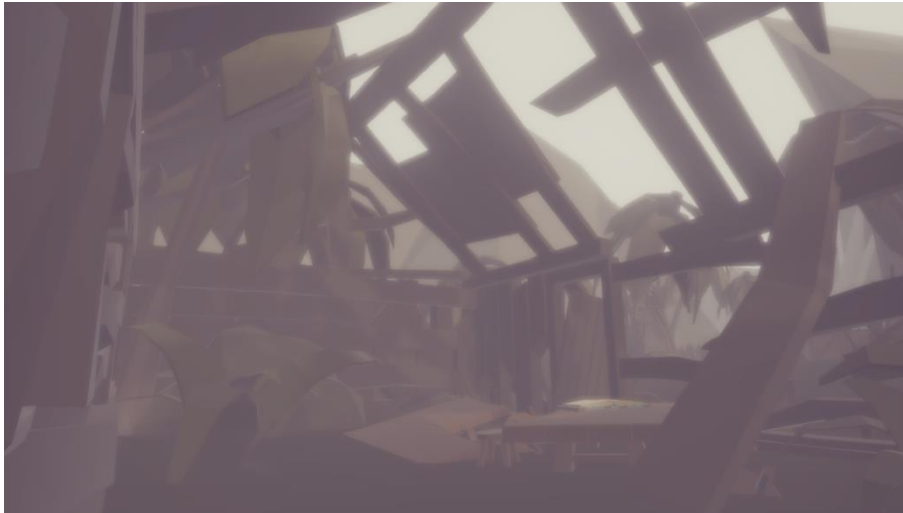


Figure 52 – A screenshot taken from inside one of the ruined houses



Figure 53 – A look up at The Oak of The Island in Story Events 3

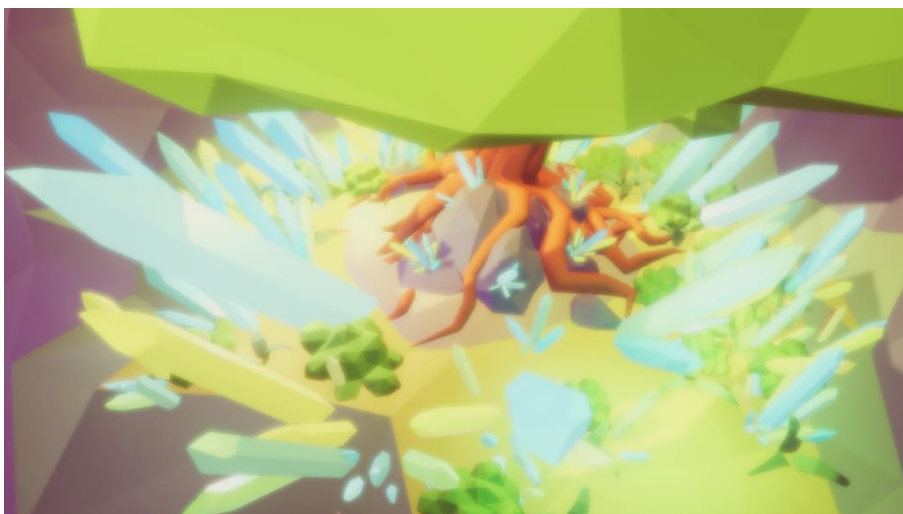


Figure 54 – A look of The Oak from a height



Figure 55 – Close shot of the crystals in The Oak



Figure 56 – The oak tree rooted deep in the rocks

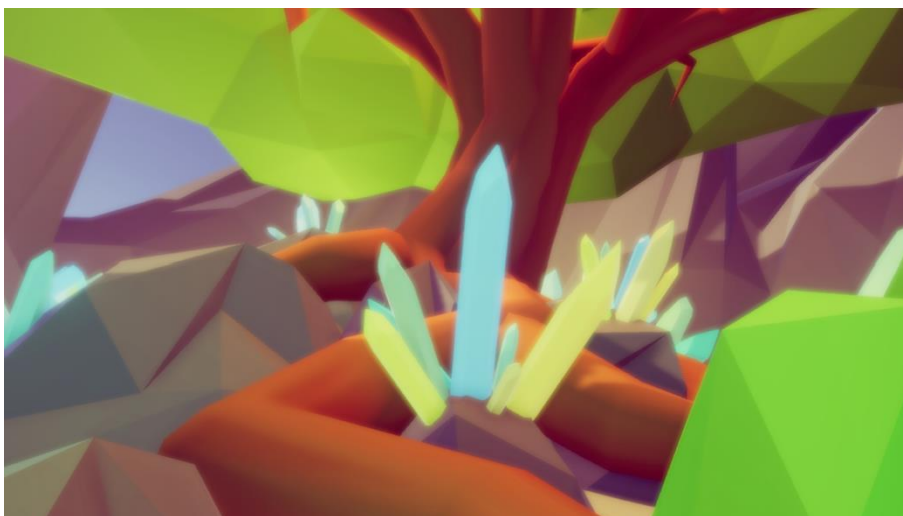


Figure 57 – The crystals on the rocks



