

# SILENCE AS AN ARTISTIC TOOL IN VIRTUAL SPACES

A prototype of an experimental audiovisual album

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Master's thesis

Olga Tasanko

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Supervisor Antti Ikonen

Advisor Noora Vikman

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**Author** Olga Tasanko

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**Abstract**

The artistic use of silence in virtual environments is an underexplored research topic even though studies about silence in arts from various perspectives have existed vastly throughout history, especially from philosophical, linguistic, and musical perspectives. Virtual environments, whether an online meeting or a video game, are increasingly common in contemporary times; yet the number of studies focusing on artistic approaches to these media forms is still uncommon, and research combining silence and virtual environments is even more so. This thesis is a qualitative and interdisciplinary study of silence in virtual spaces. It combines elements from sound design, music theory, and game design while investigating the role and implementations of silence within a virtual environment from an artistic perspective. The study aims to identify practical means to create silent virtual environments and explore the meanings and closely related thematical topics to silence, such as emptiness and absence.

The literature review introduces three key concepts—absolute silence, aesthetically meaningful silence, and contrast—experimented in the production part. The production part is a proof-of-concept constructed within a game engine. The motivation and inspiration behind the work relate to the experience of silence as a part of bereavement and the experience of loss. Additionally, this investigation delves into examining the viability of the concept of an experimental audiovisual album. Supportive questions address the integration of sound design tools in virtual environments and the design of the experimental audiovisual album. The core finding was contrast. It proved an effective method and framework while building the prototype. Other observations note best practices for creating virtual environments featuring aesthetically meaningful silences: the size of the space affects the overall atmosphere, and all sounds need room to stand out. The prototype delivers a positive outcome on the viability of the original audiovisual album idea. It works as a proof-of-concept, and with future iteration optimization and fixing of a few existing bugs, as well as tweaking the level size and audio content, it would be ready for user testing and further development.

This thesis aims to contribute to the academic discourse, fostering continued exploration in studies focusing on silence within virtual environments. The study's interdisciplinary approach offers insights for other scholars and designers to experiment with the interplay of silence, contrast, and the potential within the concept of an experimental audiovisual album.

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**Keywords** silence, virtual environments, sound design, game audio, sound art, contrast

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### Tiivistelmä

Hiljaisuutta on tutkittu laaja-alaisesti muun muassa filosofisista ja kielitieteellisistä näkökulmista. Hiljaisuuden taiteellisia ulottuvuuksia on tutkittu erityisesti musiikin suhteen, mutta esimerkiksi hiljaisuuden ja virtuaalisten ympäristöjen keskinäistä suhdetta taiteellisessa viitekehyksessä ei ole tutkittu juuri lainkaan. Tämä opinnäytetyö on laadullinen, poikkitieteellinen taiteellinen tutkimus, jossa tarkastellaan hiljaisuuden taiteellisia ulottuvuuksia virtuaalisessa ympäristössä. Työ yhdistää äänisuunnittelun, musiikin teorian ja pelisuunnittelun menetelmiä kokeellisen audiovisuaalisen albumiprototyypin kehittämisessä. Tutkimuksen tavoitteena on löytää käytännön keinoja hiljaisten virtuaalisten tilojen äänisuunnitteluun sekä tutkia taiteellisessa viitekehyksessä hiljaisuuden ja siihen läheisesti rinnastettavien teemojen, kuten tyhjyyden ja olemattomuuden muotoja.

