Intermedial and Multimodal Analysis of Speculative Worldbuilding in the Video Game *Outer Wilds*

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Abstract

This Master's thesis expands on the field of media studies through an intermedial and multimodal approach. The study is conducted as a case study on the video game *Outer Wilds* (2019), and the objective is to both analyse how the game constructs an experience of the fictional world and to investigate what merit the intermedial and the multimodal research approaches provide to the study of worldbuilding and the functioning of video games. The analytical framework of the thesis includes the theoretical framework of Roine's (2016) speculative worldbuilding and a new intermedial and multimodal methodological model called the model of direct and indirect media engagement (DIME) that I have developed in this thesis. The model combines Elleström's (2021) media modalities and Toikkanen's (2022a/2022b) three-tier model of mediality to grasp the experiential and interpretive means a media product utilises in conveying an experience to the audience.

The results show that *Outer Wilds* constructs its fictional world through the interplay between modalities theorised by Elleström (2021) – the sensorial, material, spatiotemporal and semiotic modalities – both directly and indirectly. Directly, the game uses primarily the visual and auditory modes to deliver information to the player. The game also uses these sensorial modes to expand the limits of its medium and evoke the illusion of the modalities that the medium cannot represent directly, most notably the material and spatiotemporal modalities. These direct and indirect means are used to construct the model of the world, the *world-as-construct* (Roine, 2016) as well as the process of working the model through in gameplay, the *world-as-process*.

The central finding is that the game uses the interplay between the world-internal and the world-external perspectives on its fictional world to deliver the world-as-construct to the player through the world-as-process. Thus, the world-external perspective is not excluded as many prominent worldbuilding theories claim. Additionally, the study proves that multimodal and intermedial research approaches produce crucial information on how worldbuilding functions in a video game as the process of worldbuilding is conveyed not only multimodally but in the intermedial interplay between the directly perceived modalities and the indirectly perceived and interpreted modalities that the video game medium evokes through what Toikkanen (2022a/2022b) refers to as intermedial experience.

Keywords: worldbuilding, intermediality, multimodality, video games

Tiivistelmä

Tämä maisterintutkielma laajentaa mediatutkimuksen kenttää intermediaalisen ja multimodaalisen lähestymistavan kautta. Tapaustutkimuksen kohteena on *Outer Wilds* -videopeli (2019) ja tavoitteena on sekä analysoida miten peli rakentaa kokemusta fiktiivisestä maailmastaan että kartoittaa minkälaista hyötyä intermediaalinen ja multimodaalinen lähestymistapa tarjoavat maailmanrakennuksen ja videopelien tutkimukselle. Tutkielman analyyttinen viitekehys koostuu Roinen (2016) spekulatiivisen maailmanrakennuksen teoreettisesta kehyksestä ja tässä tutkielmassa kehittämästäni uudesta intermediaalisesta ja multimodaalisesta tutkimusmetodista (DIME, direct and indirect media engagement), joka yhdistää Elleströmin (2021) mediamodaliteetit sekä Toikkasen (2022a/2022b) välineisyyden kolmiportaisen mallin. Metodologisen synteesin tarkoituksena on selvittää, minkälaisia kokemuksellisia ja tulkinnallisia keinoja mediatuotteet käyttävät välittääkseen kokemusta yleisölleen.

Tutkimuksen tulokset osoittavat, että *Outer Wilds* rakentaa fiktiivistä maailmaansa Elleströmin (2021) teoretisoimien modalitieettien – sensorinen, materiaalinen, spatiotemporaalinen ja semioottinen modaliteetti – välisen vuorovaikutuksen kautta niin suoraan kuin epäsuorasti. Suoran kanavan kautta peli hyödyntää ensisijaisesti visuaalista ja auditiivista moodia välittääkseen informaatiota pelaajalle. Peli kuitenkin käyttää myös näitä sensorisia moodeja laajentamaan videopelimediumin asettamia rajoja ja luomaan illuusion myös muista modaliteeteista, joita videopelit eivät suoraan pysty esittämään. Keskeisimmät epäsuorasti esitetyt modaliteetit pelissä ovat materiaalinen ja spatiotemporaalinen modaliteetti. Tällaisten suorien ja epäsuorien esitysten keinoja käytetään pelissä rakentamaan maailman malli (world-as-construct) sekä prosessi, jossa tämä malli työstetään läpi pelaamisen kautta (world-as-process) (Roine, 2016).

Tutkielman keskeinen päätelmä on, että *Outer Wilds* käyttää maailman sisäisen ja maailman ulkoisen näkökulman välistä vuorovaikutusta välittääkseen maailman mallin ja sen läpikäymisen pelaajalle. Niinpä maailman ulkopuolista näkökulmaa ei suljeta maailmanrakennuksen ja maailman kokemisen ulkopuolelle, kuten monet merkittävät maailmanrakennuksen teoriat väittävät. Lisäksi tutkielma osoittaa, että multimodaalinen ja intermediaalinen lähestymistapa tuottaa olennaista tietoa siitä, miten maailmanrakennus tapahtuu videopeleissä. Maailmanrakennus ei toteudu ainoastaan multimodaalisesti vaan sen sijaan suoraan havaittujen ja epäsuoraan havaittujen ja tulkittujen modaliteettien vuorovaikutuksessa. Erityisesti nämä epäsuorasti havaitut ja tulkitut modaliteetit syntyvät Toikkasen (2022a/2022b) teoretisoiman intermediaalisen kokemuksen kautta.

Avainsanat: maailmanrakennus, intermediaalisuus, multimodaalisuus, videopelit

Sisällys

1 Introduction

Understanding the impact of art and how that impact is achieved has long been a subject for academic inquiry. The long tradition of art research first concerned itself with literature, music, visual arts and theatre. In the course of the twentieth century, new types of media, notably cinema, television and the radio, were introduced to the masses. As new media formats typically require some time to reach recognition as serious artforms, the cinema industry, for example, entered the field of culture first as popular entertainment for the masses until only later achieving a place among the concept of art.

Video games have been experiencing a similar trajectory in the past decades, beginning as simple arcade games and eventually reaching consumers' homes with gaming consoles and PC gaming. Today, gaming is a formidable sector of consumer practices, the global video game market having been valued at USD 188.73 billion in 2021, with estimates of the market growing to over USD 300 billion by 2029 (Fortune Business Insights, 2023). In the past decades, video games have also finally begun to achieve recognition as a medium for art, not just popular entertainment, with both game development and reception directing their attention to the unique means by which games create meaningful stories and experiences.

Game studies, which refers to the academic research of games and gaming, is still a relatively new discipline, but it has been gaining momentum in the past decades, particularly concerning digital games due to the aforementioned rise of gaming (Mäyrä, 2008, p. 11). Early research into games and simulations has taken place since the 1970s, and computer research in the humanities has been conducted as early as 1940s, although the efforts of game studies have largely existed on the outskirts of other research disciplines such as literary or media studies (Mäyrä, 2008, p. 7–8), and the scale of the research effort may still pale in comparison to more traditional artforms, such as literature or even cinema. This thesis aims to showcase how video games can bring unique perspectives and tools to the field of art research in the form of analysing a topic that has traditionally been studied in a literary context: worldbuilding.

Worldbuilding is a concept that has spread wide in the world of art. It is used in academic research, both professional and non-professional art critique, and by those creating art themselves. As worldbuilding is a widely used term, its definitions vary. In this thesis, the concept of worldbuilding is primarily used to refer to how a piece of art prompts the interpreter to access an experience of worldness. Worldness can be defined as the lived experience of an imagined place (Roine, 2016, p. 25). On a more detailed note, the sense of worldness can also be described as "spatially organized constructs that adhere to some governing logic that makes the space intelligible, discoverable and

navigable" (Makai, 2021, p. 70). I will more specifically be using a theory on worldbuilding by Hanna-Riikka Roine (2016) that divides speculative worldbuilding into two parts: the *world-as-construct* and the *world-as-process*. The world-as-construct refers to the model of the world while the world-as-process elaborates on how this model is worked through.

This thesis is conducted as a case study, and it analyses worldbuilding in the space exploration video game *Outer Wilds* (2019) and its 2021 downloadable content (DLC) *Echoes of the Eye*. *Outer Wilds* was chosen as the research material for this study as it is a relatively new game that has already received a lot of critical acclaim but has yet to be analysed extensively in an academic context. *Outer Wilds* is also an interesting subject for analysing the potential of video game meaning-making as the gameplay is relatively unconventional in the game industry. Additionally, it is exceptionally well suited to analysing the topic of worldbuilding as the world and the exploration thereof function as the central elements of the gameplay. In this thesis, I will be using my playthrough of the game as data, and I will be referring to the content of the game through textual descriptions as well as in images taken from my playthrough, for the use of which I have received permission from the creators of the game.

I will approach the topic of worldbuilding in *Outer Wilds* from an intermedial and multimodal methodological perspective in order to grasp the unique and perhaps not so unique tools of conveying experience that video games as a medium have at their disposal. More specifically, I will be launching an intermedial and multimodal methodological model that I refer to as DIME, which combines two existing methodological frameworks for analysing media products from a multimodal and intermedial perspective, respectively. These frameworks are the theory of media modalities from Elleström (2021) and the three-tier model of mediality from Toikkanen (2022b).

The research question for this study is twofold:

1) How does *Outer Wilds* build the world-as-construct of its fictional world, and how is it worked through in the world-as-process?
2) How does analysing worldbuilding through multimodal and intermedial methods help understand the experience of worldness in *Outer Wilds*?

I will begin this thesis by presenting the research materials and then continue to the analytical framework of the study, starting with theory and then proceeding to methodology. The analytical framework will be followed by the analysis of the research materials and a discussion section that focuses on the key findings of the study.

2 Research Materials

In this section, I will introduce the research materials of this study in more detail. The materials are the main game of the video game *Outer Wilds* as well as the DLC called the *Echoes of the Eye*, which was added to the game at a later date. Additionally, as this study concerns itself with media specificity and the medium of video games, I will also provide a brief overview on the video game medium and its central characteristics.

2.1 *Outer Wilds:* main game

Outer Wilds (2019) is a critically acclaimed science fiction exploration puzzle game that has received several Game of the Year nominations. It is available on Windows, Xbox One, Xbox Series X/S and PlayStations 4 and 5, and it is played on a screen and sound system using either a controller or a mouse and a keyboard. In this thesis, I will be approaching the game from the perspective of using a controller as it is how I have played the game myself, and it is also what the game recommends. Next I will first give an overview on the premise and gameplay of the game and then introduce the world in which the game takes place.

Premise of the Game

In *Outer Wilds*, the player plays as a young unnamed Hearthian, a blue-skinned and four-eyed alien from the planet Timber Hearth. The Hearthians are a space exploration-oriented species whose civilisation revolves around uncovering the secrets of their solar system and particularly exploring the ruins of an ancient civilisation of another alien species called the Nomai to discover who they were and what lead to their extinction thousands of years ago.

In the tutorial section of the game, the player is given the objective of fetching the launch codes for their first solo space exploration journey. This objective takes the player around the sole Hearthian village on Timber Hearth and introduces the core equipment and mechanics of the game. The player's toolbox consists of a translation tool that allows the player to understand texts and recordings left behind by the Nomai, a signalscope to intercept sound waves in space, and a probe called Little Scout that can be launched into the environment to give light and provide camera footage where the player cannot go. The player is also introduced to zero-gravity manoeuvring, quantum rocks that shift

position when not being observed, and the dangers of ghost matter, a peculiar substance invisible to the naked eye that is found all around the solar system.

The tutorial section of the game culminates in a visit to the observatory and space museum where a Nomai statue suddenly opens its eyes and orients towards the main character. Memories flash before the main character's eyes before everything goes back to normal. Afterward, the main character receives the launch codes and is able to set off into space in their small spaceship. However, after 22 minutes of exploration, a comfortingly haunting music starts playing and the sun begins expanding until finally collapsing into itself and exploding in a supernova. Once again, the events of the past 22 minutes flash before the main character's eyes until finally everything goes black, only for them to open their eyes, back to the campfire on Timber Hearth where the game began. This is the central feature of *Outer Wilds*. Every 22 minutes the sun goes supernova, destroying everything in the solar system, only for the time loop to begin again. The time loop is one of the central mysteries for the player to solve in addition to what happened to the Nomai civilisation.

The gameplay consists of free-roam exploration of the solar system. The player has full freedom to decide where to explore, and consequently, the gameplay is completely non-linear in the traditional sense. There are only two limiting factors to the exploration. The first limitations consists of the 22-minute time loop in which the solar system is continuously evolving with time, and therefore certain areas are only accessible at certain times in the time loop. The second limitation concerns the main gameplay feature of the game: information. The player must explore the solar system to uncover information about the different planets and environments to decipher how to reach certain areas and what to do next. The player does not gain experience to level up or gather more skills or equipment during the game. Everything needed to finish the game is already at the player's disposal from the beginning, everything except information. The game includes several possible endings, one of which is the canonical ending to the events of the game.

World of the Game

Next, I will give a brief overview on the world of *Outer Wilds*, that is, the solar system and its different astronomical objects. The solar system of *Outer Wilds* functions much like our own. There is a central star that is being orbited by four planets.

In order from the sun, the planets of the solar system are called the Hourglass Twins, Timber Hearth, Brittle Hollow and Giant's Deep. Additionally, the solar system houses three moons. Two of them

orbit planets: Timber Hearth's moon, the Attlerock, and Brittle Hollow's moon, Hollow's Lantern. The third moon is called the Quantum Moon, and it functions differently from the other two. It can be seen all around the solar system, mysteriously disappearing and appearing elsewhere when one is not looking at it. In addition to the planets and their satellites, the solar system also houses a strange, root-like orbiter called Dark Bramble, and an asteroid called the Interloper that passes through the solar system on an elliptical orbit.

All these astronomical objects are open for exploration, and they house ruins and pieces of information left by the Nomai that help uncover what happened thousands of years ago and how that is connected to what is presently happening in the solar system. Each astronomical object includes its own environmental threats and puzzles that need to be solved to uncover all the information that is available to the player. Giant's Deep is a giant planet covered in water and filled with moving cyclones that will not only shoot the player but also the islands of the planet to space. As its name suggests, Brittle Hollow is a very fragile planet. It is bombarded with meteorites from its own moon, which leads to the surface of the planet deteriorating, and eventually chunks of the surface will fall into a black hole that the planet houses in its core. The Hourglass Twins are a duo of planets in the same orbit, connected to each other through a strange phenomenon of sand falling from one twin to the other, resembling an hourglass. Due to this phenomenon, the Ash Twin is continuously losing sand, uncovering what is hidden beneath, while the Ember Twin and its numerous underground caverns are slowly being filled with rising sand.

A central characteristic of the solar system in *Outer Wilds* is the sparseness of life. Apart from the Hearthians on Timber Hearth, the planets seem to house no intelligent life forms, only the remains of the now extinct Nomai. Even plants and especially animals are rare. For the most part, the only contact with intelligent lifeforms outside of Timber Hearth occurs with the other members of the Hearthian space program that can be found on the different planets.

2.2 Echoes of the Eye

In 2021, a DLC called *The Echoes of the Eye* was added to the game. The DLC introduces a new planet-like environment, a huge space station called the Stranger that reveals more about one of the central mysteries introduced in the main game. The DLC fits seamlessly into the main game, providing more exploration and information while also introducing some new endings as well as a minor expansion to the canonical ending of the game.

The gameplay in the DLC is similar to the main game, the main objective being uncovering more information about the solar system. However, there are some notable differences to the gameplay. First, the manner in which information is provided differs from the main game. While the main game includes a mixture of environmental storytelling and textual clues, the information in the DLC is primarily conveyed visually. There is hardly any written text included in the DLC, and instead, the Stranger offers information through embedded visual media, such as pictorial slide reels, and environmental storytelling.

Second, the DLC introduces a new set of gameplay mechanics that include sneaking around the environments and hiding, reminiscent of horror games. While there are some unsettling environments and themes in the main game, the horror aspect is something quite unique to the DLC. Sections of the DLC make the player navigate confusing environments in the darkness while simultaneously hiding from the inhabitants of the Stranger.

2.3 Video games as a medium

Now that I have introduced the specific research materials of this study, I will focus on the overall medium that is being analysed. In this section, I will give a brief overview on the general characteristics of video games as a medium with a particular focus on what makes video games distinct from other media such as literature or cinema.

Video games are an incredibly diverse medium to the point that there are scholars who view video games not as a singular medium but instead as a set of different media types (Makai, 2021, p. 69). Indeed, video games offer a wide range of experiences from simple and short mobile puzzle games to complex games that include detailed narratives, massive explorable worlds, and a variety of game mechanics. Furthermore, video games can be single player games meant to be experienced alone or even massively multiplayer online games (MMOs) that have thousands of players from all around the world playing on the same map and interacting with one another.

For the intents and purposes of this study, I will be using Makai's definition of a video game that groups all these different types of games under the general medium of a video game with the aim of distinguishing it from board games, role-playing games and gambling. For Makai (2021, p. 69), video games are a media type that in its prototypical format refers to "a piece of entertainment software that is run on specific hardware, operated by user(s) via a technological interface, who exercise agency in

a digitally realized virtual environment created by game designer(s) to influence the internal state of that environment in order to derive enjoyment from their actions at little to no risk to themselves."

A video game can be dissected into three interrelated core aspects that together create the totality of a video game. These three aspects are *the system*, *the process* and *the product*. *The system* refers to the game as a rule-based design and it indicates the limits of possibility within the simulated gameworld. *The process* dives deeper into the user experience and describes a specific reiteration of the system being played. Lastly, *the product* is "the mental construct of lived experience" that emerges in the mind of the player through the process of playing the game (Koenitz, 2010 in Makai, 2021, p. 71).

This conceptualisation highlights the interactive nature of video games. One aspect where video games differ drastically from most other media is in how they are able to not only represent but also simulate things. Representations are stable entities meaning that they "exist as one, shared thing, with a form and content that will be the same for everyone even if we experience them differently," whereas simulations are models or systems that the player themselves is able to work through and influence what kind of experience they will have (Makai, 2021, p. 70). Because of this capability to simulate, in video games, unlike literature or cinema for example, "the player's agency changes how the semiotically encoded storyworld unfolds, and players can influence the rules of the storyworld as well" (Makai, 2021, p. 71). As such, each player will have a unique experience, not just mentally but also in the concrete actualisation of the game.

Another way of dissecting a video game is Mäyrä's (2008, p. 17) division of video games into the elementary layers of *the shell* and *the core*. The core refers to the gameplay, the level of a game that has to do with everything the player is able to do. It is the "abstract ruleset governing everything a player can do" (Roine, 2016, p. 114). Fitted around the gameplay core is the shell, which is a representation of something, a semiotic sign system. In practice, the core can, for example, be a set of key bindings that execute a certain combat move. However, for the player, these key bindings are not approached just as key bindings or even just as combat moves, and instead, they look and sound a certain way and are situated in the broader context of the game in a certain way due to a potential backstory and motivations for why the player is participating in combat.

Lastly, on an intermedial note, it is important to mention that video games, and the computer as the channel through which video games are played, is particular in the sense that it allows for the remediation of other media types (Makai, 2021, p. 78). For example, a video game is able to incorporate not only simple media types such as sound, image and text, but also incorporate them as

other conventionalised forms of media, not just sounds but music, not just text but literature, and so on. In fact, the computer has even been highlighted as the "first metamedium" precisely because of its ability to simulate other media (Kay, 1984, as cites in Roine, 2016, p. 22). However, as Roine notes, while this aspect is of interest when analysing digital media, it is also important to look beyond the simulation of other traditional media types and analyse what the digital medium itself can add to the experience.