Figure 58 – A look of the tree hole from afar



Figure 59 – Close shot of the tree hole

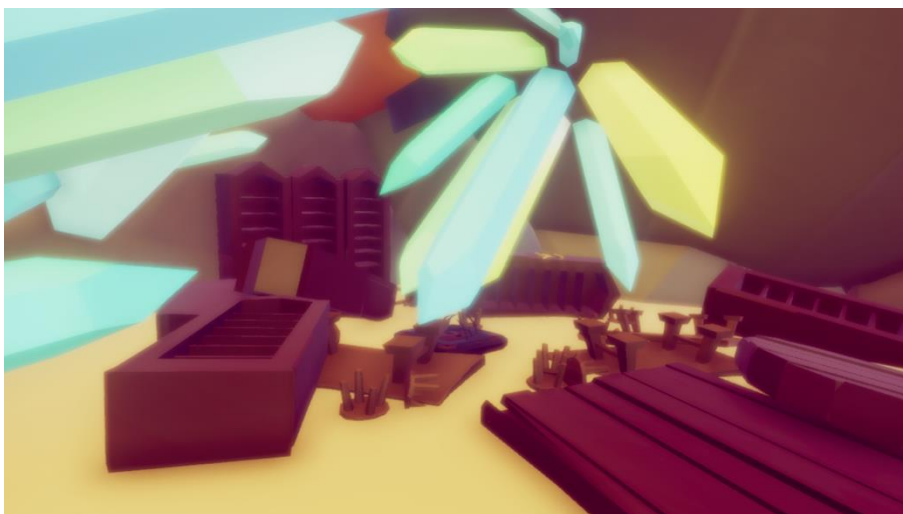


Figure 60 – A screenshot from inside the tree hole



Figure 61 – A screenshot of The Hall of The Dungeon in Story Events 3



Figure 62 – The hibachi, crystals and a dead body in The Hall



Figure 63 – A look back of The Hall through the dungeon door

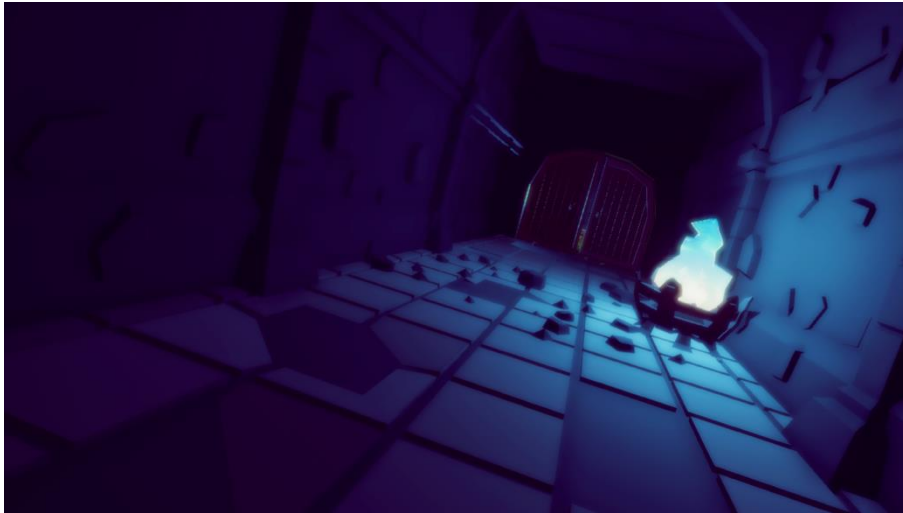