Opinnäytetyön kirjallisuuskatsauksessa esitellään kolme keskeistä käsitettä: absoluuttinen hiljaisuus, esteettisesti merkityksellinen hiljaisuus ja kontrasti. Nämä käsitteet rajaavat työn produktio-osan teoreettisen viitekehyksen. Produktio-osana on kokeellinen audiovisuaalinen prototyyppi, joka on rakennettu tyypillisesti videopelien kehityksessä käytetyn pelimoottorin avulla. Motivaatio ja taustasyys kokeellisen audiovisuaalisen albumin kehittämiseksi juontaa juurensa kirjoittajan kokemukseen hiljaisuudesta osana suruprosessia ja menetyksen käsittelyä. Kirjoittajalle oli tärkeää työstää kokemustaan taiteellisin keinoin, mikä puolestaan on toiminut taustamotivaationa opinnäytetyön produktio-osan ideoimisessa ja prototyypin toteuttamisessa. Keskeisimmät havainnot liittyvät kontrastin käsitteeseen, sen teoretisointiin sekä soveltamiseen prototyypin suunnittelu- ja toteutusvaiheessa. Iteratiivisen produktiovaiheen aikana nousi esiin myös muutamia muita huomiota, kuten esimerkiksi virtuaalisen tilan koon vaikutus tyhjyyden tai hiljaisuuden kokemukseen. Prototyyppi antaa positiivisen tuloksen alkuperäisen audiovisuaalisen albumi-idean toteuttamiskelpoisuudesta. Konsepti toimii, kunhan tulevissa versioissa kiinnitetään huomiota prototyypin optimointiin, muutamien bugien korjaamiseen sekä virtuaalisen tilan kokoon ja äänisisällön muutoksiin. Näiden muutosten jälkeen se olisi valmis esimerkiksi käyttäjätestaamista ja jatkokehittämistä varten.

Tämän opinnäytetyön tavoitteena on tuoda yksi uusi näkökulma virtuaaliympäristöjen ja hiljaisuuden tutkimuskentälle. Tutkimuksen poikkitieteellinen lähestymistapa saattaa siten tarjota oivalluksia muille tutkijoille sekä suunnittelijoille, jotka ovat kiinnostuneita kokeilemaan hiljaisuuden, kontrastin ja kokeellisen audiovisuaalisen albumin konseptin vuorovaikutusta.

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**Avainsanat** hiljaisuus, virtuaalidellisuus, äänisuunnittelu, peliaudio, äänitaide, kontrasti

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## TABLE OF CONTENTS

Preface and acknowledgements .....	iii
List of figures .....	iv
INTRODUCTION.....	1
1.1 Background and motivation.....	2
1.2 The research questions .....	3
1.3 The scope and limits of the study .....	4
1.4 The structure of the thesis.....	6
2 LITERATURE REVIEW .....	8
2.1 A short historical overview of silence in art.....	8
2.2 Theoretical framework.....	11
2.2.1 Key concept 1: Absolute silence.....	11
2.2.2 Key concept 2: Aesthetically meaningful silence .....	13
2.2.3 Key concept 3: Contrast .....	14
2.3 Silence in music and sound art .....	15
2.4 Silence in virtual spaces .....	18
2.5 Interdisciplinary perspectives.....	19
2.6 Theoretical framework for this thesis.....	23
3 RESEARCH MATERIALS AND METHODS .....	25
3.1 Methodological choices and constraints.....	27
3.1.1 Artistic research methods .....	27
3.1.2 Sound design .....	29
3.1.3 Constrains in the scope of the thesis.....	30
3.2 The implementation of the research.....	32
3.3 Methods.....	33

3.3.1	Pre-production .....	34
3.3.2	Production phase.....	35
4	THE PROTOTYPE.....	36
4.1	Designing the project .....	36
4.1.1	The original idea: Experimental audiovisual album.....	37
4.1.2	Theoretical background combined with artistic need .....	37
4.1.3	Thematic approach.....	38
4.2	Proof of concept .....	40
4.2.1	Contrast .....	41
4.2.2	Compositions featured in the Prototype .....	42
4.2.3	Wwise project .....	44
4.2.4	Level design .....	46
4.3	Uncompleted features and future development.....	51
5	RESULTS.....	53
5.1	Key findings.....	53
5.2	Critical review of the results.....	54
5.3	Reliability of the material used in the study.....	56
6	CONCLUSIONS.....	57
	REFERENCES .....	60