3 Theoretical Framework

In this section, I will present the theoretical framework of this study. I will begin by giving a brief literature review on the prominent branches of theory on worldbuilding, namely Marie-Laure Ryan's (1991) possible worlds theory and David Herman's (2009) narrative worldmaking. Then I will proceed to introducing the main theory used in this study, Hanna-Riikka Roine's (2016) theory of speculative worldbuilding.

3.1 Prominent Theories on Worldbuilding

Marie-Laure Ryan's possible worlds

Ryan's (1991, p. 16) possible worlds theory is a prominent conceptualisation of worldbuilding that has its foundations in modal logic, that is, logic that deals with statements about necessity and possibility. The theory is based on the idea that the truth conditions of statements create possible alternate worlds where truth statements that might not be accurate in our world are factual. For example, the statement "Finland is not an independent country" is not factual in our world since Finland has been an independent country since 1917 and continues to be so, but logically the statement creates the possibility of a world where the statement is factual.

There are different theories on how our own world is situated in the possible worlds theory. Ryan calls on two theories from David Lewis and Nicholas Rescher to elaborate on the two differing views on the prioritisation of our world. Lewis states in his indexical theory that all possible worlds are equally real, and all possible worlds can be actual (Lewis, 1973, as cited in Ryan 1991, p. 18). These two terms, *real* and *actual*, reoccur in the possible worlds theory. *Reality* refers to the ontological status of the world, whether it exists or not, whereas *actuality* refers to the perspective of the perceiver. For us, our world is the actual world as it is the centre of our perception of the possible worlds, while the other possible worlds are satellite worlds that surround our own. For Lewis, however, the actuality of our own world is not something inherent to our world and is only a by-product of our position. By stating that all possible worlds can be actual, Lewis means that for a person from another possible world, their world would be the actual world and ours a satellite world.

Many philosophers have taken offense to the idea that our world does not hold any sort of privileged ontological status. Rescher is an example of this school of thought. Instead of asserting that all possible worlds are equally real and can be actual depending on perspective, he states that possible

worlds are not independently existing ontological entities, and instead they are constructions of the mind. For Rescher, our world holds a privileged status as facts about our world can "unqualifiedly be said to exist" and as such they are "independent of minds" (Rescher, 1973, as cited in Ryan, 1991, p. 19). Therefore, our world holds a special status in relation to the other possible worlds since statements about other worlds cannot be verified in this manner.

Ryan (1991, p. 21) sides more with Lewis on the basis that for her, Lewis's theory offers a more satisfying explanation on how we relate to fictional worlds. However, regardless of the objective ontological status of the possible worlds, Ryan asserts that when interpreters are immersed in fiction, the fictional world becomes real and takes the place of our actual world as the centre of perception. Ryan uses the terms of *pseudoreality* and *pseudoactuality* to justify this claim. The *pseudoreality* of fictional worlds is proven in how the readers of fiction are able to emotionally empathise with the characters as if they were real (Ryan, 1991, p. 21). *Pseudoactuality*, in contrast, refers to how fiction does not require world-creating predicates, such as *imagine* or *dream*, that link the possible world of fiction to our actual world. Instead, in fiction, the perspective is typically entirely internal to the fictional world (Ryan, 1991, p. 22). Ryan has coined a term, *recentring*, to explain this latter aspect of fiction: "For the duration of our immersion in a work of fiction, the realm of possibilities is thus recentred around the sphere which the narrator presents as the actual world. This recentring pushes the reader into a new system of actuality and possibility" (Ryan, 1991, p. 22).

David Herman's narrative worldmaking

David Herman (2009) approaches the topic of worldbuilding from the perspective of narrative. He uses the term *storyworld* to refer to the worlds that narratives evoke or inversely "narratives can be defined as blueprints for a specific [narrative] mode of world-creation" (Herman, 2009, p. 105). Overall, storyworlds are "global mental representations" or "mental models" that allow the interpreter to draw conclusions about the particulars of a text, that is, the events, the characters and so on (p. 106).

Herman (2009, p. 15–16) identifies four characteristics that function as basic elements of narrative and as such also evoke storyworlds. The four elements are 1) *situatedness* 2) *event sequencing* 3) *worldmaking / world disruption* and 4) *what it's like* (p. 9). I will give a brief description of the first, second and fourth elements that are more loosely connected to the concept of worldbuilding and then elaborate in more detail on the third element, worldmaking / world disruption.

Situatedness refers to how narrative texts are always created within a context that impacts what kinds of cues the author uses to convey the other elements of the narrative. In other worlds, situatedness is the understanding that narratives are not created in a vacuum but instead in a specific "sociocommunicative environment" (Herman, 2009, p. 17). *Event sequencing* has to do with the particulars of a narrative. More specifically, it refers to the particularised characters, situations and events of a story (p. 19). Lastly, *what it's like* draws attention to the experience of a storyworld, and how narratives do not only present particular characters and events but also what it is like for the characters to go through these events and live in the storyworld (p. 21).

The third basic element of *worldmaking / world disruption* argues that the represented events of a story must introduce a disruption or disequilibrium to a storyworld that involves humans or human-like agents (Herman, 2009, p. 105). Therefore, the text must first create a world and then introduce a disruption of some sort to it for a narrative to occur. Beginning with worldmaking, Herman provides three core aspects of worldmaking: taking up residence in the storyworld (p. 112), a temporally extended experience of being inside the world (p. 119), and creating temporal and spatial dimensions of a storyworld (p. 128).

For Herman (2009, p. 112), the first aspect, taking up residence in the storyworld, is something that occurs at the beginning of a text. In other words, the beginning must somehow enable the interpreter to step into the world. Herman provides several different theories for explaining the phenomenon, for example *accommodation* (Lewis, 1979, as cited in Herman, 2009, p. 113) and Ryan's concept of *fictional recentring* which was already explored in the previous section. Herman also evokes Ryan's *principal of minimal departure* to describe how interpreters fill in the gaps in fictional worldmaking. According to Ryan, our own actual world is viewed as the world of the "ordinary", and any distance from said normal that is not explicitly indicated in the text is thought to be "a gratuitous increase of the distance between the textual universe and our own system of reality" (Ryan, 1991, p. 51). Therefore, the *principle of minimal departure* states that when interpreting a text, we conform to our own actual world as much as possible, and when the text does not explicitly infer difference or leaves a gap in information, we will project data onto the text based on our own world.

Second, a text must not only prompt the interpreter to step into the storyworld but also create an extended experience of being inside the storyworld (Herman, 2009, p. 119). For Herman, this aspect of worldmaking relates to immersion.

> Interpreters of narrative do not merely reconstruct a sequence of events and a set of existents, but imaginatively (emotionally, viscerally) inhabit a world in which, besides happening and existing, things matter, agitate, exalt, repulse, provide grounds for laughter and grief, and so on

> – both for narrative agents and for interpreters working to make sense of their circumstances and (inter)actions. (Herman, 2009, p. 119)

Third, worldmaking requires the text to create a temporal and spatial map for what is happening: where and when the events take place (Herman, 2009, p. 128). For these aspects, Herman introduces several different theories, for example Genette's temporal modes of narration, first published in 1972 (Herman, 2009, p. 129), and Zoran's three-level framework for studying the space-time nexus in narrative, published in 1984 (Herman, 2009, p. 131).

Lastly, the other half of Herman's third basic element of narrative is *world disruption*. Therefore, the previously described aspects of worldmaking create a world, but in order for it to truly become a narrative world, some sort of disruption to the equilibrium must occur (Herman, 2009, p. 134). What counts as a disruption is always dependent on the story in which it occurs, but it must transgress in some way on the normal order of events of the world.

> Once a world has been evoked and interpreters have relocated to it, orienting themselves to its canonical scripts or "given", the procedures specific to narrative worldmaking require that the world be one in which those givens are called into question, jeopardized by events that are more or less radically noncanonical, more or less antithetic to the normal order of things. (Herman, 2009, pp. 135–136)

In practice, this is the element in the beginning of the story where something changes, and the narrative is instigated. For example, in *The Lord of the Rings* (Tolkien, 1965), Sauron begins to hunt for the ring, and in *Pride and Prejudice*, Mr. Darcy and Mr. Bingley arrive to Hertfordshire, disrupting the previous status quo of the social circles.

Ryan and Herman in relation to Roine

A similarity that can be discerned between Ryan's possible worlds theory and Herman's narrative worldmaking is the idea that immersion stems from relocating into the fictional world and, for the time being, effectively forgetting about the real world or pretending that it does not exist. A logical conclusion would then be that for immersion to remain stable, there can be no real-world interference into the experience of being immersed in fiction because that interference breaks the illusion of the fictional world being the real and actual world. This is a prominent discourse in many worldbuilding theories.

However, in this thesis I will be basing my analysis on a theory that actively rejects the idea that real-world interference is detrimental to experiencing a fictional world. The theory I will be using in this

thesis is the theory of speculative worldbuilding by Hanna-Riikka Roine (2016). Roine asserts that fictional worldbuilding and immersion into a fictional world are inherently created in the interaction between the work of fiction and the real world, and thus the real-world interference is a necessary element of the process of experiencing a fictional world, as I will next elaborate on.

3.2 Speculative worldbuilding

In this study, I will use Roine's (2016) theoretical framework on worldbuilding that pertains to specifically speculative fiction, the genre to which the video game *Outer Wilds* belongs. First, I will explain how Roine defines the genre of speculative fiction and then elaborate on her model of speculative worldbuilding.

The genre of speculative fiction, and specifically science fiction, has famously been defined through the concept of a *novum*, which is a term that was coined by a prominent science fiction researcher Darko Suvin. According to Suvin (2016, p. 80), a novum is "a totalizing phenomenon or relationship deviating from the author's and implied reader's norm of reality". Here the word *totalizing* refers to the novum being something that changes the important aspects of the universe of the story so that they no longer correspond with the real world. For Suvin, the "narrative domination or hegemony" (p. 79) of the novum is what defines the science fiction genre.

Roine's (2016, p. 14) definition of speculative fiction takes the concept of the novum one step further. For Roine, speculative fiction is not only fiction defined by its speculative premise, or novum, but it must also work through this speculative premise in a processual manner. Furthermore, Roine differentiates between fantasy and science fiction based on the mode in which the speculative premise is introduced and processed. This mode in fantasy is more experiential and the speculative premise cannot be rationalised, whereas science fiction uses a mode reminiscent of the scientific method that is based in hypotheses, observations, and systematic experiments (p. 15).

This duality of the speculative premise and the process of working it through is a structure that is also repeated in Roine's (2016, 44–45) conceptualisation of speculative worldbuilding, not just in the definition of the genre. Roine's model of worldbuilding differs fundamentally from many of the prominent theories on worldbuilding, the two theories mentioned in the previous section included, in that it does not view the fictional world only as its own ontological realm that is separated from the real world. Instead, Roine sees speculative worldbuilding as a rhetorical and communicative tool that combines two approaches to the world at hand, *the world-as-construct* and *the world-as-process* (p.

25), which are realised both as possibly existing and as something that was artificially created in the real world.

The world-as-construct refers to the model of a world that the work of fiction creates (Roine, 2016, p. 19). This construct could be likened to the aforementioned idea of a fictional world being its own ontologically separate realm. However, for Roine the world-as-construct does not require that the user engage with the fictional world only as if it were real. Instead, the user is simultaneously aware of the artificiality of the world and the work of fiction. Therefore, the world-as-construct is both a world that is perceived as being material in its own right and also a world that is understood to have been made. Roine refers to these two perspectives as the *world-internal* and the *world-external* perspectives (p. 34). The world-internal perspective views the world as possibly existing while the world-external perspective views the world as a work of art, an artificial construction that is created and consumed in the real world.

If the world-as-construct is the model of a reality with a speculative premise in Roine's (2016, p. 34) definition of speculative fiction, the world-as-process refers to the working through of this model through the active engagement of the user. In the world-as-process, the users "address the construct of the world in a processual manner" (p. 19). In other words, the construct of the world is a framework within which the user can engage with and work through the speculative idea or thought experiment presented in the work of fiction. This is the core communicative aim of speculative worldbuilding: to transform abstract ideas and thought experiments into a particular, material form so that they can be communicated to the user (p. 18).

As opposed to the theories proposed by Ryan and Herman, for example, where the world-internal world-as-construct and recentring to it is the element that creates the experience of a world, for Roine (2016, p. 34), immersion into a fictional world occurs in the interplay between the world-as-construct and the world-as-process, which includes not only the world-internal perspective but also the world-external perspective of seeing the work as an artificial work of art. In Roine's model, immersion is a form of active participation on the part of the user. It is not something passively received from a text, and instead it is rooted in the active working through and making meaningful sense of the speculative world, which can often take considerable effort.

> [T]he userly sense of worldness does not reside in the elements or the premise, in the world-as-construct, but in the way we are engaged with working it through – world-as-process. This contributes toward a view of worldbuilding as real-world participation, not so much as an instance of simply reflecting or imitating our reality. (Roine, 2016, p. 47)

Speculative worldbuilding is not always fictional, but its fictional and nonfictional forms have some distinct characteristics. In its nonfictional form, speculative worldbuilding relies on a double exposure between what is known about reality and how the world presented differs from it (Roine, 2016, p. 104). In contrast, the fictional form of speculative worldbuilding does not only rely on a double exposure between what is and what is not but also uses a double perspective in relation to the mode of imagination of the user (p. 37). The double perspective is related to the world-internal and world-external perspectives, and it refers to the user engaging simultaneously with both the imagined characters and events of the fictional world (world-internal) and the artificial work of art (world-external) (p. 39).

This leads to certain characteristics that can be attributed to fictional speculative worldbuilding. First, speculative worldbuilding is an artistic practice and as such it does not always provide the world-as-process easily to the user (Roine, 2016, p. 47). One way this aesthetic challenge is achieved is through *cognitive estrangement*, which is a concept originally proposed by Viktor Shklovsky in the early twentieth century (1998, as cited in Roine, 2016, p. 48) to designate the aesthetic technique of making the content or form of art difficult as the prolongation of the process of perception is an aesthetic goal in itself. Roine (2016, p. 48) takes the concept of cognitive estrangement and states that in speculative fiction cognitive estrangement manifests specifically when the text "engages the user in world-processing." That is, "the user's process of working the premise through in a systematic manner slows down the perception of the idea that is being worked through" (p. 48). Estrangement in speculative fiction often manifests in abstract and conceptual ideas being transformed into a particular form through characters, events, and other material existents within the world-as-construct (p. 54).

Another key characteristic of speculative worldbuilding, according to Roine (2016, pp. 84–85), is that it engages the user through multiple frames of interpretation. This conceptualisation distances Roine's theory from many theories on fictional worlds that have a tendency to approach worldbuilding through the sole lens of a narrative situated in the world-internal perspective (cf. Herman, 2009). According to Roine (2016, p. 81), when the world-external perspective is ignored in this manner, the larger patterns of meaning-making that occur on a level not concerned with the particulars of a possibly existing world are disregarded, and therefore much of what is inherent to speculative worldbuilding as a rhetorical practice is lost.

The frames of interpretation that Roine (2016, p. 25, 85) proposes as relevant for speculative worldbuilding are *narrativity* and *simulativity*, and they intertwine with each other to create the experience of worldness. Narrativity is the frame of interpretation that has to do with the particulars

of a story and a world, such as the characters, locations, events, actions and consequences. Simulativity, in contrast, refers to the model of the world itself, the abstract ideas and thought experiments that are being worked through (p. 92). In other words, the simulation is the larger system that is being presented through the means of narrative particulars such as aliens or time loops. Works of fiction invite all different kinds of interpretations and responses which is why Roine uses the terms narrativity and simulativity instead of referring to a text as either a narrative or a simulation. Both responses are used simultaneously.

> [S]peculative fiction focusses not only on the easily changeable joints of reality as we understand it (such as the few striking events) but also on the very model we base our understanding on. This combination both enables the user to follow up the working out of certain idea and its consequences and facilitates her cognitive and emotional engagement with (or "absorption" into) the worlds as possibly existing. (Roine, 2016, p. 90)

In this thesis, I will be using Roine's model as the general theoretical framework of my analysis. The analysis will be divided into two larger sections, the world-as-construct and the world-as-process. These sections will be analysed from both a world-internal and a world-external perspective. Additionally, the potential interplay between these perspectives will be noted. Based on this theoretical framework, the aim of this study is to analyse how the world in the piece of fiction, or *the product*, using Koenitz's (2010 in Makai, 2021, p. 71) terms, is constructed.

4 Methodology

In this section, I will introduce the methodological framework that will be used in the analysis. In this study, the worldbuilding practices in the video game *Outer Wilds* are approached from the perspective of intermediality and multimodality. Therefore, I will begin this section by giving a brief overview on intermedial studies and how the way I approach intermediality also includes multimodality. Then I will continue to the specific methodological framework of this study: a combination of Elleström's (2021) media modalities and Toikkanen's (2022a, 2022b) three-tier model of mediality, which I refer to as the DIME model.

4.1 Intermediality

Intermediality is not a homogenous research approach. Instead, it includes a variety of different approaches on the subject of medial relations, ranging from categorisations based on the materiality of the platform used to transmit the media product (see Jensen, 2016) to considerations of the content of the media product and how that might be connected to other forms of media (see Rajewsky, 2005).

Overall, intermedial studies could be characterised as a research approach that is interested in "medial border-crossing and hybridization" (Rajewsky, 2005, p. 44). Rajewsky makes a distinction in approaches that deal with either a broad or a narrow conceptualisation of intermediality. The broad conceptualisation sees intermediality as having to do with phenomena that concern the crossing of media borders and as such distinguishes itself from both intramedial phenomena – occur within the same medium – and transmedial phenomena – more or less universal phenomena that occur across a variety of media. However, this conceptualisation of intermediality does not provide many tools for the analysis of specific manifestations of intermediality. Therefore, there are a multitude of narrower approaches to intermediality that engage with specific elements of mediality (Rajeswky, 2005, p. 46).

This study will primarily focus on definitions of intermediality provided by Elleström (2021, p. 66). Elleström makes a distinction between two types of intermedial relations: intermedial relations between *basic media types* and intermedial relations between *qualified media types*. Intermedial relations between basic media types refer to types of media characterised by specific media modality modes, such as image or sound. This kind of conceptualisation blurs the line between intermediality and multimodality which refers to phenomena that include a combination of different modes, such as visual, auditory or verbal modes. In contrast, intermedial relations between qualified media types

refer to a more conventional view towards intermediality, and it focuses on the relations between what is more mundanely referred to as different media – film, literature and video games, for example. These media types are more complex and not based in specific modes. Instead, the media distinctions are rooted in social and cultural norms (Elleström, 2021, p. 55).

The methodological structure of this study utilises Elleström's (2021, p. 71) conceptualisations of narrow and broad intermediality – the similarity of which to Rajewsky's terminology demonstrates a general issue in intermedial studies, the contradictory use of similar terms and a lack of uniformity. In Elleström's terms, narrower types of intermediality deal with relations between basic media types, while broader types of intermediality focus on relations between qualified media types. My focus will be on the former, on the relations between basic media types within a singular media product and as such, my approach could also be defined as intramedial or multimodal. The methodology chosen for answering the needs of this narrower type of intermediality is a combination of two existing methods: Elleström's (2021) own media modalities and Toikkanen's (2022a, 2022b) three-tier-model of mediality. I will introduce both methods independently and then present my synthesis of the two in the following chapters.