Figure 64 – The path to The Alchemy Lab of The Dungeon in Story Events 4



Figure 65 – Overview of The Alchemy Lab from a height



Figure 66 – The basement of The Alchemy Lab



Figure 67 – The first floor of The Alchemy Lab

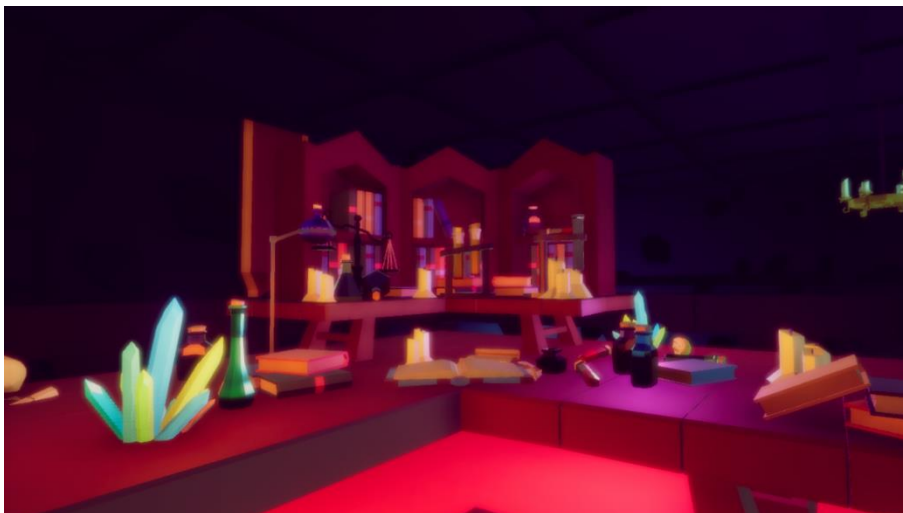


Figure 68 – Close-up of the experimental articles

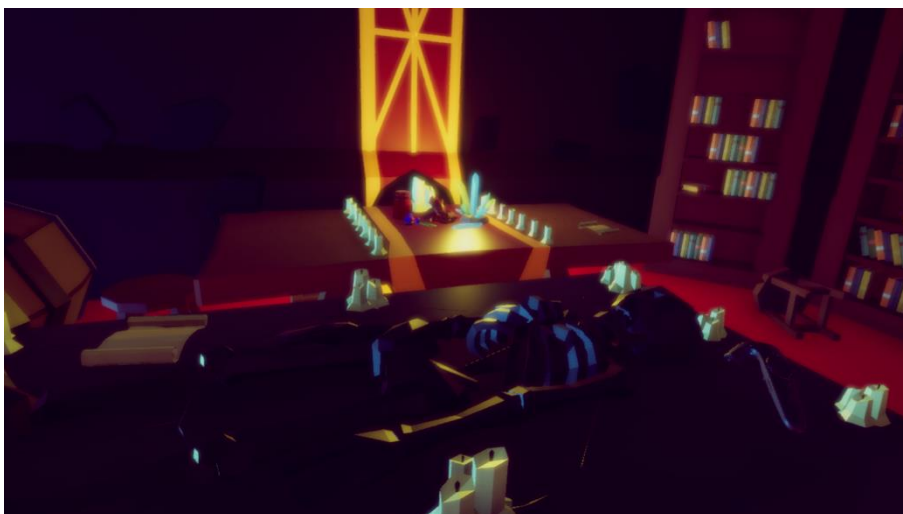


Figure 69 – Close-up of the burnt knight

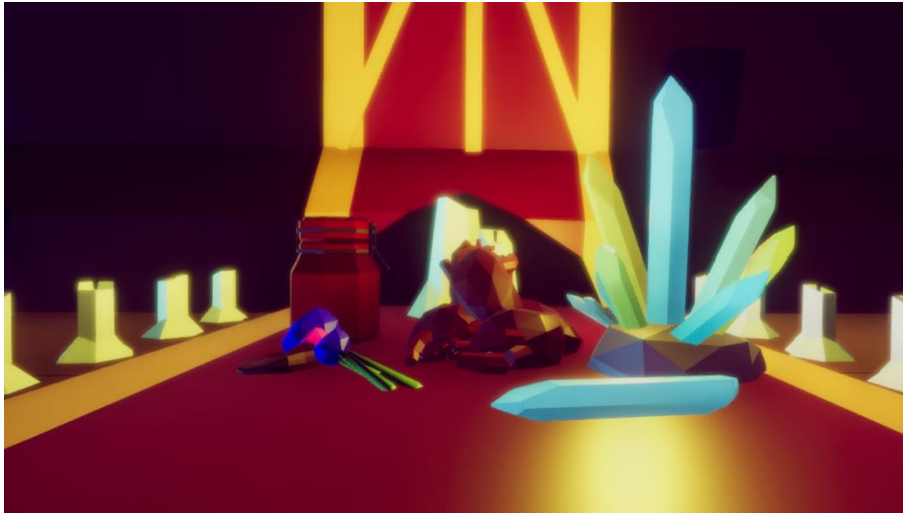


Figure 70 – Close-up of hearts, crystals, herbs and a jar of blood