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Otaniemi, 15 November 2023

Olga Tasanko

## LIST OF FIGURES

Figure 1. Iterative design process during this project. ....	26
Figure 2. List of Wwise events. ....	45
Figure 3. Schematic view of the master-mixer hierarchy.....	45
Figure 4. The Main Menu screen of the Prototype. ....	46
Figure 5. L01's layout from the top view.....	48
Figure 6. Four objects the visitor sees when entering L01. ....	48
Figure 7. The locations of the music triggers and the interactable objects. ....	49
Figure 8. Two ambience sounds and their attenuations in L01. ....	50



# INTRODUCTION

This thesis is artistic practice-based research which explores silence as an artistic tool in a virtual environment through a prototype of an experimental audiovisual album, from now on referred to as *the Prototype*. The virtual soundscape is the main focus of the artistic component of the thesis work, and silence is explored both thematically and at the practical level of creating the virtual space and exploring silence within it. The written part of the thesis provides background research on silence as a concept and as an artistic tool in sound-related practices. The thesis also explores methods for sound designing virtual spaces with silence as a relevant part of the soundscape, which can further offer ideas and practical tools to others who work with audible virtual environments, such as video games and other media- and sound art formats. This thesis aims to determine ways to use silence as an artistic tool in a virtual space.

During the production phase of the thesis, I found myself a working hypothesis from which I eventually focused only on one concept in the first prototype level. While contrast was the key concept, the full working hypothesis was the following:

"A minimalistic approach to the number of sounds, adding reverb and contrast are the key aspects in creating a silent virtual atmosphere".

This hypothesis is explored and tested in the prototype of the artistic component. This thesis explains the theoretical background and describes the process of creating the first version, the proof-of-concept, of the experimental audiovisual album prototype.

## 1.1 Background and motivation

This thesis is qualitative, interdisciplinary artistic research backed up with a theoretical framework based on background research on the artistic use of silence in different audio-including media and experimenting with the concepts brought up through this background research. It is a selection of a few relevant examples from different fields of art, as well as a thematically narrowed-down literature review related to silence.

This thesis falls into artistic research practice. According to Vienna Declaration on Artistic Research (2020), artistic research is "practice-based and practice-led research". In a relatively new online article, Angelika Boeck (Boeck & Tepe, 2021) prefers to use the term "art practice-based research", which she considers to be research that focuses on a specific field of art practice supported with a scientific approach that helps to express and explain the research subject. She argues that the artistic means and methods support the artist's aim in searching and defining the relevant research questions. In Boeck's approach, the artwork serves as a presentation of the process and as an outcome. In the case of this thesis, the prototype of an artistic component works as an experimental platform for the author to test means for creating silences in a virtual space from a sound designer's point of view.

In inspecting and exploring different sound design and composing techniques through a musicologist's perspective, the artistic component seeks to present several different experiences and interpretations of silence. One aspect is the practical level of "not-sounding" and creating a silent space in a virtual environment by balancing and mixing the audible content. Music theory also contains multiple tools through instrumentation, rhythms, pauses and rests (e.g. Bindeman, 2017, pp. 30-34). The fourth chapter of this thesis will explain these methods in more detail and how they are experimented in the Prototype. A further approach is more abstract and plays with the semantic, philosophical concepts of silence. Furthermore, the artistic component itself is a presentation of the creative process, and additionally, an outcome

which expresses the author's experience of silence in close relation to bereavement. Thus, the artistic component serves as an artistic outlet for the author.

Due to the scope of this thesis, the background, and artistic reasons behind the Prototype, even though crucial regarding the idea and motivation behind the artistic component, are left out of the thesis. The thematical aspects are not addressed fully in the Prototype studied through this thesis project but are relevant for the further development of the finished artwork that will be worked on after this thesis based on the findings and found good practices from this study.

This thesis has two goals, the first goal is to determine effective methods for employing silence as an artistic tool within a virtual space. The second goal is to create a proof-of-concept for an experimental audiovisual album and evaluate its feasibility. Therefore, the focus is not on the artistic reasons behind the Prototype and these reasons are left out of the thesis document. Ultimately, this research aspires to present a proof-of-concept for the author's experimental concept of an audiovisual album and assess its viability. Central to this experiment is the exploration of strategies for utilizing silence as an artistic tool in virtual spaces and identifying optimal practices for constructing environments that convey distinct feelings and experiences of silence within a virtual environment.