4.2 Media Modalities and the Three-tier Model of Mediality

Media Modalities

Elleström (2021, p. 4) views media as communication, or more specifically, as a communicative tool. According to Elleström, communication is a process that can be divided into three parts. There is 1) "something being transferred", 2) "two places between which the transfer occurs", and 3) "an intermediate stage that makes the transfer possible" (Elleström, 2021, p. 10). He uses the term *cognitive import* to describe the first part of the model, "something being transferred", and it refers to the message or meaning that is first sent by the producer and then received by the perceiver. The terms *producer's mind* and *perceiver's mind* are used to designate the second part of the model, "two places between which the transfer occurs" (Elleström, 2021, p. 12). The third part, "an intermediate stage that makes the transfer possible", is termed *media product*, and it is the material entity or phenomenon "through" which the cognitive import is transferred between the minds of the producer and the perceiver (Elleström, 2021, p. 13, 19). As Elleström understands media to be a tool of communication, his general conceptualisation of the term media product is a broad one, not only

including qualified media types commonly understood as media, such as literature or video games, but also seemingly simple embodied acts such as waving at someone.

In Elleström's model, when analysing a media product, what one is truly analysing is the process of transferring cognitive import "through" the media product, which leads to his four categories of media *modalities*, or basic types of media traits that can be used to decipher the process of transfer. These four modalities are the material, spatiotemporal, sensorial, and semiotic modalities (Elleström, 2021, p. 20). In Elleström's conceptualisation, the first three modalities are presemiotic, meaning that they are solely responsible for the mediation of information, that is, for receiving the raw data about the world. The presemiotic modalities are followed by the semiotic modality which is responsible for signification or making meaning out of the raw information provided by the presemiotic modalities. In other words, for Elleström (2021, p. 44), the information provided by the presemiotic modalities is meaningless until it has been interpreted through the semiotic modality. However, it is important to note that the presemiotic and semiotic modalities cannot be separated from each other. The semiotic signification occurs immediately and reflexively at the moment of perception. Afterward, the meaning-making process can continue further either unconsciously or consciously by examining patterns in the media product and finding connections to the perceiver's pre-existing knowledge and attitudes (Elleström, 2021, p. 50).

As mentioned above, for Elleström (2021. p. 46), the term modality refers to general types of media traits. Modalities are broad categories of traits shared by all media products. As media products are always physical, or at least the vessel through which they are displayed is – the technical medium of display – they must also by default be material. Media products are also inherently spatiotemporal since physical existence requires that the media product exists somewhere and at a certain point in time. All media products are also sensorial since senses are the channel through which humans perceive the world, and therefore, media products. And lastly, all media products are inherently semiotic as they create meaning through signs.

Thus, modalities are shared by all media products, but media products can still differ from one another drastically. Elleström (2021, p. 46) uses the concept of a *mode* to analyse the specific traits of a particular media product. Next, I will give a brief overview on the different modes included in each modality, starting with the presemiotic modalities. Beginning with the material modality, it can be divided into modes at least in two ways. First, it can be categorised based on the different states of matter as distinguished in physics: solid, liquid, gas or plasma (Elleström, 2021, p. 47). For example, a painting is a solid media product since when it is touched, it offers substantial resistance, whereas

an art installation made of coloured water would be categorised as liquid in its materiality. A media product can also include multiple different material modes like an art installation that includes a solid statue with flowing water. The other way of categorising the material modality into modes is based on whether the matter is organic of inorganic.

The spatiotemporal modality is divided into two. Spatiality includes three different modes based on the model of three-dimensionality: height, width and depth. Temporality brings into the model the fourth dimension of time, which in a media product can manifest as either static (does not change in time) or temporal (changes in time). A media product must have at least one of the four dimensions, or modes – height, width, depth and time – and it can include all four (Elleström, 2021, p. 48). Singing, for example, does not have spatiality, but it is temporal in that it changes in time and has a specific duration. On the other hand, a painting has two of the spatial modes, height and width, but is does not have temporality since it is a static image that does not change. Dance has all four dimensions as it is temporal, and it takes advantage of all three spatial dimensions, height, width, and depth.

The sensorial modality includes at least five modes based on the five primary human senses: visual, auditory, tactile, gustatory and olfactory. Elleström (2021, p. 49) refers to these as the five main modes of the sensorial modality. A painting, for example, is a medium that typically engages the user mainly through the visual mode, while a film uses both the visual and the auditory mode. Additionally, there are at least two other human senses that can be included as sensorial modes: proprioception and interoception. Proprioception refers to the sense of body position and movement, while interoception is the sense of the internal state of the body (Elleström, 2021, p. 49).

Lastly, in Elleström's (2021, p. 49) semiotic model, the presemiotic modalities are interpreted through the semiotic modality, which is responsible for signification or making meaning of the information provided by the presemiotic modalities. The semiotic modality is divided into three main modes: iconic, indexical and symbolic modes (Elleström, 2021, p. 51). The iconic mode refers to signs that represent their referent based on similarity. For example, a painting of a dog is iconic since it shows an image that visually resembles an actual dog. An indexical sign represents its referent through contiguity or traces of some sort. An example of an indice would be the song of a bird in the soundscape of a film even if the bird is nowhere to be seen. Finally, a symbol represents its referent purely based on conventions and norms. Most English words are symbols. They have no clear connection to their real-world referents and are instead recognisable purely based on arbitrary conventions. Symbols can also be visual, such as the colours red and green in stoplights to represent stop and go.

The presemiotic modalities together with the semiotic modality form what Elleström calls *the intracommunicational domain*. This is the area of the perceiver's mind that is foregrounded in a communicational process. It is the cognitive import that is formed in the perceiver's mind after it has passed through the media product (Elleström, 2021, pp. 28–29). However, the intracommunicational domain, and therefore the cognitive import, is not formed solely based on the media product, and it is instead supplemented with the *extracommunicational domain* which is the background area in the mind of the perceiver that consists of all the previous experiences and information that the perceiver has accumulated (Elleström, 2021, p. 28). To summarise, the intracommunicational domain is the final cognitive import in the perceiver's mind that is the result of the presemiotic information mediated by the media product and interpreted through semiosis based on the perceiver's extracommunicational domain. Elleström (2021, p. 29) also refers to this intracommunicational domain as the *virtual sphere*.

Three-tier Model of Mediality

Toikkanen (2022b, p. 105) understands intermediality in a manner that somewhat differs from Elleström and many other researchers of intermediality. He argues that experience through observation is always inherently intermedial as the experience is always mediated through the senses and potentially other indirect means before it reaches the consciousness of the perceiver. This process constitutes the *intermedial experience*, and it can be analysed using a three-tier model of mediality.

Toikkanen's (2022b, p. 107) model is divided into three tiers that are 1) sensory perceptions, 2) ways of mediating sensory perceptions, and 3) cultural and linguistic ideas that mediate experience. The first tier of sensory perceptions refers to the observations made through the senses – sight, hearing, feeling, smell and taste. In practice, this is the sensory act of visually perceiving a tree, hearing the sound of rain or touching something soft.

The second tier of mediated sensory perceptions leaves the realm of direct sensory information and instead refers to the ways in which these perceptions can be mediated through other means, which creates an imagined sensory experience on the first tier (Toikkanen, 2022b, p. 107). The means through which sensory experiences can be mediated indirectly are sometimes simple, such as writing, speech or gestures. In practice, this can look like the visual image of a tree being experienced through reading a verbal description of it, which creates an imagined visual image. Mediated experiences can also occur through more complex means, meaning different artforms and media types. For example,

the direct sensory experience of hearing the sound of rain can be mediated through a poem that evokes the imagined experience of hearing the sound.

The final tier of the model, the tier of ideas, refers to presenting information that does not necessarily directly appeal to the senses but instead offers, for example, cultural information that the perceiver converts and includes into their experience (Toikkanen, 2022b, p. 107). The garden in which a tree grows might, for example, be referred to as the garden of Eden, which based on cultural knowledge gives the impression of a luscious garden environment even without additional descriptions. Thus, the cultural knowledge of the concept brings the experience back to the first tier through imagined sensory experiences.

As is evident in the interconnectedness of the description of the model above, the model being divided into three consecutive sections does not mean that the tiers should be conceptualised as three separate categories of experience (Toikkanen, 2022b, pp. 107–108). The use of the word *tier* refers to the fact that despite the numbered form of the model, these three tiers do not work sequentially but are instead always in a constant, simultaneous interaction with each other, building upon one another and existing all at the same time. The three tiers can also form a cyclic structure as the direct and mediated sensory information evoke ideas that can further lead to new sensory experiences (Toikkanen 2022a, p. 234).

What differentiates Toikkanen's model from Elleström's conceptualisation is the differing philosophical understanding of the nature of communication and experience. As discussed above, Elleström approaches the topic of communication and media from the perspective of semiotics and argues that sensory perceptions precede communication and cognition which come into effect once the semiotic modality is activated and used to interpret and make meaning out of the presemiotic input. This means that in Elleström's model "the senses […] do not possess cognitive purchase on the matter that flows through them to become multimodal information, since their mediating physical operation as a presemiotic occurrence is effectively split from the communicative situation that follows" (Toikkanen, 2022a, p. 235). In contrast, in Toikkanen's model, the senses themselves factor into the communicative situation and, therefore, are able to produce intermedial experience. He uses the example of Lovecraft's short novel *The Dream-Quest of Unknown Kadath* and its sublime imagery that evades verbal description to demonstrate this nature of sensory information.

> When sensory perceptions presented in words grow as erratic and incomprehensible as they do in DQ, it become evident that the seeing, hearing, and feeling of the endless north cannot be interpretively controlled because the experience feels as it went beyond words, leaving behind all ideas based on them for a sublime effect. (Toikkanen, 2022a, p. 235)

In other words, according to Toikkanen, cognitive purchase must occur on the level of sensory perceptions since this type of sublime experience is possible and the beyond-words quality of the text does not leave room for semiotic interpretation.

4.3 Synthesis of the Two Models

In this study, I will be utilising a synthesis of Elleström's (2021) media modalities and Toikkanen's (2022b) three-tier model of mediality in order to combine the strengths of both models. Toikkanen's three-tier model offers a way of grasping the experientiality of perception that precedes interpretation. Meanwhile, Elleström's (2021) modalities provide a more detailed model for analysing the different aspects of a media product that take part in the process of interpretation. I argue that by combining these two approaches, a more complete model of media engagement can be achieved, a model that incorporates both the cognitive agency of the senses themselves in the process of experience and the semiotic interpretation that follows and continues the meaning-making process. I refer to this hybrid as the model of direct and indirect media engagement, or DIME.

The model proposed here is structured around the distinction between experience and interpretation theorised by Toikkanen and Virtanen (2020). They argue that experience always precedes interpretation as interpretation requires certain conditions of sensing and perceiving, conditions of experience, before an individual can perform the act of interpretation. In this sense, experience is something relatively objective and also collective, while interpretation is a subjective process based on the collectively shareable perceptions (p. 85). Interpretation is an integral part of the continuous process of experiencing something (pp. 87–88), but it does not precede or define the experience (p. 85).

Following this distinction between experience and interpretation, I propose a methodological model for analysing media that incorporates both the direct experientiality of sensorial, material and spatiotemporal information as well as the more complex interpretive process of using semiosis to make meaning out of the input provided by the other modalities. The overall structure of the model echoes Toikkanen's (2022b) three-tier model of mediality with tiers designated to direct and indirect experiences as well as a tier for ideas. However, aspects of Elleström's (2021) theory on modalities are incorporated, and most notably, the model includes three alternative routes experience can take depending on whether the process includes semiotic interpretation or works directly through the sensorial, material and spatiotemporal modalities to produce ideas. I will first present the three tiers

independently of each other and then explain what the alternative routes of experiencing a media product are.

The first tier of the model that is always present in the perception of any kind of media product is the direct perception of sensorial, material and spatiotemporal information. These three modalities can be detected directly through the senses and bodily perceptions of the world and as such they are firmly in the category of experience according to Toikkanen and Virtanen's (2020) division of experience and interpretation. I refer to this first tier as *direct perception*. Of the three modalities borrowed from Elleström (2021) that are included in the first tier, the sensorial modality is the dominant one in the perception of media products since materiality and spatiality are always perceived through the senses while temporality is perceived through sensorially perceived changes to the world in relation to the abstract concept of time. However, compared to Toikkanen's model, I have chosen to explicitly include Elleström's (2021) material and spatiotemporal modalities into the first tier as they make visible the full spectrum of modalities present in a media product, which can be lost when simply focusing on the senses.

The second tier of the model includes indirect mediation of the first tier, that is, the sensorial, material, and spatiotemporal modalities. It once again echoes the second tier of Toikkanen's (2022b) three-tier model with the addition of the other three modalities from Elleström's (2021) theory. I have chosen to refer to these three modalities – the sensorial, material and spatiotemporal modalities – as the *experiential modalities*, instead of the term *presemiotic modalities* used by Elleström (2021, p. 47), since my synthesis follows the concept proposed by Toikkanen (2022a, p. 235) that the senses can possess cognitive purchase on their own regardless of whether they have been further interpreted through the semiotic modality.

The second tier of the model is divided into two possible routes. The first possibility is the first-tier direct perceptions being mediated indirectly through one of the experiential modalities. For example, the material modality can be mediated through the sensorial modality, the solidity of objects being conveyed through a visual of touch and a sound effect that reinforces it. Specific modes of the modalities can also be mediated through different modes in the same modality, such as the tactile mode of the sensorial modality being mediated through the auditory mode, which is a concept that is also present in Elleström's (2021, p. 68) theory where he refers to it as cross-modal representation. In this methodological model, I refer to this type of mediation as *indirect perception* as it mediates the perceptions of the first tier indirectly.

The second possible route of the second tier of the model includes the first-tier modalities being mediated through semiosis, which is the central difference between the second tier in my model compared to the second tier in Toikkanen's (2022b) three-tier model of mediality. This means that in addition to the experiential modalities, the direct perception of the first tier can also be mediated through the semiotic modality. I refer to this alternate path of the second tier as *indirect interpretation*, following Toikkanen and Virtanen's (2020) division between experience and interpretation. More specifically, the semiotic modality includes the symbolic, iconic, and indexical modes, based on Elleström's (2021) categorisation.

In stating that the direct perception of the first tier can be mediated through the semiotic modality, I mean that, for example, spatiality can be mediated though the symbolic mode in numeric indications of distance, or the sensory experience of temperature can be semiotically mediated through specific colours that are both symbolically and iconically linked to temperature, blue indicating cold and red indicating warmth. It is important to note that indirect interpretation is always based on direct first-tier sensorial information, for instance the colour red or blue in the previous example, or visually perceived text in many instances of symbolic information. However, the full meaning is only accessed once this information has been interpreted through semiosis which utilises not only the media product itself but also the extracommunicational domain of the perceiver (Elleström, 2021, pp. 28–29).

The final tier of the model is a tier borrowed directly from Toikkanen (2022b): the tier of ideas. As was explained in the previous chapter, ideas function in media products as cultural or language-based elements that do not directly or even indirectly evoke sensory (or material or spatiotemporal) information. Instead, ideas produce associations to concepts on a cultural or linguistic level that then mediate imagined sensory, material or spatiotemporal perceptions. In my model, the tier of ideas is based on the previous two tiers. The ideas are evoked either through direct perception on the first tier or indirect perception or interpretation on the second tier. This creates three possible routes for perception of a media product to occur. Ideas can remain exclusively in the realm of experience, either going directly from the first-tier modalities to the tier of ideas or passing through indirect perception on the second tier. Ideas can also take the interpretive route, the direct first-tier modalities being mediated through indirect interpretation via the semiotic modality, which then evokes ideas on the third tier.

In my analytical framework, I will combine this methodological model with the concepts of speculative worldbuilding from Roine (2016) that were discussed in chapter 3. I will combine the methodological categories, the three tiers of my synthesis, with the different components of speculative worldbuilding, namely the world-as-construct and the world-as-process, both from world-

internal and world-external perspectives. This way, when analysing *Outer Wilds*, I can examine each component of speculative worldbuilding on each of the tiers of the methodological model. In practice, the analytical framework that I use in this study can be conceptualised as a kind of matrix table, as illustrated in Figure 1.

	First tier: direct perception (sensoria, material, spatiotemporal)	**Second tier (A):** indirect perception (via sensorial, material or spatiotemporal)	**Second tier (B):** indirect interpretation (via semiotic)	**Third tier:** ideas
WORLD-AS-CONSTRUCT				
world-internal	Environmental visuals and auditory soundscape	spatiality and materiality of the gameworld	Semiotically conveyed past temporality and the scale of the gameworld	Juxtaposition between the familiar and the unfamiliar
world-external	Extradiegetic music and the materiality of the technical medium of display			Title and logo of the game
WORLD-AS-PROCESS				
world-internal	Recentring through visually and auditorily conveyed 1st person perspective	Material and spatial elements of environmental puzzles	The knowledge mechanics	Video game conventions integrated into the gameworld
world-external	The materiality of the technical medium of display used to play the game			Video game conventions

Figure 1. *Visualization of the analytical framework and examples on points of analysis.*

5 Analysis

In this section, I will be implementing the analytical framework described in the previous chapter. This chapter will be structured around Roine's (2016) model of speculative worldbuilding, beginning with an examination of how *Outer Wilds* uses the multimodal and intermedial means at its disposal, analysed through my methodological model DIME, to create the world-as-construct, both world-internally and world-externally. Then I will continue to examine how the game makes the player work through this construct, the world-as-process, to deliver the player an experience of the world.

5.1 World-as-construct

As stated in chapter 3.2, Roine's (2016) theory of speculative worldbuilding divides the concept into two parts, the world-as-construct and the world-as-process. In this chapter, I will examine the former of the two, the world-as-construct, which refers to the model of the world. This model of the world includes both the potential of viewing the world as possibly existing and the understanding that the world is artificial, made in the real world (Roine, 2016, p. 19). In my examination of the world-as-construct, I have divided the model into four subsections. In chapters 5.1.1 and 5.1.2, I begin by analysing the general framework of the world which includes the topography and temporal design of the world. Then I continue to the species living inside the world in chapter 5.1.3. Finally, chapter 5.1.4 focuses on the overall ideas that the game evokes about the world-as-construct.

5.1.1 Topographical design

I will begin my investigation of the world-as-construct (Roine, 2016) of *Outer Wilds* with an examination of how the game composes the topographical design of the solar system, that is, the physical features of its world. In this section, I will examine how the game creates the spatiality, the materiality and the distinct sensorial features of the world, which are three of the modalities adopted from Elleström's (2021) theory of media modalities explained in chapter 3.2. Temporality, the other half of Elleström's modality of spatiotemporality, will be examined in its own chapter, as temporality has a very prominent role in the world of *Outer Wilds*. The spatial, material and sensorial modalities are realised in the game either directly following Elleström's categorisation, which constitutes direct perception on the first tier of the DIME model, or indirectly on the second tier of the model, either as indirect perception or indirect interpretation.