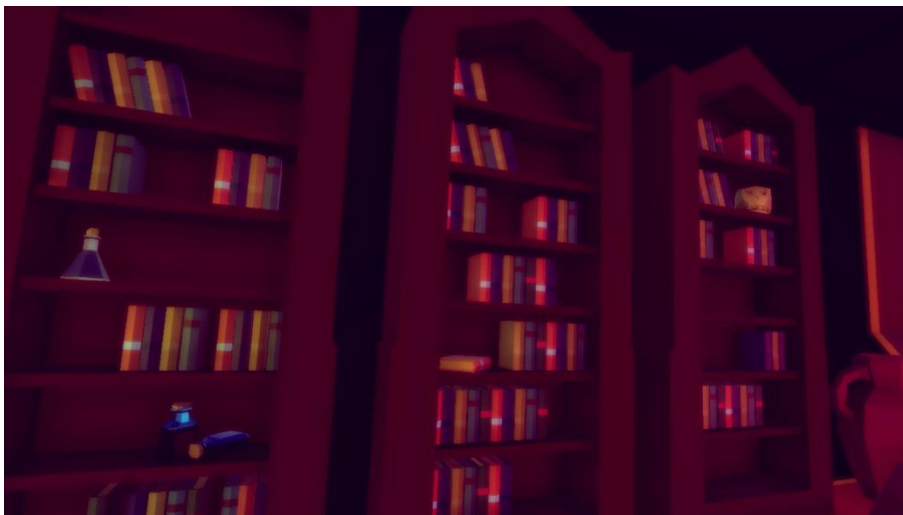


Figure 71 – Close-up of the bookshelves

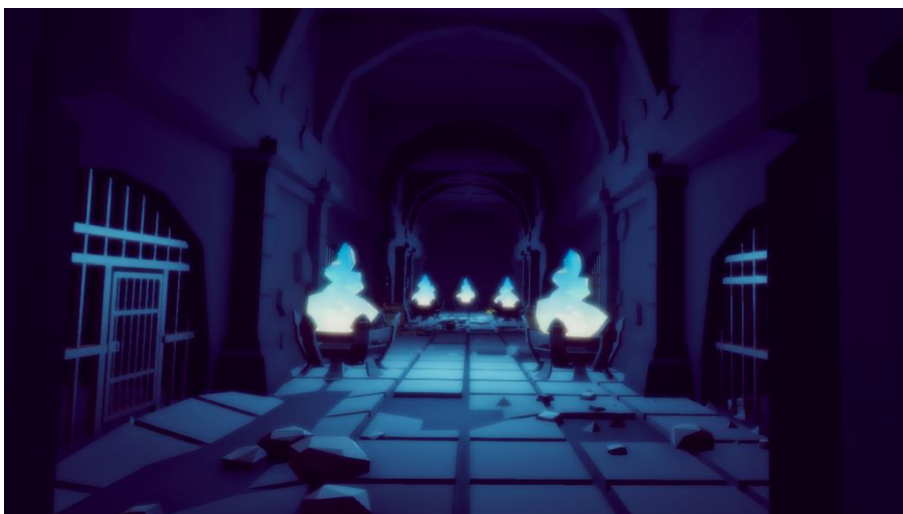


Figure 72 – Overview of The Prison of The Dungeon in Story Events 4



Figure 73 – Close shot of one of the cells

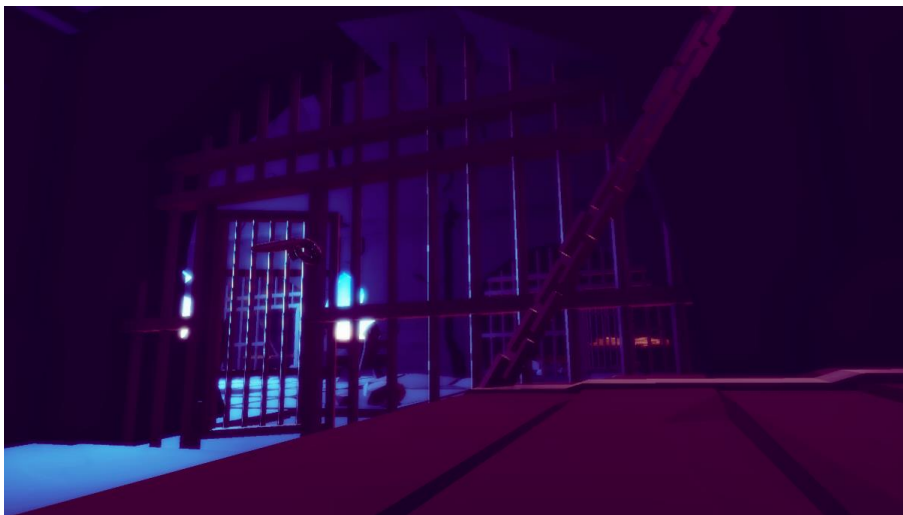


Figure 74 – A screenshot taken on the plank bed of a cell

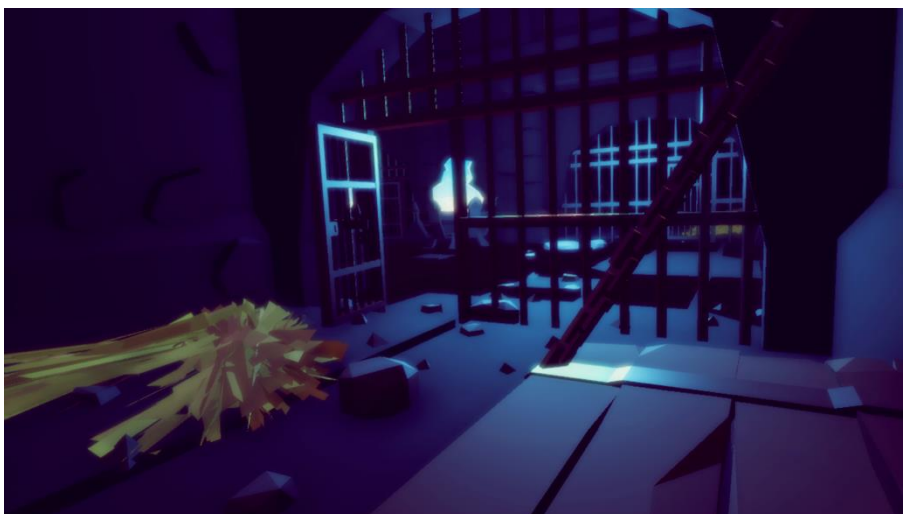


Figure 75 – Another screenshot taken on the plank bed of a cell

Appendix B: Arthurian Legend

This section contains Arthurian Legend.

Morgause, Leader of Avalon, the nest of elves, has been dissatisfied with her small island and coveted the land of Britain for a long time; she knows that in sending an army to the land she will probably lose most of her people and then never be ready for the massive invasion of the Saxons. Morgause has started her plan under the cover of giving backing to the land.