## **1.2 The research questions**

The primary research questions for this study comprise of two core questions: firstly, it explores the process of using sound design to create virtual spaces characterized by silence. Second, it seeks to evaluate the viability and effectiveness of an experimental audiovisual album as a creative concept. Within this overarching framework, the study also addresses the following

subordinate questions: (1) What sound design tools and techniques are available for the construction of silent virtual environments? (2) How do these tools and techniques synergize with the conceptualization and design of an experimental audiovisual album?

### **1.3 The scope and limits of the study**

Absolute silence is impossible to achieve. However, in a virtual setting, it is possible to cut all the virtual sounds off and create virtual silence or, as van Elferen and Raeymaekers (2015, p. 269) define it " -- a phenomenological silence created by the combination of technological means and listener perception". Listener perception is more than hearing sounds. Therefore, a sense of silence is created by using sounds and creating ambiances that the listener's perception observes as silent, even though the virtual space would constantly be running an audio track to make the virtual space sound silent, and the experience of silence feel natural. For example, in video games, immersion is a crucial part of the game experience and immersion is created partly through the world-building and carefully crafted audio design, which plays an important role when building the atmosphere and ambiance of the game world (e.g. Collins, 2008, p. 134). In the case of virtual online meetings, however, silence can be considered awkward or unpleasant, and the aim is to avoid it (e.g. Boland et al., 2022; Waters, 2023). As explained in the examples above, the virtual environment offers a place to explore and create pleasant or unpleasant experiences, which is further experimented with within this thesis.

This thesis consists of a practical artistic component where the writer combines different techniques from sound studies, music theory (composing techniques) and game design. The aim is to create a virtual space with both practical uses of silence as a composing tool and as an atmosphere in the virtual space. The Prototype explores silence and closely related thematical

subjects, such as the experience of loss, absence, and emptiness. The work is not meant to be a game but uses a game engine as a platform for the experimental audiovisual album. The virtual space was created considering game design methods, such as level design principles. In addition, the interaction functions are thus familiar to anyone who has played video games before. Moreover, the project explores the distinction between a game and not a game. This topic is discussed excessively in the field of game studies. Main discussions revolve around whether games can be art and how to define art games in general. Although the author is interested in art games, in the scope of this thesis, the aim is not to design a game but rather to experiment if game design tools are suitable for alternative creative approaches. The purpose of the artistic component is to present the audiovisual album: The Prototype is not playable in a ludological sense as no goals or sets of rules exist for the listener. Instead, when the listener interacts with objects in the virtual world, the experience might resemble them from a few game genres, such as walking simulators and autobiographical games. These will be discussed in detail later in the fourth chapter of this thesis.

To summarise, the experimental approach comes from using a game engine called Unreal Engine 5 (Epic Games, 2004-2023) as an artistic platform for audio-oriented artwork prototype, in which the virtual soundscape is the focus of the work both thematically and in a practical sense of creating the virtual space and exploring silence within it. The written part of the thesis provides background research on silence as an artistic tool in virtual space and how to use silence as a tool for sound design and composing. The artistic component, the Prototype, serves as the presentation of the process and as an outcome, which applies to the artistic research practice discussed earlier in this chapter.

This thesis focuses exclusively on the concept of silence within auditory formats, with a particular emphasis on its role within an experimental audiovisual album created within a virtual environment using a game engine. The

scope of this work deliberately excludes the exploration of silence in other domains, such as nature, religion, linguistics, communications, and psychology. Furthermore, it does not delve into the realms of new media art, literature, or visual arts.

While the author has previously investigated game audio in the context of art games, this study takes a different approach to examine silence's presence and significance within the experimental audiovisual album. It's worth noting that the author's background and interests are strongly influenced by game audio, game audio design, and game design, aligning with the focus of their master's program in sound in new media.