Spatiality

I will begin with spatiality, which in Elleström's (2021, p. 48) categorisation is half of the spatiotemporal modality, as it is the first requirement for an environment exist. *Outer Wilds* uses indirect means to achieve the perception of this modality, meaning that the spatiality of the game is mainly conveyed through intermedial experience (Toikkanen, 2022b, p. 234), the first-tier modality of spatiality being mediated indirectly through the second tier. A video game played on a screen does not inherently provide a three-dimensional space as the screen, or the technical medium of display, using Elleström's (2021, p. 34) terminology, is limited by its two dimensions of height and width. However, despite this limitation, *Outer Wilds* and many other video games alike manage to create an illusion of a three-dimensional space, namely the addition of the third spatial mode of depth, by using other modalities. *Outer Wilds*, in particular, accomplishes this on the second tier through indirect perception, which constitutes of the use of the world-internal sensorial modality, namely the auditory and visual modes, in interaction with the world-external materiality of the technical medium of display, in this case the controller.

In *Outer Wilds*, the first and perhaps primary method of creating the illusion of the screen providing not only the spatial modes of height and width but also depth is through the visual mode and perspective. Practically all visual illusions of a three-dimensional space use perspective and the comparative sizes of objects to evoke depth in the environment. In all simplicity, things that are closer to the point of observation appear larger and lower than those farther away. As *Outer Wilds* is played in first-person perspective, the point of observation is the player themselves as the main character, bridging the gap between the world-internal and the world-external as the point of observation for the player is also the point of observation for the world-internal main character.

However, in order for the player to correctly interpret size differences as depth, there must be a point of reference, either world-internally in the environment or world-externally in what Elleström (2021, pp. 28–29) calls the extracommunicational domain of the player. What this means world-internally is that the interactive nature of a video game, being able to move within the virtual environment, allows the player to gauge the sizes of unfamiliar things by comparing the objects to the player themselves, which allows for a more accurate estimation of depth even when farther away. However, this is not always necessary since the elements within the gameworld are often things that exist in the real world, which allows for the player to use world-external knowledge, the extracommunicational domain, to estimate the size of objects. For example, the pine trees on Timber Hearth or buildings all around the solar system are comparable to their counterparts in the real world, and thus, the player assumes that their sizes are also comparable. This phenomenon of assuming that aspects of the fictional world

correspond with the real world when no contradicting information is provided is what Ryan (1991, p. 51) refers to as *the principle of minimal departure*.

Nevertheless, *Outer Wilds* is not a still image, where visual perspective is the only tool available to evoke three-dimensionality. As the video game is a medium where the player is able to interactively move in the virtual space, the game provides not only a visual of a three-dimensional space but the experience of existing within it. This is accomplished through the dynamic nature of how the direct perception of the visual and auditory modes are used in the game. Visually, the player is able to use the world-external materiality of the controller to dynamically move the point of observation, and thus, what they can see on screen. Auditorily, the environmental soundscape of the game will likewise change depending on the player's position in the world. Environmental elements that make noise, for example a waterfall in the village on Timber Hearth, emit sound based on how close the player is to the source of the sound. When standing right by the waterfall, the sound of rushing water is loud and covers most other noises from the environment. In contrast, when farther away, the sound is fainter. Optimally, when using headphones with directional sound, the dynamic nature of sound also functions directionally giving an even more realistic illusion of spatiality.

What makes the spatiality in *Outer Wilds* somewhat unique in the realm of video games is the way the game manages to avoid placing obvious limits to its spatiality. Since a video game can never be truly limitless spatially, they often use borders to limit the level designs. These borders might be visually integrated into the world-internal world-as-construct, for example as fences, buildings, or other kinds of world-internal structures, like in *Final Fantasy VII Remake* (Square Enix Business Division 1, 2021), or they might be obvious force fields that have no world-internal integration, like in *Genshin Impact* (miHoYo, 2020).

Outer Wilds manages to bypass the need for these kinds of limitations, whether they be integrated into the world-internal world-as-construct or not, through the way its world and levels are designed. The different levels of the game, the planets and the other astronomical objects, are all accessible in the larger simulation of a solar system, which means that there is no need to limit the level designs of the astronomical objects as the transition to space is seamless. Furthermore, the levels themselves consist of the entire astronomical objects, negating the need for artificially limiting their size since the spherical structure of a planet, for example, is naturally limited to its surface area (or the inside thereof in the case of the structurally hollow Brittle Hollow). The only limitations to spatial movement in *Outer Wilds* are those that are dictated by the material reality of the gameworld or the laws of physics that govern how the material reality functions in the game. I will return to the material modality later in this chapter.

Even the solar system as a whole is not enclosed by borders in relation to the rest of the universe. This is achieved through the combination of visuals and the player's world-external knowledge on the size of the universe. The player is able to fly outside the solar system and visually witness how the sun and the astronomical objects become smaller and smaller until finally the solar system looks like just another star in space. The player can continue their flight infinitely as far as they can reach before the time loop resets the player to Timber Hearth. As the player knows through their extracommunicational domain that star systems are very far away from each other, the lack of substance outside of the solar system is believable and creates the illusion of the broader spatiality of the universe.

So far, I have described the way the sensorial modality is used to indirectly evoke three-dimensional spatiality through indirect perception. However, the game also uses indirect interpretation via the semiotic modality (Elleström, 2021, p. 51) to reinforce the illusion of depth. For example, the game uses the symbolic mode, numbers, to indicate distance from the player to different objects when using the lock-on feature that is available whenever the player is wearing the spacesuit or flying the spaceship. While this does not have an immediate impact on the perception of spatiality in the game, the indirect perception through the experiential modalities being the principal way of perceiving spatiality, it has huge repercussions on the overall concept of the spatiality of the solar system and the universe of *Outer Wilds*, as the numeric indications of distance reveal a huge discrepancy between the world-internal solar system and the world-external expectations the player has on the size thereof. The solar system of *Outer Wilds* is tiny compared to our own. Whereas in our solar system, the distance from the outermost planet to the sun is approximately 4,5 billion kilometres, in *Outer Wilds*, the comparable distance from Dark Bramble to the sun is only 20 kilometres, making the entire solar system ridiculously small. This has implications on the overall ideas about the world-as-construct of *Outer Wilds*, which will be examined in more detail in chapter 5.1.4.

Furthermore, the absence of world-internally integrated or fully artificial borders around the solar system is also interpretively reaffirmed through the semiotic modality in the game, specifically through the symbolic mode. For example, the Nomai are textually confirmed to have come from somewhere outside the solar system. This is stated indirectly in Nomai communications and also directly in the ship log: "The Nomai warped to this solar system in a spaceship called the Vessel. They were attempting to follow a signal from the Eye of the universe" (*Outer Wilds*, 2019). The vastness and emptiness of space and the universe is also further textually highlighted in one of the alternate endings to the game that is triggered if the player manages to escape the time loop and fly far enough from the solar system to avoid the supernova. After flying for a while in the visual

emptiness of space, the screen fades to black and the following message appears: "NOW BEYOND THE REACH OF THE SUPERNOVA, YOU DRIFT THROUGH SPACE UNTIL YOUR SHIP'S RESOURCES ARE FINALLY DEPLETED" (*Outer Wilds*, 2019). This ending highlights how doomed a space traveler is outside their own solar system due to the emptiness and sheer size of the universe.

Materiality

Next, I will proceed to the other necessary modality of an environment from Elleström's (2021, p. 47) media modalities: materiality. A space may exist by itself, but without anything to fill it, it cannot be described as an environment. Materiality is similar to spatiality in a video game since much like the screen lacking the mode of depth, a video game also lacks materiality apart from the world-external technical medium of display, the screen and the controller. Therefore, the world-internal materiality of the gameworld must be mediated in some way through the second tier of DIME. In *Outer Wilds*, this occurs through indirect perception and more specifically in the interaction between the world-internal sensorial modality, namely the visual and auditory modes, and the world-external materiality of the controller. This interaction creates the world-internal illusion of all modes of materiality theorised by Elleström (2021, p. 47): solid, liquid, gas, plasma, and even vacuum, that is, the lack of materiality.

The way *Outer Wilds* evokes the distinct experience of these four modes of materiality, or the lack thereof, is through indirect perception via the sensorial modality, how they look and sound, and most importantly, through the interplay between these world-internal sensorial modes and the world-external material controls of the game. More specifically, this interplay occurs in how the relationship between the controls and the sensorial changes in the game change depending on what mode of materiality is being interacted with.

The visual and auditory route of emulating a mode of materiality occurs through imitating what the player knows certain materialities look and sound like based on their world-external knowledge of the world, their extracommunicational domain (Elleström, 2021, pp. 28–29). Visually, the material modes have textures that imitate what they would look like in reality, albeit acknowledging the stylized visual design. For example, solid materials are static and unchanging with textures that correspond with the specific types of solid materiality in question. Wood has a different texture from soil or stone. In contrast, the main liquid materiality of the game, water, is not static and is instead in

constant motion, and the texture is transparent enough to emulate water's ability to pass light through itself.

Perhaps even more impactfully, the different material modes are also realised through differences in the auditory mode, most notably in the sound of footsteps. As an example of the different sounds on solid materials, footsteps on wood have a creaky quality to them, for example on the bridges in the village on Timber Hearth, whereas footsteps on soil are crunchier. Furthermore, the mode of liquid is auditorily even more distinct compared to the solid modes. Walking in water has a splashing sound effect, and being submerged in water muffles all other environmental sounds with an overlay of an underwater hum. The lack of materiality in the vacuum of space is auditorily realised as a complete lack of world-internal sound, apart from the sound made by the propulsion engines of the spaceship or the spacesuit.

Moving onto the fully interactive means of conveying materiality, which occur in the interplay between the world-external feel of the controls and the world-internal auditory and visual changes depending on what materiality is encountered. On solid ground movement is effortless but solid objects and surfaces will also create absolute limits to movement, for example in the case of buildings or cliff walls. Moving while underwater has no such limitations unless a solid object is encountered. However, the movement speed is much slower and the speed at which changes to movement can be made feels quite sluggish. Vacuum, in contrast, also has no limits to movement unless solid objects are encountered, but compared to water, movement is much faster and acceleration and motion do not stop unless countered with propulsion in the other direction, which makes precise movement challenging.

This only leaves the material mode of gas. Gas is an interesting mode in the game since it cannot be perceived visually or auditorily in the same way as liquid or solid materials. However, gaseous materialities are nonetheless present in the game. They are realised either indirectly through another modality on the second tier of the model or in the interaction between the world-as-construct and the gameplay, that is, the world-as-process. For example, oxygen is entirely invisible and makes no sound in the game. However, there are some indirect ways the player is able to detect oxygen. For example, whenever the player enters an area with oxygen, the spacesuit will show the message: "Oxygen detected" (*Outer Wilds*, 2019). The spacesuit also shows an oxygen meter on the screen that will slowly deplete when the player has to use the oxygen reserves in an environment with no oxygen, and likewise, the meter will fill up when the player enters an area with oxygen. Thus, the game conveys the materiality of oxygen indirectly through the interpretive semiotic modality, and more specifically, through the symbolic mode in textual indications and abstract meters.

However, there are also more complex ways oxygen is conveyed that combine the sensorial modality and the gameplay. In environments with oxygen, the player is able to function freely even without a space suit. It is in the lack of oxygen that its indirect materiality is made apparent. In an environment with no oxygen, when the player is not wearing a spacesuit, the game will first indicate the lack of the gaseous material mode through an auditory sound of the main character gasping for breath. Almost immediately after, the screen will go black and the player dies, returning to the starting point on Timber Hearth at the beginning of a new time loop. Thus, the materiality of oxygen is mediated through the gameplay feature of not being able to function without it in combination with the sensorial mode of interoception, that is the mode that concerns bodily functions (Elleström, 2021, p. 49), in the form of breathing, which is likewise mediated indirectly on the second tier through the visual and auditory sensorial modes.

Returning to the general perception of materiality, the illusion thereof is also realised through laws of physics that mimic reality, which are likewise perceived indirectly either fully through the world-internal sensorial modality or in the interplay between the world-internal sensorial modality and the world-external materiality of the controller. As an example of the former category, light functions dynamically in the game, emanating from the sun and being blocked by solid materiality. This causes the planets to have a day-night cycle that is dependent on their rotation in relation to the sun, which is sometimes exploited in the gameplay, most notably in the DLC where the space station called the Stranger is only visible when situated between the player and the sun since it uses cloaking technology to make itself invisible.

An example of a law of physics evoked indirectly in the interplay between the world-internal sensorial modality and the world-external material modality is gravity, which will be examined in more detail when analysing proprioception and gameplay in chapter 5.2.1. However, here it is relevant to note that, on a larger scale, gravity functions like in our own solar system based on the materiality of the world. Large enough material masses will create their own gravity, and the larger the mass, the stronger the gravity. The sun has a very strong gravitational pull that can be near impossible to combat at close range, whereas smaller planets, for example the Hourglass Twins, have weaker gravity and it is easier to not be pulled in by them. The strength of the gravity is perceived indirectly through the interplay between the world-internal sensorial modality and the world-external material modality, that is, through how the player is able to control the visual changes of movement on screen through the world-external materiality of the controller. In stronger gravity, there is more resistance to the controls, which is perceived as lesser sensorial change on screen.

Sensorial design features

Now that I have examined how the general spatial and material framework of the world-as-construct in *Outer Wilds* functions, I will continue to the more detailed design features of the solar system. These features are realised through the sensorial modality, namely the visual and auditory modes. Therefore, as opposed to the previous spatial and material modalities, these features are conveyed through direct perception on the first tier of the methodological model as they are modes within the direct capabilities of the video game medium. This type of direct perception of the sensorial modality corresponds with the first tier of Toikkanen's (2022b) three-tier model of mediality.

Outer Wilds has a very conscious way of presenting different planets and environments sensorially. They are all easily recognizable and distinct from each other, which is the result of careful design choices in four overall categories: colour palette, textures, distinctive design elements and soundscape. The auditory category of soundscape is further divided into the world-internal soundscape, referring to environmental sounds that are part of the gameworld itself, and the world-external music, referring to the instrumental music that does not feature in the world-internal world-as-construct. I will first address the three categories that are perceived through the visual mode and then proceed to the auditory features.

Beginning with colour palette, each of the four planets, with the addition of Dark Bramble in the place of the former fifth planet of the solar system, has a distinctive colour palette that can be recognised even when viewing the planets from a great distance. The Hourglass Twins are characterised by warm tones of sandy beige and orange. Timber Hearth is very Earth-like in its colour palette with tones of lush green and blue. Brittle Hollow is a much deeper blue with bright white and icy blue on the poles, contrasted by a deep orange colour on the underside of the surface. The outer cloud layer of Giant's Deep is a murky green colour, and even under the clouds, the planet itself is characterised by broken colours of blue, grey and brown, whereas Dark Bramble is a rich brown colour with the remnants of the former fifth planet stuck to Dark Bramble being an icy combination of white and light blue.

The second category of texture is directly linked to the colour palette as well as to the different modes of materiality in the gameworld examined in the previous section. Similarly to colour, each planet has certain dominant textures. The Hourglass Twins are mostly covered in the texture of sand or smooth sand polished stone. Timber Hearth is mostly grass and vegetation with some water textures and mountainous stone textures. Brittle Hollow is, as its name suggests, covered in a brittle-looking stone texture that looks like it is cracking. The outer layer of Giant's Deep is covered in the texture of clouds while the inner layer is mostly covered in water. Lastly, Dark Bramble has an organic

texture, reminiscent of the roots of a tree, while the remnants of the fifth planet are made of snow and ice.

The third category of distinct features refers to the standout design elements that are present on every planet. On the Hourglass Twins, the standout element is the giant sand column that connects the two planets and transfers sand from the Ash Twin to the Ember Twin. Brittle Hollow has two distinguishing elements. First, the planet is bombarded by meteorites spewed by its own moon, which destroy the surface of the planet. Second, the planet is entirely hollow, and its centre houses a visually strange black hole that bends light in a manner that reflects its surroundings. Giant's Deep has a swarm of cyclones that circle the ocean surface of the planet. And lastly, Dark Bramble can be entered through the seed pod at the centre of the entity, which reveals a confusing hazy environment guarded by giant anglerfish. All these standout elements of the planets are not only part of the distinct designs of each environment but also integrated as central elements in the planet-specific gameplay mechanics, and as such, function as elements of the world-as-process, which will be examined in chapter 5.2.

The visual features of the planets make them very distinct to the point that fragments of the planets can be recognised even when they are encountered elsewhere. The most notable example of this is an environment that I have yet to mention, the Quantum Moon that wanders around the solar system. The Quantum Moon adopts the colour palettes, textures and distinctive features of whatever planet it is orbiting at the time, already demonstrating how these three visual features make the planets distinct and recognizable. Furthermore, the original location of the Quantum Moon is by the Eye of the universe. In this location, the Quantum Moon adopts the visual appearance of deep blues in a swirl pattern with inky blue rocks that have a distinct texture of spherical holes. This rock texture, in particular, is encountered repeatedly around the solar system in rock fragments (see Figure 2), and the distinct design of the colour palette and textures is used to indicate a connection to the Quantum Moon and the Eye of the Universe. This type of visual connection serves as an element of the knowledge gathering gameplay mechanics examined later in chapter 5.2.2.

Figure 2. *Example of the colour palette and textures at the Quantum Moon and a Quantum Moon fragment at the Observatory on Timber Hearth* (*Outer Wilds*, 2019)

Finally, the sensorial design of the solar system also includes the category of a distinct auditory design associated with each planet. While there are many sounds used universally throughout the solar system, which makes the overall soundscape of the game consistent and cohesive, each planet has certain distinctive sounds associated to them. I will first examine the world-internal sound design of the environments and then continue to the world-external music.

Each of the major environments have sounds that are specific to them and create the overall atmosphere of the environment. On the Hourglass Twins, the distinctive soundscape consists of the sound of falling sand. Timber Hearth is most notably characterised by the chirping of crickets. Brittle Hollow has a soundscape that consists of howling wind and the crackling explosions caused by the meteorites that episodically hit the surface of the planet. Lastly, Giant's Deep is a planet with perpetual rain, and as such, a stormy sound of rain and droplets hitting the helmet of the spacesuit is heard whenever outside on Giant's Deep.

Just like the visual features of the astronomical objects, the world-internal soundscape of the environments is also used as a feature of the gameplay in drawing connections between related places and objects. Continuing with the example of the Quantum Moon, not only is the Quantum Moon distinct through the visual mode but also auditorily. When listened to through the signalscope, the Quantum Moon emits a very specific ambient sound. This sound is also intercepted whenever pointing the signalscope at any of the Quantum Moon fragments found around the solar system. This

auditory feature can be used to navigate in the solar system to locate the quantum fragments that play a further role in the gameplay.

Proceeding to the final category of the sensorial design features, certain environments in the solar system also have world-external music. However, the music is less specific to planets and rather relates to certain environments on the planets, namely the Nomai structures that can be found around the solar system. I will examine the world-external music in relation to the Nomai in more detail in chapter 5.1.3. Here I will focus on the general trends regarding world-external music in the game. Namely, the world-external music can be divided into two general categories: the music associated with the Hearthians and Timber Hearth and the music associated with outer space.

Beginning with the music associated with the Hearthians, the first instance of world-external music in the game is the track called "Timber Hearth" (Phralow, 2019f) that begins playing in the village on Timber Hearth as the sun rises. The music is played in major key and has a positive and relaxing tone accomplished through the use of familiar acoustic instruments, most notably an acoustic guitar and a banjo. This music is very similar to the music that plays in the menus, making it the starting point of the game musically to which everything else is compared.