Morgause orders Viviane, Lady of the Lake, to inform a wizard, Merlin the Cambion (half-human, half-demon), that Britain needs a powerful king to bring peace upon the land where has been of war and blood for hundreds of years; and Avalon believes that Merlin who has grown upon and knows this land better than anyone else, understands what human-kind needs and can rise a right person to be the king. He believes that Avalon will bless the man, and render him victorious and significant upon the land; for people from Britain, their unfortunate souls shall dwell in Avalon.

Knowing nothing about Morgause and her plan, Merlin decides to save the British from Saxons, not only out of respect for life but also for Viviane, as he lost his mind since he first saw her.

Just as planned, Igraine, sister of Morgause, marries the Duke of Cornwall, gives birth to Morgaine; and turns to be part of Merlin's plot, lies with Uther and begets Arthur the King, the chosen one, a half-elf.

As the plan goes, Merlin teaches and guides Arthur, uses Caliburn (forged in Avalon, drawn from a stone by Arthur for his elfin birth) and Excalibur (given by Viviane, Lady of the Lake) to let Arthur be the king and become invincible, however, Arthur is reliant upon Merlin's advice.

On the other side, Viviane carries off Lancelot, raises him and makes him consummately skilled in battle, but disloyal. Then she sends him to Arthur. When Morgaine, Arthur's half-sister, knows that she is a half-elf, Morgause shows herself to Morgaine and teaches her magic, and orders her to enchant Arthur in return, which is how Mordred is born.

When the time comes that Arthur and his knights have beaten back all the invasion of Saxons, Arthur and his knights have no value to Morgause. However, Morgause wants to receive Arthur's homage for his ancestry, but Arthur refuses to be her puppet.

Now it is time to dispose of Arthur. By order of Morgause, Viviane threatens Balin for Arthur's head, or she will curse Balin, but he refuses to be disloyal, and dies soon after. Viviane also fails in the second try: Merlin discovers an assassination attempt. When it comes to the third time, Morgause continues her original plan that she has started at the beginning

and turns Arthur's death to be part of it, which is more secret and specific than the first two actions. Merlin is supposed to be first to die because she knows that she will not get a chance if Merlin survives, as he is the biggest support of Arthur and his kingdom; and she knows that the right person to murder Merlin is Viviane.

By order of Morgause, Viviane persuades Merlin to go to an island with her since he is tired and needs a break from helping the land. She is sure that Merlin wants her by his persistent attention on the way to the island. But she does not receive the crazy suitor because she is worried about the blood mix of their future newborn (Demon-elf-human hybrid). With joy and her will to try, Viviane departs from Morgause's desire. Viviane asks Merlin for an offer: she will accept his love if he teaches her how to cast the prohibited spell that can teleport and then lock the targeted person in void. Merlin is dazzled by the unexpected excitement and forgets how dangerous the spell is, and shows her step by step while she pretends to be following and waits for a chance. At the moment she has just finished following, she targets at Merlin and casts on him. Merlin is teleported and locked in void, he is never a threat to Morgause, and more importantly, Viviane keeps him alive.

Without Merlin, Arthur is no defences against Morgause, so she starts the rest of the plan to collapse Arthur and his knights. Morgause orders Viviane to slay the people coming to the island and searching for Merlin, while

Viviane imprisons some of them for a certain purpose: she fuses her and his power in her prisoners' bodies to predict if the future born will be fine, because she knows that she cannot resist his fervent pursuit, and even if she can assure her love is platonic, he cannot. Viviane, therefore, decides to cast herself to be with Merlin or go back to her lake alone, according to the result of a test of power.

As a servant of Morgause, Viviane spreads rumours about Lancelot and Guinevere. Under pressure from people and knights, Arthur urged by Gawain, son of Morgaine, starts an expedition to France for Lancelot's head. However, Mordred, bastard of Arthur and Morgaine, seizes the opportunity that the King is not on the throne, and takes the country under his control. Arthur is driven to fight back leading his death in battle since Arthur has loses the scabbard of Excalibur along with the protection from the scabbard.

In the end, Arthur's remains are taken to Avalon by Morgause, Viviane and Morgaine for the next stage of the plan.