## **1.4 The structure of the thesis**

This thesis transitions from a literature review on silence to the production chapters in the following chapters. Chapter 2 provides a historical overview of silence and explores theoretical foundations relevant to this thesis. It draws insights from a comprehensive literature review across interdisciplinary approaches to silence, focusing specifically on virtual environments. Chapter 3 explains the methodological approaches employed in this artistic research, outlining the integration of practices from artistic research methods to sound design. It also briefly addresses the constraints within the scope of the thesis and explains the implementation of the research.

Chapter 4 details the production part, introducing the Prototype and explaining the design and project phases in terms of contrast, the featured music, the implementation of audio through Wwise (Audiokinetic Inc, 2023), and the construction of the level in Unreal Engine 5. Chapter 5 presents the results and key findings generated during the process, accompanied by a critical review of the results. Additionally, the reliability of the material is discussed in this chapter.

Chapter 6 summarizes the conclusions drawn from this qualitative and interdisciplinary study, underscoring key insights, emphasizing the significance of silence in virtual environments, and proposing avenues for future research. Together, these chapters form a cohesive narrative that reveals the intricate interplay of sound, music, and design in the exploration of silence within the digital realm.

Furthermore, all figures are created or taken by the author unless explicitly stated otherwise. Digital documentation accompanying this thesis includes two playthrough videos of the Prototype, first one named *arts\_2023\_tasanko\_olga\_Proto20231111* and the second one named *arts\_2023\_tasanko\_olga\_Proto20231112*, along with an Excel sheet listing the assets utilized as placeholders in the Prototype (named *arts\_2023\_tasanko\_olga\_ListOfUEAssets*). All 3D assets have been collected from Unreal Engine Marketplace. The Excel sheet provides a comprehensive list including the original name of the asset, associated asset package, creator of the asset package, and a hyperlink to the marketplace webpage.

Additionally, AI tools ChatGPT<sup>1</sup> and Grammarly<sup>2</sup> were used for double-checking grammar and academic tone, and proofreading assistance. Additionally, the text was proofread by a few non-native English speakers.

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<sup>1</sup> OpenAI. (2023). ChatGPT (Mar 14 version) [Large language model]. <https://chat.openai.com/chat> (accessed 14.11.2023).

<sup>2</sup> Grammarly Inc. (2023). Grammarly [Grammar checker]. <https://www.grammarly.com/grammar-check> (accessed 14.11.2023).

## 2 LITERATURE REVIEW

This literature review explores different meanings and uses of silence in art, especially in sound and music, as well as thematic aspects of silence relevant to the topic of this thesis. The main concepts introduced in this literature review support the thesis topic, silence as an artistic tool in virtual spaces, and the relevant terminology introduced in the following subsections are *absolute silence*, *aesthetically meaningful silence*, and *contrast*. Furthermore, the literature review provides a brief examination of the role of silence in musical compositions and sound design practice. It highlights the importance of an interdisciplinary approach to fully comprehend the varied meanings associated with silence. These factors greatly impact the author's artistic perspective and approach to exploring the concept of silence, which makes these topics relevant to background research on the subject.

### 2.1 A short historical overview of silence in art

The study of silence dates to ancient Greece when the theory of poetic rhythm recognized two types of pauses influencing verse-melody (Lissa, 1964). Furthermore, silence has been a topic for several philosophers throughout history (see for example Dauenhauer, 1980) and a common topic in linguistics (e.g. Jaworski, 1997). Before World War I, a period marked by cultural innovation in the arts and sciences, silence in culture, as Bindeman (2017, p. 13) notes, primarily served a creative purpose as a form of empty space. During this era, Bindeman (2017) explains, silence was often represented in literature as darkness, emptiness, nothingness, and the void.