The music on Timber Hearth is in stark contrast to the music encountered in other locations around the solar system, which has a distinctly different feeling associated to it. It is more ominous and melancholic in tone, mostly played in minor key, and it is harder to distinguish which instruments are used to play it, making it sound unfamiliar and strange. The music is mostly played with a synthesizer, and it has a sound that could be categorized as synth wave, or in more ambient instances, as synthetic low fidelity music, which is characterised by elements that are usually considered to be imperfections in music, distortions of sound, discordance of notes and so on. Due to the synth wave and low fidelity qualities, the music creates a cosmic and unsettling atmosphere. Occasionally, these more unfamiliar features are accompanied by a piano in minor key, as for example on the track called "Nomai Ruins" (Phralow, 2019e) which adds a melancholic tone.

Overall, the world-external music used in the game creates a clear division between Timber Hearth and other. Timber Hearth is the familiar and relaxing environment musically while everything else is unsettling and strange. This dichotomy is highlighted even further in the instanced where the two opposing music styles mix. An example of this is the observatory on Timber Hearth. The observatory is an environment where the familiarity of Timber Hearth is combined with the unfamiliarity of space as the building is geared towards space research and also includes a museum of all the discoveries the Hearthians have made about the solar system. This duality of the familiar and the unfamiliar is

reflected in the world-external music used in the building. The track called "The Museum" (Phralow, 2019b) opens with a synthetic ambient sound that evokes a cosmic atmosphere, which is then joined by a banjo reminiscent of the other acoustic music heard on Timber Hearth.

Altogether, the four sensorially perceived categories that are used to build the visual and auditory design of the planets and other environments of the solar system are what provide the details to the topography of the gameworld. The spatial modality offers a general framework for the world-as-construct, the material modality fills it with substance that the player is able to interact with, and finally, the sensorial modality provides the details and the distinctive design of the world.

5.1.2 Temporal design

In the previous chapter, I left out temporality, which is the other half of the spatiotemporal modality (Elleström, 2021, p. 48). While I acknowledge that space and time are inherently linked in the real world as in the game, I have chosen to examine them separately since temporality plays such a prominent role in *Outer Wilds*. As a video game that centres time-loop mechanics and discovering information about an ancient civilisation, time functions as an important aspect of the world, both in the world-as-construct and the world-as-process (Roine, 2016).

The overall temporality of the game is divided into two halves based on how the temporality is conveyed. First, there is the present time temporality of the gameplay, which is primarily realised as direct perception on the first tier of the DIME model. The present time is perceived as a combination of world-external temporality, time passing in the real world, and the world-internal sensorial changes that can be perceived directly in the game. In contrast, the second half of the temporality, the past timeline of the Nomai, is conveyed almost exclusively through indirect interpretation via semiosis, and the realm of direct perception is missing altogether. I will begin this chapter with an examination of the present time temporality and then continue to the past timeline.

Direct perception of the present temporality

As mentioned above, the present time in *Outer Wilds* is conveyed through direct perception on the first tier, which combines world-internal sensorial information with world-external passing of time. This is a trait of the video game medium, meaning that the player doing things in the game, and sensorially perceiving themselves doing things, takes time in the real world. Therefore, video games

are a temporal medium according to Elleström's (2021, p. 48) media modalities, as opposed to media formats that lack the temporal mode such as traditional statues, for example.

However, in *Outer Wilds*, the temporality of the gameplay is highlighted even further compared to most video games due to the 22-minute time loop that the game functions around. Even if the player does absolutely nothing in the game, the gameworld keeps evolving temporally around them in a cycle of 22 minutes. The astral bodies keep orbiting the sun, and certain environmental changes will occur dependent on time passing both world-internally in the gameworld and world-externally in the real world. Brittle Hollow being bombarded with meteorites is as an example of the temporally evolving nature of the solar system. As time passes, more and more meteorites hit the surface of the planet, chunks of the surface falling inside the planet and into the black hole at its centre. This process is perceived directly through the visual mode of the sensorial modality.

Furthermore, in *Outer Wilds*, the world-internal and the world-external temporalities merge. The time loop lasts 22 minutes in both the gameworld and in real time. This merging is confirmed through indirect interpretation using the semiotic modality, which supports the aforementioned direct perception of temporality in the game. The game includes textual, that is symbolic, information that indicates that the time loop was the result of a Nomai project called the Ash Twin Project, which revolved around the function of sending memories and information back in time by 22 minutes as is stated in the following excerpt.

> Yarrow: "We're nearly ready to activate the Ash Twin project! Here is what will happen: First, the Sun Station will receive the order to fire at the sun, prompting it to explode. Using the energy from the resulting supernova, the Ash Twin Project will send the order for the Orbital Probe Cannon to fire back in time by 22 minutes. Exactly 22 minutes after these orders are received, the Sun Station will again trigger the supernova to send the probe data from this cannon launch back in time. In total, each cycle created by the Ash Twin Project will last precisely 22 minutes. We can end this cycle at will." (*Outer Wilds,* 2019*)*

The game also uses the interplay between the indirect world-internal textual information and the direct world-external temporality on more concrete level. There are certain places in the solar system where the player can find technology that counts time in real-time. For example, at the core of the Ash Twin, there is a textual log that shows dynamically the exact time left before the sun goes supernova. This number changes depending on how long the present time loop has been played, which reinforces the merging of the world-internal and world-external temporalities.

However, the world-internal and world-external temporalities do not necessarily merge absolutely in the game depending on which game options the player has enabled, and thus, the world-internal

world-as-construct can be impacted by the world-external world-as-process. On practical terms, the game includes a mechanism of freezing time whenever reading textual information, which can be activated or deactivated. When this option is activated, gameplay is made easier since the player has more time to accomplish things within a single time loop. However, consequently, the direct connection between world-internal and world-external temporality is partially lost as the 22-minutes of the loop will be longer in the world-external temporality depending on how much time has been spent reading.

Indirect interpretation of the past temporality

Proceeding to the past timeline of the game, this section of temporality is approached in a vastly different manner compared to the present time which is mainly perceived through direct perception. In contrast, the temporality of the past timeline is almost exclusively mediated through indirect interpretation via the semiotic modality on the second tier of DIME. All three modes of the semiotic modality – symbolic, iconic and indexical modes (Elleström, 2021, p. 51) – take part in producing the perception of the past in the game. Next, I will examine each mode and explain how it is used to convey time that is never directly perceived in the gameplay.

Regarding the symbolic mode, which concerns signs that represent their referent based on normative conventions (Elleström, 2021, p. 50), it is used in the temporality of the gameworld primarily through text. The majority of the textual information concerning the past timeline is in the form of dialogue between the Nomai. The dialogue pieces that can be found around the solar system make references to the particulars of the world, to places, members of the Nomai species, and events that had occurred or were occurring at the time of communication. The player must assemble these pieces together in order to gain a full understanding on the past timeline.

What makes the past timeline of the game even more challenging to perceive is that the timeline is not temporally situated in one contained stage. The Nomai disappeared from the solar system 281 042 years ago, which is stated in an information log found at the space station called the Sun Station. However, there are at least two distinctly different stages to the Nomai timeline with no clear indication to which of the two any given Nomai record belongs. Instead, the player must use indexical clues based on the names of the Nomai and which events they are associated with to deduce which stage in the Nomai history the recordings belong to.

The Nomai timeline in the solar system begins when the Nomai clan warps into the solar system. Upon entry, the Nomai ship gets caught in Dark Bramble, and the Nomai must use escape pods to evacuate. Each of the three escape pods that can be found on Brittle Hollow, the Ember Twin and inside Dark Bramble have records left by their crew including the names of these individual Nomai. Based on the names, the player can draw connections to when they have been mentioned elsewhere and in what way. For example, Annona is one of the Nomai who crashed to the Ember Twin, which is evident in him being present on the recording found by the escape pod on the Ember Twin.

> Annona: "We need status reports for all systems, but initial things first: Is everyone unharmed?"
>
> Rhus: "Our escape pod's passengers are afraid, but physically well, Annona; everyone survived the crash." (*Outer Wilds,* 2019)

A temporal connection from Annona to the later stage of the Nomai history can then be made based on a Nomai called Poke and the following statement.

> Poke: "I feel strange, trying to recreate Annona's warp core without him. At times it still feels strange to no longer be his (very young) apprentice, and for the Black Hole Forge to be in my care and not his. To have the chance to try is thrilling, but… I don't want to disappoint everyone. I think I can do this (probably), but what if excitement has clouded my assessment of my own abilities? Was I wrong in volunteering to build it…? I was born in this star system, and never saw Annona's warp core with my own three eyes. I only know what he taught me. What if I've bitten off a larger portion than I can consume?" (*Outer Wilds*, 2019)

The player can infer that Poke is of a later generation than Annona, since she was born in the solar system as opposed to arriving on the original ship. However, no more than a couple generations could have passed since Annona was still alive to be a mentor for Poke. Knowing this temporal relation between Annona and Poke reveals the overall timeline of the Nomai since Poke is on a recording that reveals the end of the Nomai civilisation. The recording inside the comet Interloper describes the moments just before the volatile ghost matter inside the comet exploded causing the extinction of the Nomai.

> Poke: "Pye, I don't think we want this matter interacting with us. As far as I can tell, direct contact with it would almost certainly be fatal."
>
> Pye: "I've never encountered anything like this casing, but it's all that's protecting us from what's inside. Worse still, this matter is disturbingly volatile."
>
> Poke: "…Pye. Whatever the matter inside this stone casing is, it's more than just profoundly unstable; it's under tonnes of pressure. Look at this density scan. I've never seen anything this tightly compacted before! What is this?"
>
> Pye: "This is orders of magnitude worse than I'd imagined. If this stone were to rupture, the lethal matter within would rapidly expand, completely blanketing this star system almost

> instantaneously. And the pressure is still building as the comet approaches this star system […] Return to the shuttle, right now! The rest of our friends need to know they're in terrible danger. Leave your equipment and run!" (*Outer Wilds*, 2019)

These types of deduction chains are necessary for the player to experience the past timeline of the game, and as such, they are a part of the working through of the world-as-construct, which Roine (2016, p. 25) refers to as the world-as-process. I will return to this aspect of the world-as-process in chapter 5.2.2 which focuses on the knowledge mechanics of the game.

The textual, or symbolic, clues about temporality are also supported by an assortment of indexical information, which is first perceived directly on the first tier through the sensorial modality, mainly through the visual mode, and then interpreted indirectly through the indexical mode of the semiotic modality (Elleström, 2021, p. 49). In practice, all Nomai environments in the game are indices for their former society, the ruins of the buildings and the skeletons littered around the environments being traces of the time when these environments were still intact and inhabited by the Nomai.

More specifically, the temporal modality of the past timeline is often expressed in the discrepancies between the environment perceived directly through the sensorial modality on the first tier and the indirectly interpreted semiotic textual information on the second tier. This interplay between the different channels of experiencing the gameworld function as indices for the events of the past timeline. For example, returning to the previous textual example, an earlier passage of the same recording includes Poke describing the environment: "The spherical stone casing here seems to be the source of the energy readings… No, rather, the source is what's within the stone. I'm detecting some form of exotic matter" (*Outer Wilds*, 2019). However, in the present time of the gameplay, the inside of the Interloper, perceived directly through the visual mode, does not reflect what Poke is describing textually. Instead of a stone casing, the cavern has a large green crystal-like rupture that visually resembles the crystals found around the solar system wherever there is ghost matter. Based on this discrepancy between the information provided by the visual and the symbolic modes, the player can conclude that the volatile rupture of the ghost matter inside the stone casing hypothesised by Poke and Pye on the previous recording has already taken place.

Lastly, the iconic mode is also present in forming the entirety of the perception of the past temporality. This occurs through visual media embedded into the gameworld as paintings and statues left behind by the Nomai, which depict events that have occurred in the past and otherwise describe the time of the Nomai. Just like with the indexical information, the embedded media are first perceived directly through the visual mode and then interpreted on the second tier through the iconic mode (Elleström,

2021, p. 49). For example, the arrival of the Nomai into the solar system is depicted visually in a three-part wall painting at the Old Settlement on Brittle Hollow. There are also paintings and statues that depict the Nomai themselves, which I will examine in more detail in the next chapter on the existent design. The section of the game that uses the iconic mode extensively is the DLC, in which almost all information on the past temporality of the space station called the Stranger is revealed in the iconic mode through slide reels that depict visually what happened in the past.

5.1.3 Existent design

So far, I have examined the physical landscape of the world-as-construct (Roine, 2016) of *Outer Wilds* as well as the temporal design. These aspects of the world-as-construct provide the overall framework for the world. However, a fictional world is also filled with things, or existents. In this chapter, I will focus specifically on the beings that inhabit the gameworld, namely the two species present in the main game: the Hearthians, the species of the main character, and the Nomai, the extinct species whose traces can be found around the solar system.

These two species are realised very differently in the game due to the duality of the temporal design examined in the previous chapter. The Hearthians exist in the present time of the gameplay, and thus, their design uses both direct and indirect means on the first and second tier of DIME. In contrast, the Nomai are an extinct species that, apart from one exception, is never encountered in the present time solar system. Therefore, similarly to how the past temporality of the game was shown to be conveyed in the previous chapter, the Nomai are almost exclusively perceived through indirect interpretation via the semiotic modality.

An added element of the existent design that has yet to be utilised extensively in the analysis of the world-as-construct is the third tier of the methodological model, the tier of ideas (Toikkanen, 2022b), which is evoked through the information provided by the other two tiers and the world-external extracommunicational domain of the perceiver (Elleström, 2021, p. 28). In this chapter, the third tier of the methodological model is used to complement the analysis on the existents, namely what kinds of ideas the previously mentioned direct and indirect means of perception evoke regarding the two species.

The Hearthians

I will begin this section by examining the Hearthians. The Hearthians are a bipedal species with blue skin, four eyes in two rows and large, pointed ears. The way the Hearthians are realised in the game incorporates the full spectrum of the possible tools a media product has at its disposal, from direct perception to indirect perception and interpretation to the realm of ideas. The manner in which the Hearthians are perceived is directly linked to the temporality of the game. Since the Hearthians exist in the present timeline of the gameplay, which is primarily perceived directly via the sensorial and temporal modalities, the Hearthians are also primarily perceived in this direct manner. The direct perception is also supported by semiotic information via indirect interpretation, and the combination of direct perception and indirect interpretation is used to elicit ideas about the species.

I will begin the analysis of the Hearthians with the overarching ideas that the game evokes about the species and then move backwards explaining how these ideas are elicited in the game through the first and second tiers of the methodological model. The two overall ideas, or the two defining qualities, of the species are as follows. The first overarching idea is that the Hearthians are a species that embodies a relaxed and even idyllically rustic lifestyle. The second central idea is that the Hearthians are a species whose society revolves around scientific development and space exploration in particular.

The first of the two central ideas stated above, the relaxed and idyllically rustic lifestyle, is primarily conveyed through direct perception on the first tier via the visual design of the species and their village on Timber Hearth. The clothing worn by the Hearthians shows a down-to-earth rural aesthetic with a lot of plaid, leather and patches (see Figure 3). Even the spacesuits worn by the explorers are in earthy colours of yellowish tan fabric and leather with a brassy metal helmet, reminiscent of antique diving suits. Likewise, the architecture of the Hearthian village has a complementary aesthetic of wooden textures and house styles that resemble cabins or treehouses in some cases. These world-internal aesthetic design choices, both in the Hearthians themselves and in their architecture, are world-externally associated with ideas of slow-paced and relaxed rural lifestyle.

Figure 3. *The Hearthian Marl on Timber Hearth and the explorer Gabbro on Giant's Deep* (*Outer Wilds*, 2019)

The visual design elements are also supported by the auditory design of Timber Hearth on the first tier of the methodological model, which combines both world-internal and world-external elements. As already mentioned in chapter 5.1.1, Timber Hearth and the village are characterised by the world-internal sound of crickets during the night, which evokes ideas about calm countryside. Furthermore, during the day, the village on Timber Hearth has relaxing, acoustic world-external music, the sound and tone of which is echoed world-internally in the music the Hearthians themselves play in the game. All the Hearthian explorers have a signature instrument – the banjo, the drums, the flute, the harmonica or whistling – which they can be seen and heard playing when encountered on the different planets. All these instruments are acoustic, reinforcing the qualities associated to the world-external music of Timber Hearth examined in chapter 5.1.1 on a world-internal level, evoking ideas of a relaxed and rustic country society.

The relaxed and carefree attitude of the direct sensorial design described above is also reaffirmed on the second tier of the methodological model, specifically through indirect interpretation via the semiotic modality. The dominant mode of semiosis is the symbolic mode through textual information provided by the dialogue. One of the most notable examples on the laid-back attitude of the species is how they talk about space travel. Apart from the Hearthian Riebeck on Brittle Hollow, who is characterised by a fear of space, all the Hearthians have a very carefree attitude towards space exploration, talking about it as an exciting adventure, closer to camping than dangerous travel in outer space. For example, the Hearthian called Slate demonstrates the carefree attitude by saying at the

beginning of the time loop: “Doesn’t matter if you go to the moon, Brittle Hollow or just the other side of Timber Hearth. It’s all the same to me. Get out there and have fun!” (*Outer Wilds*, 2019).

The association between space travel and camping is also reinforces through direct perception on the first tier via the visual design of the equipment used by the Hearthian explorers. All the explorers are encountered on the different planets at their campsites which include visual elements traditionally associated with camping. The campsites include camping gear like hammocks or sleeping bags, camping coffee pots and portable radios. Additionally, all the campsites are built around or near a campfire that the player can use to roast marshmallows, inviting the gameplay, or the world-as-process, to participate in building the characterisation of the Hearthians in the world-as-construct. Thus, the direct perception of the world-internal visual features associated with the Hearthians connect the species to world-external knowledge about camping gear, which results in the idea of an analogy between camping and space travel.

The relaxed attitude towards space exploration brings us to the other central idea related to the Hearthians: their drive for space research and exploration. This aspect of the species is likewise conveyed both as direct perception on the first tier through the sensorial modality and as indirect interpretation on the second tier through the semiotic modality. Beginning with the direct sensorial aspects, the scientific orientation of the species can be perceived visually in the village on Timber Hearth, as most of the village is reserved for activities adjacent to space exploration. For example, there is a huge observatory, the telescope being a visual representation of astronomy and other types of space research. The same building also houses a museum that showcases visual examples of the scientific findings the Hearthians have discovered so far, such as a diorama on the stages of a star dying.

The central position of the space program in the Hearthian village is also reinforced through indirect interpretation on the second tier, specifically in the symbolic textual design. For example, when speaking with the old Hearthian called Rutile in the village on Timber Hearth, they tell the player that they are worried about the scientific development causing explosions and other accidents in the village but that they are used to it by now.

> Main character: “Do you really worry that the space program will burn the village down?”
>
> Rutile: “Only constantly. You learn to live with it. You also learn to sleep with a bucket of water next to your bed, just in case.” (*Outer Wilds*, 2019)

Thus, the space program holds such a central position in the Hearthian society that the issues it sometimes causes are viewed as a normal part of daily life.

The level of scientific development of the Hearthians is somewhat contradictory when compared to humans, which can be perceived directly in the visual design of the technology developed by the Hearthians. They have a space program and spaceships that can be used to easily manoeuvre in the solar system, indicating a rather advanced mastery of science and technology. However, visually the equipment used by the Hearthians look quite outdated compared to the current level of technology in the real world. For example, as already mentioned, the spacesuits used by the Hearthians resemble antique diving suits more than modern space suits. Furthermore, the ship used to fly around the solar system is mostly made of wood, even on the outside, and the Hearthians still use recording devices such as tape recorders to leave messages.