In more modern times, particularly since the 1960s, research on silence in the arts, especially music and related areas, has thrived. The study of silence



in music has been a reoccurring theme within the field of audio-related disciplines, such as musicology and music theory, composing and music studies. Even though there is a lot of musicological literature on the topic, the approach remains mostly philosophical or speculative, as Syroyid Syroyid (2020) explains at the beginning of their relatively recent doctoral dissertation about the analysis of silences in music. However, those delving into this discourse of silence in art, will most likely find material particularly from the 1960s onwards, and encounter the works of John Cage, a renowned American avant-garde composer of the 20th century. Cage's profound insights into music, sound, and silence have significantly shaped both the academic and popular conversation in this domain. His compositions, such as *4'33"* (Cage, 1952) as well as his writings and thoughts about silence (e.g. Cage, 1961; Gann, 2010; Kahn, 1997; Miller, 1990; Syroyid Syroyid, 2020; Wolf & Bernhart, 2016), are part of the movement of bringing silence on stage and as part of (experimental) music and composing tradition. Some other notable authors from the 1960s include Susan Sontag with their essay on the Aesthetics of Silence (1967), Zofia Lissa with their article Aesthetic Functions of Silence and Rest in Music (1964) and a bit later work by Thomas Clifton, *The Poetics of Musical Silence* (1976).

It is important to note, however, that all these examples come from Western writers and can be considered only examples of Western history of silence in art. Andrew Edgar (Jaworski, 1997, p. 323) highlights that various aspects of music theory, including musical acoustics, tonal structures, performance techniques, compositional practices, and the advancements in instrument technology, are not exclusive to Western European culture. Performing music within a state of contemplative silence transcends cultural boundaries, but literature other than Western origin is more difficult to acquire.

More recent explorations of silence in the realm of art extend to the performing arts, such as fields like theatre and films (e.g. Altman, 1996; Gasparyan, 2019; Kaye & LeBrecht, 2009; Kulezic-Wilson, 2009; O'Rawe, 2006;

Wierzbicki, 2012). In the case of video games, finding studies about silence in terms of sound design proved difficult. However, some game genres, such as horror games, implement atmospheric elements and silence is used as an expressive tool that can create tension and, for example, a sense of loneliness, fear or even love (see Whalen, 2007). This thesis seeks to contribute to the underexplored area of silence in virtual environments, which remains an uncharted territory within the academic field of silence in art. While no academic research specifically addressing silence in virtual environments was found, it is worth noting some works that offer intriguing approaches to silence in virtual experiences. Subsection 2.4, Silence in virtual environments, introduces a few references to contemporary academic studies that, while not explicitly focused on silence, are closely related through interdisciplinary approaches. These aforementioned studies focus on immersion (e.g. Luoma, 2022; Tekrø, 2018).

Silence has been explored in various academic disciplines beyond its artistic context. For instance, it has been examined in fields related to community and education (Ollin, 2008; Wood & Tribe, 2016), as well as in political contexts (Schweiger, 2015) and contemporary psychoanalysis (Little, 2018). As a topic, silence is highly researched across interdisciplinary fields within various academic disciplines.

Beyond academic resources, a few video games have left a lasting impression on the author through their use of silence or in creating a virtual environment with a silent atmosphere: *LIMBO* (Playdead, 2010) and *INSIDE* (Playdead, 2016) have a very interesting—and silent—approach to sound design, *Dear Esther* (The Chinese Room & Briscoe, 2012) creates an eerie and hollow atmosphere with music.

## **2.2 Theoretical framework**

The theoretical framework comprises three main topics that guided the conceptual work during the design process. The following key concepts will be explained in more detail in the subsequent three subsections. The first key concept, absolute silence, serves as a metaphor for death and forms a fundamental thematic foundation for the artistic ideas that led to the inception of the experimental audiovisual album. Although the deeper meaning behind the album tracks may not be fully relevant in this initial prototype and proof-of-concept stage, it's important to acknowledge that absolute silence and its profound symbolic interpretations carry significant weight on the thematic aspects of the artistic component.

Moving on to the second key concept, aesthetically meaningful silence, it gains substantial importance within the fully constructed and designed virtual environment. Every sound element and its relationship with other components within the virtual space is meticulously planned. Consequently, silence in this context is meaningful in every sense, and it is a deliberate and aesthetic choice. Therefore, the Prototype can be viewed as an expression of aesthetically meaningful silence.

The third concept is both a framework and a method, which was found during the practice-based research: contrast.

### **2.2.1 Key concept 1: Absolute silence**

According to Merriam-Webster dictionary (Merriam-Webster, n.d.), the noun 'silence' means "forbearance from speech or noise", "absence of sound or noise", and "absence of mention". In addition, the synonyms listed in the dictionary mention terms such as muteness, stillness and oblivion, obscurity, and secrecy. Since absolute silence would mean the absolute absence of sound, consequently, it would also mean audible nothing. In other words, it

would mean hearing nothing and experiencing nothing. As van Elferen and Rayemaekers ponder in their article (2015, p. 268), no human can experience absolute silence while alive.

Absolute silence is impossible to experience in any living environment. As an example, van Elferen and Rayemaekers (2015, p. 270) view the concept of absolute silence as the ultimate form of silence. Absolute silence is "silence beyond all sound", a silence that never was nor can be (ibid). In this thesis work, silence is approached both at the practical level of experimenting with the concept and at the more abstract level as a concept of silence representing the absence of being. As said before, it is impossible to experience absolute silence, but in this thesis, the aim is to explore if it is possible to create an experience of silence by acknowledging the closely related concepts, such as the absence or lack of sounds, the experience of emptiness, and the concept of nothing.

Absolute silence, as the utmost form of silence, is an intriguing concept. When approached through sound studies, it becomes evident (e.g. Mowitt, 2015; Sterne, 2012) that creating a silent soundscape requires an understanding of the various meanings of silence and the practical tools to achieve the precise type of silence under consideration. When thinking about the contrast between sound and silence, in an acoustic sense, the world always sounds something. Even a silent (natural) environment is not dead silent.

It appears that absolute silence is the end of the physical possibility of hearing or experiencing any acoustic phenomena. Since the world is never fully acoustically silent, reaching the state of absolute silence is impossible. In virtual space, it is possible to cut all the digital sounds away, but the listener can still hear the world outside the virtual space: sounds bleeding through their headphones if they are wearing one, noise in the environment, even their blood flowing in their ears if the surroundings are relatively noiseless, or headphones are concealing enough. However, the concept of absolute silence is of a theoretical and philosophical kind rather than something a living being

can experience at all. A silent atmosphere or a silent soundscape is more of an emotional experience of the environment rather than just quietness, musical rest, or a lack of all sounds. Additionally, absolute silence is a concept of not existing, not sounding and not being. In other words, as a thematical concept, it can be considered a metaphor for death.

### **2.2.2 Key concept 2: Aesthetically meaningful silence**

Haigh Khatchadourian (2015, p. 9) argues that silence is always context-dependent, whether it occurs in human life or in the natural world. Conversely, noise, which takes various forms, is constantly present in the modern world, and it often disrupts our auditory experiences and is perceived as sound pollution. However, as Khatchadourian explains, in human experiences, as well as in art and language, silence usually exists alongside or within different sounds, including various types of noise. Sometimes, silence even acts as a backdrop for sound or is part of the setting for sound when an extended period of complete silence is interrupted or punctuated by sound. This interaction significantly shapes how we perceive the meaning of silence or, conversely, how we interpret sounds or noises in a particular context.

Khatchadourian introduces meaningful silence by describing it as silence possessing "some kind of meaning of other", meaning, that it is an act of doing something, for example remaining silent when asked a question. This is distinguished from meaningless silence, which in Khatchadourian view means many kinds of noises and sounds and cacophonies that people come aware of when they temporarily disappear from the field of hearing. In addition to the division into meaningful and meaningless silences, there are also aesthetically meaningful silences, which occur for example in the context of artistic works, such as pauses and silences in literature, music, or the environment, such as silence in a forest or Japanese garden (see Khatchadourian, 2015, p. 4).

The treatment of silence in the artistic component of this thesis is firmly rooted in the perspective of meaningful silence. Consequently, meaningful silence provides a relevant theoretical framework through which the experimental audiovisual album explores silence both as an artistic tool for constructing the environment and thematically within the musical pieces featured in the album. The virtual space has been constructed from scratch, and every instance of silence and sound is with intent and meaning, aimed at conveying a specific experience to those who engage with the prototype.