In fact, the only pieces of technology that seem futuristic visually or in their gameplay function are the gravity crystals which create artificial gravity inside the ship and the warping technology in the little scout that allows the player to recall the scout instantly even at great distances. However, these pieces of technology can also be found in the Nomai environments, which is an indice for the technology being adopted from the Nomai. This connection is also confirmed symbolically via indirect interpretation by a piece of text found in the museum on Timber Hearth: "The Nomai technology brought back from space by our astronauts has been a great boon to Outer Wilds Ventures, allowing us to modify expedition gear in exiting and useful ways" (Outer Wilds, 2019). This connection to the Nomai brings us to the other species of the game. Next, I will examine how the Nomai are actualised in the game and how their depiction contrasts with the Hearthians.

The Nomai

The Nomai are depicted very differently from the Hearthians, primarily due to the difference in the modalities and the tiers of media engagement that are used to actualise them, since the Nomai are a part of the past temporality that is not perceived directly in the game. Whereas the depiction of the Hearthians utilises all modalities on all tiers of the methodological model, the Nomai are almost exclusively actualised through indirect interpretation on the second tier and ideas on the third tier evoked by the second-tier input. However, the depiction of the Nomai is nonetheless robust, utilising all three modes of the semiotic modality, the symbolic, the iconic and the indexical (Elleström, 2016, p. 49), in a similar manner to how the past temporality is mediated, as was shown in chapter 5.1.2.

Beginning with the outward appearance of the Nomai, as opposed to the Hearthians, their appearance is conveyed via indirect interpretation on the second tier through the iconic mode. The gameworld includes embedded media such as paintings and statues that depict the Nomai, which iconically represent them through visual similarity between the actual referents, the Nomai, and the depictions. These iconic representations are proven to be accurate in different ways. The space suited depictions are proven accurate once the player encounters the referent of the paintings, the sole living Nomai left in the solar system called Solanum, who can be directly perceived through the sensorial modality (see Figure 4).

Figure 4. *Painting depicting the Nomai in spacesuits, found at the Tower of Quantum Knowledge, and the Nomai Solanum encountered on the Quantum Moon* (*Outer Wilds*, 2019)

However, the paintings and statues that depict the Nomai without the space suits, particularly without the helmet, are confirmed indirectly, through the indexical and symbolic modes. Overall, the visual design of the Nomai depicted in the embedded media shows them as humanoid, bipedal beings with antler-like horns, three eyes and covered in white fur (see Figure 5). Beginning with indexical confirmation, the skeletons of the Nomai can be found around the solar system and these skeletons have antlers and three eye sockets, confirming that these features seen in the embedded media are accurate. The physical features of the Nomai are also confirmed textually by the Nomai themselves, for example when the Nomai Poke says in a recording: "I was born in this star system, and never saw Annona's warp core with *my own three eyes*" (*Outer Wilds*, 2019, emphasis added).

Figure 5. *A Nomai statue at the Observatory on Timber Hearth and a painting of a Nomai found at the Sun Station* (*Outer Wilds*, 2019)

The indexical and symbolic modes bring us to what can be learned about the Nomai apart from their outward appearance. Similarly to the Hearthians, the game assigns certain central ideas or qualities to the Nomai species. The first of these is the scientific and exploration-oriented nature of the Nomai society. This idea is evoked through a combination of indirect interpretation via the semiotic modes of indexical and symbolic modes. For example, it can be discerned indexically that the Nomai were technologically advanced enough to inhabit the entire solar system as the ruins of their cities and structures can be found all over the solar system. Through textual, or symbolic, information, the trajectory of the Nomai civilisation in the solar system can be specified even further. For instance, on Brittle Hollow, the order of settlement on the planet can be identified through the textual names of the structures. The name "Old Settlement" indicates that this part of the planet was inhabited first, and the larger and more elaborate "Hanging City" was built later once the Nomai had gained more resources.

The scientific prowess of the Nomai species can also be deduced indexically through the visual design of the equipment and technology the Nomai have left behind. For example, when comparing the Hearthian spaceships to the Nomai spaceships (see Figure 6), it is evident that the Nomai functioned on a different technological level to the Hearthians. Whereas the Hearthian ship has parts like jet engines and fuel tanks, parts that are familiar to the player based on their world-external knowledge of human technology, the Nomai ship has none of these recognizable parts. Furthermore, the Nomai technology also includes futuristic elements such as force fields and gravity crystals. The unfamiliarity of the visual design of the technology is an indice for the futuristic and alien technology the Nomai possessed.

Figure 6. *A Nomai spaceship found at the Quantum Moon and the flyable Hearthian spaceship* (*Outer Wilds*, 2019)

However, the futuristic and scientifically oriented idea about the Nomai is also balanced by characteristics that build the idea of the species as psychologically human-like, which makes the species relatable not only to the player but also to the Hearthians within the gameworld. This is accomplished mainly though indirect interpretation on the second tier, namely through the symbolic mode via textual information.

First, the Nomai use a lot of humor in their communications. When a Nomai called Cycad is speaking about sealing the core of the Ash Twin, he uses a pun, which is noted humorously by the other Nomai.

> Cycad: "If they're sealing off all entrances, I hope they've planned a-core-dingly!"
> Oeno: "I thought you had forbidden you apprentice from making puns,
> Coleus: "How else would he improve." (*Outer Wilds*, 2019)

The Nomai are also shown to have familial and love relations amongst themselves. Several of the Nomai are indicated to be siblings with each other, and the recordings left by the original crashers show the deep love the Nomai are able to feel for one another: "We can hear the other escape pods' distress signals, which gives me hope. Foli, are you still here? I am unsure how to survive in this place without you. (I am unsure how to be me without you)" (*Outer Wilds*, 2019). These types of characteristics bridge the division between the three species, the Nomai, the Hearthians and the humans, making them all exist on an even playing field regarding the player's ability to empathise with them.

So far, I have examined information that pertains to the Nomai in the world-internal world-as-construct. However, there is also one prominent world-external element that impacts how the player perceives the Nomai, and particularly what kinds of ideas are evoked about them on the third tier of the methodological model. As already mentioned in chapter 5.1.1, most Nomai environments in the solar system have world-external music which has a strange and cosmic sound due to the use of the synthesizer and ambient discordant notes. While the communications and records left by the Nomai are often light in tone and show the hope and humanity the species had, the world-external music reminds the player of the inherent idea of melancholia that is a part of the overall concept of the Nomai species.

For example, the track named "The Sun Station" (Phralow, 2019d) comprises of synthesizer sounds and discordant notes that are present in most of the music associated with outer space. However, the song is played in a very slow pace and in minor key, which makes the track have a melancholic atmosphere. Another example that illustrates the more ominous aspects of the Nomai species is a track called "The Search" (Phralow, 2019c), which plays in the Southern Observatory on Brittle Hollow. This track has the same synthetic foundation as the previously mentioned track, but the rhythm is much faster and the tone has more tension, which creates a pressing and ominous atmosphere. The track also includes a piano in minor key, providing the melancholic feeling that is present in most of the tracks used in Nomai environments. Overall, the track simultaneously expresses the idea of urgency felt by the Nomai when searching for the Eye of the universe, which is the purpose of the Southern Observatory, and conveys the tension in the narrative of the Nomai that is caused by the knowledge of their inevitable extinction.

5.1.4 Ideas about the world-as-construct

So far in my analysis, I have mainly focused on the first two tiers of the DIME model, the direct perception via direct sensorial, material and spatiotemporal input and the indirect representation of them either through indirect perception via one of the aforementioned modalities or through indirect interpretation via the semiotic modality. However, this leaves out the third tier of the model, ideas, adopted from Toikkanen (2022a/2022b). In the previous section, I used the third tier in the analysis of the existents of the game. In this section, I will examine the larger ideas about the entire world-as-constructs of *Outer Wilds,* and how the aspects of the game that I have presented in the previous analysis chapters participate in evoking ideas about the world.

The central idea that is evoked in *Outer Wilds* and participates in how the player experiences the world-as-construct is a juxtaposition between ideas about familiarity, which include secondary characteristics like safety and normality, and ideas about unfamiliarity, which include characteristics such as danger, mystery and fascination. These opposing ideas are realised in the game through the third tier of the methodological model which refers to ideas evoked by Elleström's (2021) four modalities – sensorial, material, spatiotemporal or semiotic modalities – either directly or indirectly. These ideas are also evoked both world-internally and world-externally, as well as in a combination of the two perspectives.

I will begin examining the juxtaposition through the lens of the world-external perspective as it is perceived even before playing the game simply by observing the promotional materials, namely the title of the game and the logo design of the title. Starting with the meaning of the title itself, the title *Outer Wilds* exhibits the duality between the familiar and the unfamiliar through the secondary characteristics of natural and cosmic, which are evoked by the symbolic meaning of the words. The word *outer* is often encountered in the compound word *outer space*, and as such it carries a connotation of unfamiliarity on a cosmic level. It is an environment that is so unfamiliar that most humans never experience it directly. Outer space as a concept also carries a connotation of danger since it is an environment that cannot support human life. In contrast, the second part of the title, *wilds*, is a word that is anchored to the planet Earth, and therefore, it is automatically more familiar. Furthermore, the word *wilds* refers to nature, and while nature can certainly include danger, nature and forests in particular are also associated with relaxation and tranquillity, which translate to safety.

These textually and symbolically based associations of the title are also reinforced indirectly through the iconic mode in the visual design of the logo (see in Figure 7).

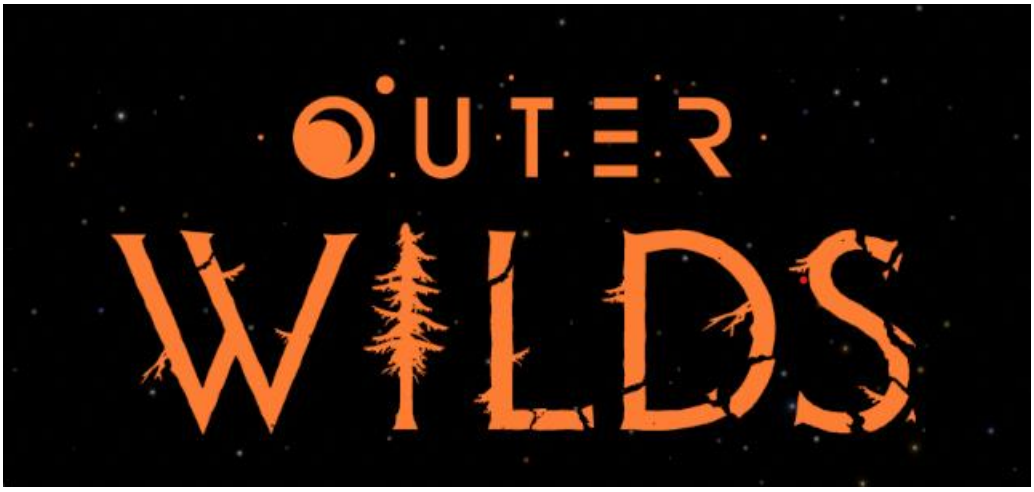

Figure 7. *The title and logo of Outer Wilds (2019)*

The logo design shows the word *outer* in a font that is very minimalistic, even missing some lines in the letters, which gives it a minimalistic and futuristic impression. Furthermore, the letter *o* is stylised to iconically represent a planet with a small moon. The minimalistic cosmic design is contrasted with a more organic design on the word *wilds*, which in addition to the iconic mode also indirectly utilises the material modality and the division between organic and inorganic modes mediated visually. The letters are cracked, emulating cracked stone, and the letters are also sprouting branches, emulating the familiar materialities encountered on Earth. Furthermore, the letter *i* is shaped like a pine tree, iconically evoking the idea of a forest. Overall, these organic elements of the design produce an idea of the familiar naturalness of earth in contrast to unfamiliar and cosmic futurism.

As already mentioned, the world-external initial characterisation of the game through a contrast between familiarity and unfamiliarity is also present in the world-internal design of the world-as-construct. World-internally, the juxtaposition is created mainly through the topographical and existent designs examined in chapters 5.1.1 and 5.1.3. These design elements of the world-as-construct utilise primarily the experiential sensorial, material and spatiotemporal modalities through direct and indirect perception. In this chapter, I will further elaborate on how these design elements of the game are used to produce an overall idea about the world-as-construct on the third tier. I will begin the analysis by examining the familiar and then proceed to the unfamiliar elements.

In *Outer Wilds*, the words familiar and safe are near synonymous with the Hearthians and Timber Hearth. First, Timber Hearth resembles Earth sensorially in its colour palette and textures, as was discussed in chapter 5.1.1. Furthermore, in the solar system of *Outer Wilds,* Timber Hearth is the closest match to Earth in materiality and the distribution of the different modes of the material

modality, namely solid soil with vegetation and liquid water, which makes it feel very familiar and safe, especially in contrast to the strangeness of the other planets. In this way, the world-internal sensorial and material modalities are used in conjunction with the world-external knowledge of our own environment to evoke ideas about familiarity and safety.

Even the name of the planet, Timber Hearth, creates an association to familiarity and safety through indirect interpretation via the semiotic modality. The word *timber* refers to the forested nature of the planet, forests being environments commonly associated with natural and relaxing qualities. Moreover, the word *hearth* evokes an association to safety, as a hearth is traditionally viewed as the heart of a home. In the past, it was what kept the house warm and enabled cooking, thus making the house habitable. Therefore, the word *hearth* in the planet's name evokes an association to a home; Timber Hearth is the home in the solar system.

The existent design of the Hearthians and their society described in chapter 5.1.3 also support this association with familiarity and safety. The Hearthians embody the idea of better times of the past. As was examined in the previous chapter, the depiction of the Hearthians evokes ideas of rustic and even idyllic life. More specifically, the Hearthian society elicits an idea of a rustic and idyllic past. Particularly the technology of the Hearthians has an outdated appearance, and this outdatedness in combination with the relaxed atmosphere of the Hearthian society and the Hearthians' carefree attitude towards life creates an idealised image of a past time when the pace of life was slower and life less complicated.

In contrast to the Hearthians and Timber Hearth, the rest of the solar system is depicted as strange and threatening. For example, the other planets have specific gameplay features that can kill the player, being crushed by rising sand on the Ember Twin or being hit by a meteor on Brittle Hollow, which are entirely missing on Timber Hearth. Furthermore, the standout features of the other planets discussed in chapter 5.1.1 make them appear very strange in comparison to Timber Hearth, or by proxy to Earth. Some of the astronomical objects also have characteristic that evoke ideas of the sublime, an aesthetic concept theorised in the eighteenth century by Edmund Burke (1990) that incites feelings of terror and awe-struck astonishment. For example, Dark Bramble has several qualities of the sublime in its level design, most notably the characteristics of obscurity, vastness and infinity.

The characteristic of obscurity (Burke, 1990, p. 45) in Dark Bramble is created by the haze inside that is perceived directly on the first tier through the visual mode. The haze keeps the player from being able to perceive the entire environment, highlighting the fear of the unknown. Obscurity is also present in the sound design of Dark Bramble. The inside of Dark Bramble has a world-external

ambient music, titled "Dark Bramble" (Phralow, 2019a), that incorporates the synthetic and cosmic elements common in the world-external music encountered in outer space in the game. The lack of recognisable instruments and consistent melody in the ambient music evokes a type of musical obscurity that supports the sublime effect of the environment.

The sublime qualities of vastness and infinity (Burke, 1990, pp. 66–67) relate to the modality of spatiality and the space-bending characteristics of Dark Bramble, and they are perceived through indirect perception of the spatial modality as described in chapter 5.1.1. When looked at from space, the seed pod at the core of Dark Bramble does not look very large. However, once inside, the environment is revealed to be infinitely larger. In addition to the aforementioned sensorially mediated spatial modality of Dark Bramble, the unnatural infiniteness is also noted symbolically through indirect interpretation by a Nomai recording found near the Nomai escape pod inside Dark Bramble.

> It's almost too faint to hear now, but the Vessel's beacon is still faintly emitting from within this thorny seed. Yet the opening is too small for even a single Nomai to fit through it, so our escape pod couldn't have flown through here. I don't understand how this could be possible, but this gruesome place seems able to *manipulate space itself* […] (*Outer Wilds*, 2019, emphasis added)

Another juxtaposition that utilises the concept of the sublime to deliver a central idea on the world-as-construct of the game is the juxtaposition of scale. The game plays with spatial scale, juxtaposing the ridiculously small and the cosmically gigantic. As already mentioned in chapter 5.1.1, the solar system in *Outer Wilds* is incredibly small in comparison to our real solar system, which is conveyed numerically. This numeric indication in combination with the spatiality perceived indirectly in the combination of world-internal sensorial information and the world-external ability to move within the gameworld and how quickly the player is able to travel from planet to planet makes the solar system feel quite comfortable and cozy, harkening back to the ideas of familiarity and safety.

This smallness of scale is contrasted with the cosmically large. The overall spatiality of the game does not only include the smallness of the solar system but contrasts it with the infiniteness of space, which is conveyed in how the player is able to exit the solar system and enter endless flight in empty space, as was described in chapter 5.1.1. The player is also confronted with events on such a cosmic scale that they enter the realm of the sublime. The supernova that ends each time loop is a prime example of a sublime event, according to Burke's theory. It is terrifying and powerful (Burke, 1990, p. 53, 59), destroying everything the player has interacted with throughout the game, both living and not. It is vast (p. 66), encompassing spatially the entirety of the environment the player has existed in, and it is also sudden (p. 76), the sun going from its normal visual state to supernova in only 22

minutes, the final stage occurring in mere minutes. And finally, the supernova also utilises the quality of overpowering light (Burke, 1990, p. 73) in the evocation of a sublime experience. When the sun goes supernova, an intensely bright blueish light advances from the centre of the solar system outwards, and when it reaches the player, the light overpowers all other visuals before the player dies.

However, even the sublime supernova is made small in comparison to the ending of the game. The ending shows not just the solar system of the game but all the star systems and galaxies of the universe dying, taking the scale to an infinitely (Burke, 1990, p. 67) larger scale. The final conclusion of the game shows the universe dying and killing all that the player has come to know and love about the world-as-construct, only for a new Big Bang to occur and the universe be reborn, beginning a new cycle.

The concrete building blocks of these juxtapositions, the sensorial, spatial, material and semiotic elements that are used to build the gameworld, function as materialisations of the more abstract thought experiment of the game, the aspect of speculative fiction that the world-as-construct and the world-as-process aim to communicate to the player (Roine, 2016). The familiarity and the small scale are used to anchor the player into the world and make it feel comfortable which is then compromised by the cosmic and sublime elements that, especially in contrast to the familiarity and smallness of scale, make the player feel incredibly small in the face of the cosmic sublime.

This is all part of the narrative of the game which shows the main character, and the player by proxy, being unable to save the solar system or the entire universe. The player is a part of making the cycle continue, creating a new universe, which is communicated to the player by the Nomai Solanum at the end of the game: “All that remains is to collapse the innumerable possibilities before us. It’s tempting to linger in this moment, while every possibility still exists. But unless they are collapsed by an observer, they will never be more than possibilities” (*Outer Wilds*, 2019). However, the player cannot make the cycle stop and save what is dear to them personally in the game. All they can do is be part of the process and allow the universe to follow its natural cycle, recognizing that they are just an infinitely small individual compared to the cosmic proportions of the entire universe. In this way, the game subverts the world-external expectation associated with speculative fiction as a genre that the hero is special and meant to save the world.

Thus, the larger thought experiment of the game, the central idea – what if you were a space explorer in a solar system that is destroyed every 22 minutes due to being stuck in a time loop right at the end of the universe – is realised in the game through the design elements of the world-as-construct which is built using the different modalities either directly on the first tier or indirectly on the second tier of

the DIME model. This thought experiment is brought to the player to be experienced through the world-as-process, which in creates the aesthetic product of the game by slowing down the perception of the central idea. In the next chapter of this thesis, I will proceed to examining how the world-as-process functions and permits the perception of the full world-as-construct.

5.2 World-as-process

The previous chapters have focused on the basic model of the world in *Outer Wilds*, the world-as-construct in Roine's (2016) terminology. However, this construct does not yet tell us anything about how the model is made available for the player to be experienced. This is the other half of Roine's theory of speculative worldbuilding, the world-as-process. In the following chapters, I will be examining how *Outer Wilds* makes the player work through the model of the world. As a video game, this active participation occurs primarily through the gameplay. This chapter is divided into four subchapters that relate to different aspects of the world-as-process. These aspects are recentring into the world, the knowledge mechanics, the environmental puzzles and the overall ideas evoked about the world-as-process.

5.2.1 Recentring into the fictional world

To examine the world-as-process of *Outer Wilds*, we must first establish how the topography, that is the physical layout of the world, is made available for experience. To explain this, I will be using the concept of recentring from Marie-Laure Ryan (1991, p. 22). As explained in chapter 3.1, Ryan states that for a perceiver to be immersed into a fictional world, the perceiver must recentre themselves into the world and for the time being believe that it is the actual world. This is a concept that Roine (2016, p. 41) rejects, as it disregards the world-external aspects of worldbuilding.

I argue that recentring can never occur absolutely, as the world-external aspects of a piece of fiction are always present in some capacity, as has already been shown in the analysis of the world-as-construct. However, recentring is nonetheless a tool that can be used as a part of the world-as-process to anchor the perceiver into the topography of the fictional world, which becomes evident in the following chapters that analyse how *Outer Wilds* draws the player into the gameworld and makes the topography available to be experienced facilitating the gameplay.

The primary method of recentring used in *Outer Wilds* is the first-person perspective of the gameplay. What this means is that everything described in chapter 5.1, the topography, the temporal design and the existents of the solar system, are perceived by the player through first-person perspective that positions the player as the main character. The perspective is realised primarily through direct sensorial perception on the first tier of the methodological model. Through the visual mode, the player sees only what is in the field of vision of the main character. The connection between the player's field of vision on screen to the world-internal experience of the main character is made particularly clear when equipping the spacesuit. The game shows visually how the helmet descends to obstruct the field of vision of the main character, and afterwards the corners of the screen are blacked out to emulate the limited field of vision from within a helmet (see Figure 8). Furthermore, another element of the game that foregrounds the first-person perspective is whenever the main character closes their eyes, namely when dying or dozing off by a campfire. The screen will go black in three horizontal panels, emulating what closing one's eyes looks like when you have four eyes in two rows as is the case with the Hearthian species.

Figure 8. *Example of the limited field of vision through the helmet and raindrops hitting the visor of the helmet on Giant's Deep* (*Outer Wilds*, 2019)

The direct visual dimension of the first-person perspective is also present in more subtle aspects of the game, namely in certain dynamic visual elements that depend on the positioning of the player, once again bringing the experience back to the interaction between the world-internal sensorial input and the world-external materiality of the controller. An example of this kind of dynamic visual is the

rain on Giant's Deep. Whenever outside on Giant's Deep, the perpetual rain will not only be seen pelting the environment but also the player themselves, which is conveyed through the visual of rain drops hitting the visor of the helmet (see Figure 8). When in a covered area, the visual effect ceases, the rain droplets drying and disappearing from the visor. This type of dynamic sensorial perception also extends to the auditory mode as was already discussed in chapter 5.1.1. Certain environmental sounds that have a contained source will sound louder whenever approached. Likewise, these sounds will fade away when gaining distance. This interactivity of the soundscape further reinforces the experience of inhabiting the body of the main character and existing within the fictional world.

In addition to the visual and auditory modes that are perceived directly in the game, *Outer Wilds* also utilises other sensorial modes through indirect perception and indirect interpretation on the second tier of the DIME model to reinforce the feeling of existing within the gameworld. These sensorial modes are proprioception and interoception, which refer to the sense of the positioning of the body and the sense of the internal functions of the body (Elleström, 2021, p. 49). Neither of these sensorial modes can be perceived directly through a screen and therefore the game has to use indirect means to achieve the effect. In *Outer Wilds*, this is accomplished world-internally through the visual and auditory modes as well as the semiotic modality in some instances, and world-externally through how the sensorial modality is linked to the materiality of using the controller.

The primary aspect of proprioception that is present in the game is the impact of gravity on the player. This is expressed precisely through the interplay between the world-internal sensorial information on screen and the world-external use of the controller, which indirectly emulate the sense of proprioception. The different environments in the game have different levels of gravity, ranging from complete weightlessness of space to the relatively strong gravitational pull of Giant's Deep, with Timber Hearth functioning as the point-of-reference, since its gravity is comparable to Earth. In strong gravity, the material actions taken world-externally have a much weaker effect on the world-internal visuals and audio. Likewise, in weak gravity, the impact world-internally is much more drastic. The absolute extreme of no gravity at all in the weightlessness of space is evoked through the infinite world-internal visual continuation of any movement performed world-externally. The main character continues to move and accelerate indefinitely unless the initial propulsion is counteracted by propulsion in another direction.

Proceeding to interoception and how the game anchors the player into the body of the main character, to convince the player that their actions have an impact on an actual being whose body they are inhabiting, the game needs to create an illusion that the player is in fact inhabiting a living being. The primary mode through which the indirect perception of interoception is achieved in the game is the

auditory mode. Breathing is a constant sound in the game. Whenever the player is wearing a spacesuit, the sound design includes the sound of breathing distorted by an oxygen mask. When oxygen begins to run low, the sound of breathing becomes more laboured until eventually the sound of gasping is heard, and the player dies of suffocation. This continuous element of the auditory design anchors the player into the body of the main character.

Another aspect of interoception that is present in the game is the feeling of bodily pain. This is also perceived indirectly on the second tier of the model through the sensorial modality, both visual and auditory modes. Whenever colliding with something, the screen flashes white, emulating the effect of vision blacking out with intense pain. The impact will also make a crashing sound, the strength of which depends on the intensity of the collision, and a ringing sound can be heard, emulating the effects of head injury. Similar effects are also associated with other pain inducing events in the game. For example, when being electrocuted in the DLC, the screen shows a lightning effect, and the player hears an electric zap. The equipment, namely the spacesuit, are also used visually to reinforce that something harmful has occurred. In both cases, the UI of the suit flickers for a while before coming back to life to indicate that the suit has taken some damage as well.

Both proprioception and interoception are also reinforced semiotically through indirect interpretation on the second tier. *Outer Wilds* has an assortment of meters that indicate different things about the player in relation to the environment and their bodily functions. For proprioception, there is a numeric, that is symbolic, indicator for how strong the gravitation is as well as an iconic image that dynamically shows the orientation of the player in relation to the ground. As for interoception, the upper left corner of the screen has several meters including a health meter. The health meter is an iconic image of a body that will become redder the more damage the player takes (see Figure 9). The colour red functions as a symbol for pain, as is common practice in visual media overall. Once enough damage has been taken, the spacesuit also gives a symbolic indication through text, either “vitals low” or “vitals critical” (*Outer Wilds*, 2019) depending on the gravity of the damage.

Figure 9. *The oxygen and fuel meters as well as the health meter when substantial damage has been taken* (*Outer Wilds*, 2019)

Finally, moving on from the sensorial methods of recentring, I will briefly examine the central gameplay element of the game, the knowledge-gathering mechanics, which functions mainly through indirect interpretation via the semiotic modality. This aspect of the game will be examined in more detail in the next chapter. However, here I will focus specifically on the overall impact of the game mechanics from the perspective of recentring.

Generally, the knowledge mechanics of the game can be qualified as a tool of psychological participation. Walton (1990, p. 252) defines psychological participation as "mental lives we lead in the worlds of games and make-believe." In short, psychological participation refers to the mental processes directed at the fictional world that an audience member goes through when engaging with fiction, for example emotions towards events and characters of a story. I argue that the knowledge mechanics in *Outer Wilds* can likewise be classified as psychological participation since the cognitive processes of acquiring information in the game and piecing it together uses the actual cognitive abilities of the player even though the process is directed at fictional information.

Furthermore, the cognitive process that the player goes through is functionally the same as that which the main character of the game experiences, which bridges the gap between the world-external player and the world-internal main character. To elaborate, I will use an example of another type of gameplay mechanics common in video games as comparison: combat. Combat mechanics are a prime example of gameplay where the world-internal and the world-external perspectives do not match. While the video game character is performing combat moves, the player is pressing buttons, which are two very different actions. In contrast, the knowledge mechanics in *Outer Wilds* have the player and the main

character perform a near identical process: reading, absorbing information and making connections, or put more concisely, the interpretive process of signification involved in semiosis (Elleström, 2021). This bridges the gap between world-internal and world-external functions, anchoring the player into their character, and consequently, recentring them to the gameworld.

The knowledge mechanics bring us to the next chapter of this thesis. In the following chapters, I will examine the central game mechanics of *Outer Wilds*, specifically from the perspective of how they are used to make the world-as-construct available to be experienced, and also how these mechanics impact the process of perception and specifically slow it down. I begin by analysing the aforementioned knowledge mechanics and then continue to the puzzle elements of the game.

5.2.2 Knowledge Mechanics

As was already established in the previous chapter, the central gameplay mechanics of *Outer Wilds* consist of exploring the world of the game and gathering knowledge from the different astronomical objects and structures in the solar system. However, gathering knowledge and particularly connecting different pieces of information together is made quite challenging in the game due to the non-linear nature of the gameplay and the way information is scattered around the solar system in small pieces. In this chapter, I will examine how the knowledge mechanics function in the game. The knowledge that the player collects in the game primarily relates to the past timeline of the Nomai and as such it is mainly conveyed through indirect interpretation of the semiotic modality on the second tier of the methodological model, as discussed in chapters 5.1.2 and 5.1.3. The primary mode used is the symbolic mode, through textual information, but the iconic and indexical modes (Elleström, 2021, p. 49) are also utilised to support the textual information.

The main challenge of the knowledge mechanics in *Outer Wilds* is the non-linearity of receiving information. Since the player can approach the solar system in any order they wish, they will also find pieces of information in a random order, and there is very little preordained structure to the information that would help the player understand the full world-as-construct that is built through the information. This can result in difficulties in understanding the information that has been found. Nomai communications mention places, people and events that have yet to be explained to the player, and as such, they are symbolic signs whose referent the player has not yet uncovered. Often only after finding the missing piece of information does the rest make sense. An added challenge is also created

by the fact that information is sometimes provided in multiple different modes. As already mentioned, pieces of information are primarily textual, but they might also be in an iconic or indexical form.

As an example of the way different semiotic modes are combined in the process of deciphering the full world-as-construct of the game and being able to advance to the ending, I present the following trilogy of paintings on Figure 10, which can be found in the Old Settlement on Brittle Hollow. Next, I will elaborate on the process of interpretation required to understand what the paintings convey about the world-as-construct.

Figure 10. *Wall paintings found in the Old Settlement on Brittle Hollow (Outer Wilds, 2019)*

The paintings depict how the Nomai first arrive to the solar system. Purely based on the iconic information available, the player might be able to interpret some of what is being depicted correctly. The player likely has not yet encountered the Vessel, the spaceship in the image, as it is located deep inside Dark Bramble, and thus they are missing the referent for the icon in the painting. However, the iconic image is very recognizably a spaceship, based on common world-external ideas about what an alien spaceship looks like. The player might also recognise the thorny rootlike shape in the second and third images as Dark Bramble even if the player has yet to visit it directly, since traces, or indices, of Dark Bramble can be encountered around the solar system in a similar manner to how fragments of the Quantum Moon are recognisable even within different environments due to their unique sensorial features, as was examined in chapter 5.1.1. And lastly, the three small icons that are shown leaving the big spaceship in the third image should be recognizable since the referent for one of them is located right above the Old Settlement where the mural is found, and it houses textual, or symbolic, records that identify it as a Nomai escape pod. However, the specific narrative conveyed in the images is left rather vague purely based on the iconic information described above.

The images are further specified through symbolic textual information that can likewise be found in the Old Settlement. In the same room, a text wall identifies the star-like icon of the first image as the Eye of the universe by showing the same icon as in the mural and stating the following.

> Thatch: "This knowledge is too dear to lose: Here is everything we can recall about the signal we encountered while aboard the Vessel."
>
> Filix: "The signal looked like an eye: round with a circle at the center much like a pupil. (Suppose the signal was looking for something.)"
>
> Filix: "The signal was older than the universe itself! This is the most significant detail."
>
> Plume: "No Nomai clan has ever encountered anything like it! How can anything in this universe be older than the universe itself?"
>
> Thatch: "Imagine what rare and profound knowledge it might offer. We must find this Eye of the universe." (*Outer Wilds*, 2019)

Another text found on a cliff wall in one of the buildings in the Old Settlement states: "We're here because the Eye's signal called to us and we followed" (*Outer Wilds*, 2019). Based on this added symbolic information, the player should be able to deduce that the images depict the Nomai intercepting the signal from the Eye, somehow getting caught in Dark Bramble and sending out escape pods, one of which never made it out of Dark Bramble as is evident in it hitting a dead end in the third image. However, often all the related information is not located in such close proximity and instead might be found on entirely different planets, which can make the process of interpretation more challenging.

The final aid in piecing together information in the game comes in the form of the ship log. The ship log presents information that has been collected in two forms. The map mode shows information structured around where it is was found, whereas the rumour mode shows a mind map that provides additional information by grouping and colour coding related information together and using arrows to illustrate connections between pieces of information (see Figure 11). Even without the addition of the iconic and indexical information, the ship log can sometimes provide interpretations on iconic information that the player might not have realised themselves. This is how most of the information in the DLC functions as the DLC has close to zero textual information in the environments themselves. The main game occasionally utilises this function as well. For instance, in the former example, when looking up the second image in the ship log, the description gives a clearer image on what exactly is happening: "mural of Dark Bramble ensnaring the Nomai vessel" (*Outer Wilds*, 2019).

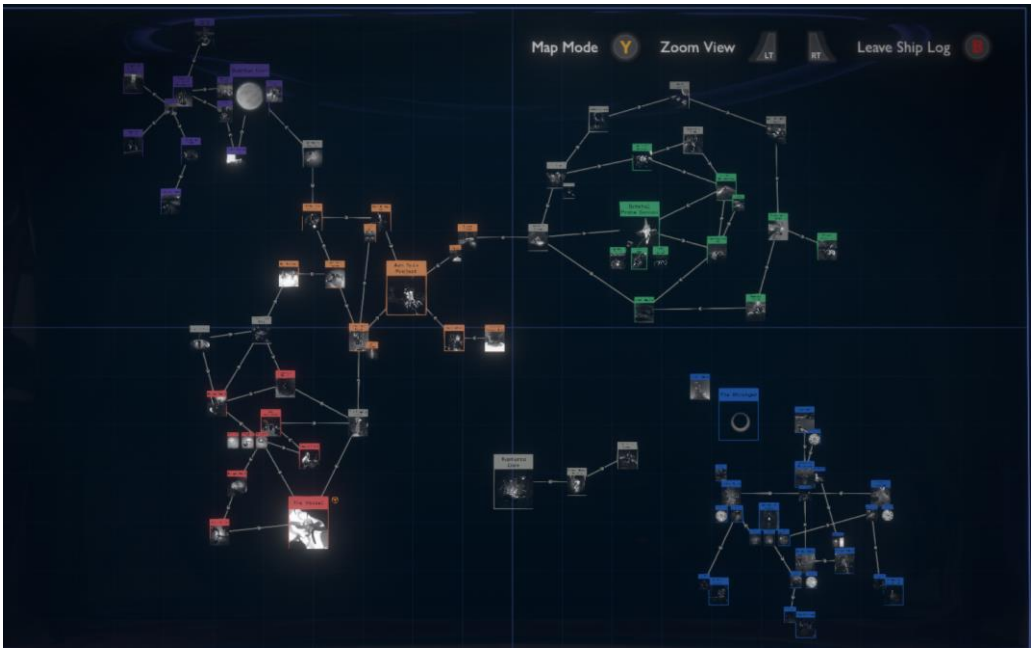

Figure 11. *The ship log in rumour mode* (*Outer Wilds*, 2019)

Overall, the process of the knowledge mechanics can be described as hermeneutic interpretation, which states that "one can understand a text (or any state of affairs) only by grasping in advance the relation of a specific part to the whole in which it belongs, even if one can only arrive at a sense of the whole by working through its parts" (Armstrong, 2013, p. 54). This is exactly what occurs in *Outer Wilds*. The player receives information in bits and pieces that they can only interpret through the wider context of the world-as-construct, but the world-as-construct becomes available for interpretation only through the individual pieces of information. The movement between the individual pieces of information and the wider context built from them is what creates the knowledge mechanics of the game and simultaneously makes the perception of the larger thought experiment slower, which is what Roine (2016, p. 47) refers to as *cognitive estrangement* in speculative fiction and specifies as one of the central aesthetic characteristics of speculative fiction and speculative worldbuilding.

5.2.2 Environmental Puzzles

The other half of the gameplay in *Outer Wilds* consists of solving different kinds of environmental puzzles to reach new areas of the world that hold more pieces of information. The game includes a variety of different types of puzzles that are all integrated into the environment, that is, into the world-

as-construct. The puzzles can overall be divided roughly into three categories. First, there are puzzles that require just navigating the indirect perception of the materiality and spatiotemporality of the world-as-construct. Second, there are puzzles that incorporate the first category but with the added requirement of using some of the gameplay equipment included in the game, which for the most part function through the direct perception of the sensorial modality. And third, there are puzzles that are incorporated more closely into the knowledge mechanics of the game and require indirect interpretation via the semiotic modality in addition to the spatiotemporal and material navigation. This semiotic information can be found somewhere in the gameworld, sometimes close to the puzzle itself and sometimes on an entirely different planet. Next, I will examine these three categories in more detail.

The first category includes two subcategories of puzzles. First, there are puzzles that concern just the materiality and spatiality of the world, and second, there are puzzles that also include the temporal mode, all of which are realised indirectly on the second tier of the methodological model as stated in chapter 5.1.1. An example of the first type are the gravity crystal puzzles that can be found in most Nomai environments, but they are perhaps the most prominent on Brittle Hollow. In order to reach an area of Brittle Hollow called the Southern Observatory, the player must navigate an upside-down route that is passable due to the gravitation crystals that shift gravity to the underside of the planet's surface. The only thing required to solve these puzzles is to manage the spatiality of the route and the material limitations of the terrain and the reach of the artificial gravity generated by the crystals. This type of navigation is accomplished in the interplay between the world-external material use of the controller and the visually realised indirect perception of the materiality and spatiality of the world-internal world-as-construct.

The second type of puzzle in the first category includes the added mode of temporality. This means that the puzzle can only be solved at specific points in time within the 22-minute time loop. A prime example of this type of puzzle is located on the comet called the Interloper that travels on an elliptical orbit around the sun. This puzzle is specifically spatiotemporal in its nature since in order to gain passage inside the comet, the comet itself must be on the section of its orbit that takes it right by the sun. The reason for this is that at any other temporal and spatial point, the entrance to the tunnels is blocked by the material obstruction of ice. When the timing is correct and the comet is close enough to the sun, the ice melts and reveals the passage inside the comet. This puzzle in particular showcases the interrelated nature of the spatiotemporal modality and how that connection is used in the gameplay.

The second category of puzzles includes puzzles that likewise require the indirect navigation of the material and spatiotemporal modalities of the world-as-construct but with the added element of having to use specific equipment to solve the puzzle. The two notable equipment are the signalscope, which functions around the directly perceived auditory mode of intercepting sound, and the scout, which has both a hand-held camera function and a launch option that allows the player to record visual footage from farther away. The scout also has a light feature, allowing the player to illuminate areas, which is utilized particularly in the puzzles of the DLC.

An example of the second category is the wide variety of different puzzles in the gameworld concerning ghost matter. These puzzles can be visually identified by the green crystals wherever there is ghost matter nearby and a symbolic textual indication from the spacesuit that states: "GHOST MATTER DETECTED" (*Outer Wilds*, 2019). However, ghost matter itself cannot be detected with the naked eye in the gameworld. Therefore, concerning the material modality, ghost matter could be likened to a colourless lethal gas. The only way of determining where exactly ghost matter is located is to use the camera function on the scout. On camera, ghost matter can be detected visually as a green haze reminiscent of the northern lights. Ghost matter is lethal and the puzzles function through the material block that this gameplay elicited materiality creates in the space. To solve these puzzles, the player must utilise the visual mode of the camera to identify which areas are safe to travel and which are not, once again through the interaction between the world-internal sensory input and the world-external materiality of the controller.

The third category of puzzles requires some sort of key piece of information found in the world, which is accessed through indirect interpretation of the semiotic modality, almost always in a symbolic textual form. An example of this type of puzzle is navigating Dark Bramble without being eaten by the giant anglerfish that inhabit the environment. If the player approaches Dark Bramble like in any other environment, they will attract the anglerfish. However, if the player has already been to the Ember Twin and found the notes left by Nomai children related to the anglerfish, they will know how to avoid attracting the monstrous fish. In the Sunless City, the player can find the following discussion between the Nomai children on a game they had devised around the anglerfish.

> Laevi: "*Rule change!* The anglerfish now has to wear a blindfold. (And do *not* peek!)"
>
> Lami: "Why are we changing it? It's too hard if you can't see anything!"
>
> Laevi: "Aunt Pye says real anglerfish are blind, so you have to wear a blindfold! The rule stands!" (*Outer Wilds*, 2019)

This clue of the anglerfish being blind is further connected directly to the anglerfish in Dark Bramble through another Nomai communication wall found in the room above the children's notes, where the Nomai called Melorae says: "Visually, the specimen appears to be of the same species as the anglerfish in Dark Bramble. We don't believe it originated from this planet" (*Outer Wilds*, 2019). With this information, the player can deduce that they are able to navigate Dark Bramble without being eaten if they can manage the auditory mode and not make too much noise. This information is then applied to the spatial and material environment of Dark Bramble to reach the relevant areas inside it.

What all these different puzzle types have in common is that they act as tools of *cognitive estrangement* (Roine, 2016, p. 47), which I already mentioned in relation to the knowledge mechanics in the previous chapter. The puzzles slow down the process of reaching certain areas of the solar system and therefore also the process of uncovering all the relevant information there is to be found in the solar system to piece together the overall world-as-construct and the thought experiment of the game.

5.2.4 Ideas on the World-as-process

In the previous chapters on the world-as-process, I have examined how the player is made to work through the world-as-construct on the first two tiers of the methodological model. However, I have not approached the topic of the world-as-process through the lens of the third tier of the model, the tier of ideas (Toikkanen, 2022b). In this final chapter of the analysis section, I will focus on the more abstract concepts and ideas on the world-as-process that are evoked by the direct first tier and the indirect second tier of perceiving and interpreting the game.

The central ideas concerning the world-as-process in *Outer Wilds* relate to the concept of video game conventions in the gameplay core, that is, everything the player is able to do (Mäyrä, 2008, p. 17). Relating Mäyrä's terminology back to the theory of speculative worldbuilding, the gameplay core refers to the world-as-process (Roine, 2016). However, *Outer Wilds* consistently integrates video game conventions into the representational shell of the game (Mäyrä, 2008, p. 17), or the world-as-construct. Furthermore, the conventions I will be examining in this chapter are also typically a part of the gameplay world-externally. *Outer Wilds* does not only integrate these video game conventions into the world-as-construct but into the world-internal world-as-construct, making them a believable element of the gameworld, reinforcing the effects of recentring.

The integration occurs through direct perception of the sensorial, material and spatiotemporal modalities on first tier of the DIME model as well as through indirect perception and indirect interpretation of the semiotic modality on the second tier of the model. For example, the puzzles that are a core part of the gameplay in *Outer Wilds,* and also a common element in video games, utilise all of the experiential modalities, the sensorial, material and spatiotemporal modalities, some of which are perceived directly on the first tier, namely the sensorial modality, or mediated through indirect perception on the second tier as was examined in the previous chapter. In video games, puzzles can often function as world-external additions to the gameplay which also makes them world-external to the world-as-construct meaning that they have no justification to exist within the gameworld. Alternatively, puzzles can exist somewhere between the world-internal and the world-external perspectives, being somewhat integrated into the world-as-construct but feeling disjointed and unconvincing as actual parts of the gameworld. This is the case, for example, in *Deep Rock Galactic* (Ghost Ship Games, 2020), in which a mission can include a crate with jet boots that make movement in the environment easier. To access these boots, the player must hack into the crate, which is appropriate from a world-internal perspective. However, the process of hacking is an arcade-style side-scroller mini game, which is less believable as a world-internal part of the world-as-construct. This is not the case in *Outer Wilds*, where all the puzzles are integrated into the world-internal world-as-construct, since the puzzle elements are directly connected to the sensorial, material, spatiotemporal and semiotic elements of the gameworld, as was discussed in the previous chapter.

The integration of the gameplay core into the world-internal world-as-construct is also present through indirect interpretation on a semiotic level, particularly through symbolic textual information. For example, the game includes gameplay tips and hints in the world-internal dialogue, such as when the Hearthian Slate directs the player to fetch the launch codes necessary to get up to the launch tower at the beginning of the game: "Anyway, you'll need to get the **launch codes from Hornfels at the observatory** before you can lift off. Just bring those here once you've said your goodbyes or whatever" (*Outer Wilds*, 2019). As the hints and tips are said by the world-internal characters and make logical sense within the gameworld, they are integrated seamlessly into the world-internal world-as-construct. However, the hints can be divided into two categories regarding their integration. The former example includes world-external information in the form of the relevant information appearing in yellow (bolded in the example), which is a visual symbol for the gameplay function of the piece of dialogue. Thus, these types of hints exist between the world-internal and the world-external perspectives. In contrast, the game also includes hints that are not indicated in any special

way within the dialogue and the player must recognise the hints by themselves. In these cases, the hints remain firmly within the world-internal world-as-construct.

Another symbolically interpreted category of gameplay features that are integrated into the world-internal world-as-construct is the different metrics that are relevant to the gameplay. In particular, these are the metrics regarding the health of the main character, oxygen levels and fuel levels. While the function of these kinds of metrics are in most video games justifiable within the world-internal world-as-construct, how they are presented within the game is typically world-external through health bars or other types of indicators that do not actually exist within the gameworld. *Outer Wilds* integrates these types of elements fully into the world-internal perspective. The aforementioned metrics are tied to the use of the spacesuit in the game, which is directly perceivable visually in how they are only visible when the suit is equipped. Furthermore, when the suit is first equipped, all these meters flicker onto the screen, reinforcing visually the idea of them being a part of the UI of the spacesuit. Whenever the player is not using the spacesuit, the health and oxygen metrics are still present in the game as the player is able to take damage or die of the lack of oxygen. However, the only way the player is able to be fully aware of the precise condition of their body is by using the world-internally justified meters of the spacesuit.

The same strategy of world-internal integration is used with the map in the game. Maps are an interesting gameplay element since they are typically features that could be world-internal but are not made explicitly so. Similarly to the meters, in *Outer Wilds*, the map is explicitly made a part of the world-internal function of the spacesuit, which is apparent in how the map can only be accessed when using the suit. Thus, the integration utilises the direct perception of the visual mode. Furthermore, the world-internal nature of the map is also reinforced semiotically through indirect interpretation in the form of textual references. The museum on Timber Hearth includes a description of the deep space satellite that is located on the outskirts of the solar system. The description states: “Thanks to a recent upgrade, the deep space satellite is now responsible for generating the real-time solar system map used by our newest astronauts” (*Outer Wilds*, 2019), giving a world-internal explanation for the map.

There are also video game elements – once again utilising a combination of direct perception and indirect interpretation similarly to the map feature – that are not strictly necessary for the completion of the game but make the gameplay process more enjoyable, such as the action of skipping time by dozing off by a campfire. This action is actualised and integrated into the world-internal world-as-construct both sensorially through the visual and auditory features of the time-skip mechanism being tied to the campfires and semiotically through the textual reinforcement of the integration in a note that can be found in the campsite by the radio tower on Timber Hearth: “GABBRO’S 3 FOOLPROOF

STEPS FOR DOZING OFF. 1. Light a nice, cozy campfire and get comfortable. 2. Gaze deeply into the serene warmth. 3. Let time begin to slip away as you allow the flames to lull you into a peaceful slumber" (*Outer Wilds*, 2019).

The pattern of integrating the video game conventions of the world-as-process into the world-internal world-as-construct is also foregrounded in certain instances where the game humorously highlights this interplay between the world-internal and world-external perspectives by making a video game element world-internal while also acknowledging its world-external foundation through a textual double meaning. For example, choosing the dialogue option of "I have a map!" when speaking with the Hearthian Gabbro on Giant's Deep results in Gabbro responding with "Yeah, um, that one that's standard with all our spacesuits? The one you have with you at all times that opens with the press of a button? … That map?" (*Outer Wilds*, 2019). The mention of pressing a button merges the world-internal and the world-external, since the statement applies both to the use of the world-internal technology and to the world-external use of the controller.

These examples highlight a central aspect of the world-as-process of *Outer Wilds*. Unlike in the world-as-construct where the world-external perspective is quite explicitly present in the game, the world-as-process includes a variety of ways in which typically world-external elements are integrated into the world-internal perspective and as such the artificiality of their world-external nature is concealed. Therefore, the third tier of ideas regarding the world-as-process reveals a further tool of recentring, which was previously examined in chapter 5.2.1. The tool of integrating world-external gameplay conventions into the world-internal world-as-construct is used to conceal the divide between the game and the real world.

6 Discussion

The two research questions of this thesis were 1) How does *Outer Wilds* build the world-as-construct of its fictional world and how is it worked through in the world-as-process? and 2) How does analysing worldbuilding by multimodal and intermedial methods help understand the experience of worldness in *Outer Wilds*? The former question has quite extensively been answered in the previous analysis chapters through the use of existing theories on worldbuilding, such as Roine's (2016) theory of speculative worldbuilding, and a methodological framework that combines concepts from two well established methodological models from Elleström (2021) and Toikkanen (2022a/2022b). However, in this chapter, I will be exploring the overall patterns that emerge in the analysis results. I will also use these general tendencies that arise from the results to answer the second research question regarding what merit intermedial and multimodal methods, and particularly the DIME model I have launched in this thesis, provide for the study of worldbuilding.

I will start with the general patterns that can be discerned from the analysis results. The central pattern that is repeated in most of the subchapters on both the world-as-construct and the world-as-process is the interplay between the world-internal and the world-external perspectives. As has been already established, the world-internal perspective refers to the conceptualisation of the fictional world as possibly existing, while the world-external perspective acknowledges that the fictional world is simultaneously also an artificial product made by someone in the real world (Roine, 2016, p. 34). Roine also states that said artificiality is "a resource for both authors and users" (p. 19). This duality of the concept can be observed in my analysis results particularly regarding the world-as-construct. The results indicate that the world-external perspective functions in two ways. First, it is a way for the game developers to incorporate elements that add to the meaning and experience of the gameworld and the story but do not belong to the fictional world itself, like world-external music in the construction of fictional environments. Second, the world-external perspective functions as an element of how the players interact with the game, navigating the landscape of the gameworld through a combination of perceiving modalities world-internally and simultaneously interacting with them via the world-external materiality of the technical medium of display, specifically the controller.

However, the interplay between the world-internal and the world-external perspectives functions in a different manner regarding the world-as-process. While the world-external perspective remains explicitly foregrounded in the world-as-construct of *Outer Wilds*, the world-as-process attempts to conceal the world-external perspective through integrating typically world-external gameplay elements into the world-internal world-as-construct, as was examined in the previous chapter. This

raises an interesting question regarding the different theoretical approaches on worldbuilding described in chapter 3. Ryan's (1991) and Herman's (2009) stances on worldbuilding include the element of recentring into the fictional world to which the world-external is seen as incompatible, while Roine (2016) regards both the world-internal and the world-external perspectives as necessary components of worldbuilding and immersion.

While the previously described interplay between the world-internal and the world-external perspectives in the world-as-construct of *Outer Wilds* supports Roine's claim, the world-as-process, in contrast, seems to contradict it. The immersion of the gameplay appears to occur in the integration of the world-external gameplay elements into the world-internal world-as-construct, thus concealing the artificiality of the world-external perspective and anchoring the player into the world-internal perspective. What this indicates is that while the world-external is always present in a media product, as Roine states, media products can also use the concealment thereof as a tool of worldbuilding and immersion. It also indicates that the world-as-construct and the world-as-process can function according to different kinds of principles regarding the interplay between the world-internal and the world-external perspectives.

Next, I will address the second research question: how do intermedial and multimodal analysis methods help understand the experience of worldness in the game? The answer to this question lies in the interplay between the different modalities used to analyse *Outer Wilds* in this study, and particularly, in the interplay between the three tiers of the DIME model, which proves the compatibility of using Elleström's (2021) media modalities and Toikkanen's (2022a/2022b) three-tier model of mediality as the foundation of my methodological model.

Elleström's (2021) modalities provide a detailed tool for understanding the different components of a video game that are used together to create the experience of worldness. As is evident in the results shared in chapter 5, all four modalities theorised by Elleström (2021, p. 46) – sensorial, material, spatiotemporal and semiotic modalities – factor extensively into the construction of the world-as-construct of *Outer Wilds*, and how it is worked through in the world-as-process. However, if these modalities were used to analyse the game by themselves, using a purely multimodal methodological framework, the results would showcase only a one-dimensional conceptualisation on how the world and experience thereof is built in the game. When viewed through the lens of the methodological model used in this study, it would only reveal the function of the first tier, the direct perception of the modalities that the video game medium is capable of using.

It is these modalities being combined within the intermedial framework, specifically the concept of *intermedial experience* as theorised by Toikkanen (2022a/2022b), that allows for the examination of how the modalities function in relation to one another, both directly through the first tier of the model and indirectly through the second tier as well as on the more abstract and conceptual third tier of ideas. The necessity of this type of intermedial framework is evident, for example, when examining the topography of the world in chapter 5.1.1 and the spatial and material aspects of the gameworld. Spatiality and materiality are necessary elements of any world, but they are conveyed almost entirely indirectly on the second tier of the model as the video game medium cannot directly utilise these modalities to their full extent. Furthermore, it is the third tier of ideas, evoked by the first and second tiers, that reveals the more abstract concepts of the game, the larger thought experiment in Roine's (2016) terminology, that is communicated through the material manifestation of the fictional world.

Likewise, the inclusion of Elleström's modalities to Toikkanen's three tier model is beneficial when analysing worldbuilding as particularly the modalities of materiality and spatiotemporality are an integral part of the experience of worldness as was proved in chapter 5.1.1, and as such, the sensorial modality is insufficient on its own. While the other experiential modalities are subordinate to the sensorial modality, as was discussed in chapter 3.3, when examining a media product solely through the sensorial modality, these other aspects are prone to be ignored, which would be detrimental to gaining a full understanding on the world-as-construct and world-as-process of a video game.

The analytical framework of this study, the combination of the theory of speculative worldbuilding (Roine, 2016) and the methodological tools of Elleström (2021) and Toikkanen (2022a/2022b), shows that the experience of worldness is built through a complex interplay between the direct and indirect media modalities, which is able to produce the illusion and imagined experience of modalities necessary for the experience of worldness in speculative fiction that are not actually present in the video game medium. Thus, the video game *Outer Wilds* is capable of superseding the media specific limitations of the medium through intermedial experience.

7 Conclusion

In this thesis, I set out to explore how the video game *Outer Wilds* builds the experience of the world-as-construct of its world and makes the player work through it in the world-as-process. I analysed both aspects of speculative worldbuilding (Roine, 2016) from world-internal and world-external perspectives, which account for the fictional world being perceived as a possibly existing world as well as an artificial construct. The speculative worldbuilding was approached from the methodological framework of intermedial and multimodal analysis. More specifically, I combined the two methodological models of Elleström's (2021) medial modalities and Toikkanen's (2022b) three-tier model of mediality by launching a new model of multimodal and intermedial analysis that I refer to as DIME. This model permits the analysis of the full spectrum of perceiving a media product both from an experiential and interpretive perspective.

The analysis results show that the world-as-construct is built in *Outer Wilds* through the sensorial, material, spatiotemporal and semiotic modalities. Of these modalities, only the sensorial modality is primarily perceived directly on the first tier of the methodological model, while the other three are mostly mediated indirectly on the second tier. The complex interplay between the modalities shows the versatility of the digital video game medium and that a medium is not limited to the modalities it can represent directly since the human brain is able to use imagination as a tool of experience in the process of intermedial experience, as theorised by Toikkanen (2022b).

However, this study has only focused on a limited section of Roine's (2016) theory of speculative worldbuilding, namely the world-internal and world-external perspectives. Thus, there are other aspects of the theory that would merit more research in the future. For example, Roine (2016, p. 84–85) speaks on the different frames of interpretation in relation to worldbuilding, namely the narrative and simulative frames. These elements open a further avenue of research that could deepen the understanding of how the world of *Outer Wilds* is constructed and brought to the experience of the player, especially since the video game medium does not function according to the traditional rules of narrative due to its interactive nature. For this reason, Roine's concept of media using different frames of interpretation like narrativity and simulativity would provide an interesting and fruitful avenue for further study on the worldbuilding in *Outer Wilds*.

Furthermore, another point of interest in future research will be developing further the methodological model I have launched in this thesis. In this thesis, I have proven that the combination of Elleström's (2021) and Toikkanen's (2022b) models works in the analysis of *Outer Wilds* and provides unique results on how the video game medium functions. However, particularly the different routes of

perceiving a media product though the three tiers could be developed further and utilised more efficiently in analysis. Namely, the distinction between the experiential and the interpretive routes could be conceptualised in more detail. Likewise, the model still requires further testing on different types of media products to realise its full potential.

Through the development of the methodological model in the future, my hope is that it can be used by myself and others as a tool for analysing a diverse set of media products and how they function and impact their audience. The model could also in the future provide a tool to analyse research topics that differ from the form-oriented approach I have taken in this thesis. For example, in combination with concepts such as discourse and ideology, the model could be used to more efficiently analyse meaning in the content of media products, especially when said media product utilises multiple modalities and modes to convey a message.

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