### **2.2.3 Key concept 3: Contrast**

Interestingly, only a few mentions of silence in art that consider contrast as a crucial concept in creating silence were among the literature read for the rest of the literature review. Despite the vast array of different perspectives and approaches to the consideration of silence in philosophical aspects and the breakdown of its presence in musical works, none of the resources reviewed during this thesis project delved into the topic of contrast as needing closer inspection. The reason might lie within the structure of the research questions of this study, and I might have overlooked an important area of study while focusing on the current scope, which primarily involves silence in art, with a primary focus on music and sound.

One exception to this was a Master of Fine Arts thesis (Haertel, 1985b) and an art history paper written by Nilza Gray Haertel in the Spring of 1985. In the art history paper, they begin the introduction by stating how silence only exists within the context of relation and write the following:

"-- Nevertheless, by sheer contrast, silence can take the shape of a real 'presence', with an 'individuality' of its own [...] Therefore, the power and the magic of silence is subordinated to its contrasting elements. By either negating them, suspending them or interrupting them it

becomes significant in itself and also modifies the significance of its opposites. " (Haertel, 1985a, p. 1)

However, contrast is implicitly present as a silent concept within the comparisons made in any of the referenced literature, such as spoken versus unspoken, sound versus no-sound, space versus negative space, and so on. While the concept of contrast may be considered too broad or seemingly uninteresting within the context of the deeper meaning of silence and its applications in art, it has nonetheless emerged as a pivotal approach and conceptual tool in the development of this thesis. Contrast provides a perspective from which to focus on a specific aspect in the first level of the Prototype, offering this thesis a proof-of-concept of the audiovisual album. Additionally, it gives more structured and defined methods to test and compare at the prototype level.

### **2.3 Silence in music and sound art**

Lissa (1964), driven by their exploration of the aesthetic functions of film music, discovered silence as a significant dramatic tool when combined with visual elements. In their article, Lissa notes how silence implies a much bigger notion than a musical rest (*ibid*, p. 444). Rest is only one manifestation of silence, whereas silence itself is capable of evoking responses in any form of art that involves the elements of temporal development.

Andrew Edgar discusses the relationship between music and silence (Jaworski, 1997, pp. 311-328). He states that all music has a specific relationship to silence, with silence being as essential to the composition and performance process as sound itself. Edgar introduces four distinct relationships that exist between music and silence: silence within music, music within silence, music as a replacement for silence, and silence as a substitution for music. Within the scope of this study, the focus is more on the relationship involving silence within music, with an examination of the compositional

techniques that generate these musical silences. Nonetheless, it is good to acknowledge these other connections as well.

Silence within music goes beyond mere absence; it depends more on the functions within a larger compositional framework, as Edgar explains (*ibid.* p 312). He further enhances his point by referring to an article by Thomas Clifton (1976) and the writings and works of John Cage.

Similarly to Edgar's exploration of the intricate relationship between music and silence, Khatchadourian (2015, p. 67) delves into the realm of temporal arts, exploring the meanings and roles of silences within this context. In temporal arts, the meanings of rests and silences are contextual. Their significance depends on their position within the text or score and their relationships with what precedes and follows them, establishing linguistic-aesthetic connections. When a pause, rest, or silence carries meaning in any sense within a literary or musical work, it imparts a degree of aesthetic expressiveness. This expressiveness, in turn, communicates intellectually and/or emotionally with the audience through the conveyed meanings. Importantly, these meanings typically emerge within clusters or complexes rather than as isolated pauses, and various parts or the entirety of musical passages, melodies, or themes. In cases where the contexts of pauses or silences are indefinite or open to different interpretations, the meanings of these silences may also remain ambiguous, Khatchadourian explains.

In contrast, the approach to composing the musical pieces in the experimental audiovisual album prototyped in this thesis project has been more intuitive and artistic. While music theory and its relationship to silence was explored during this thesis, the composition process relied on the author's artistic intention. Theoretical discussions assisted in formulating thoughts when creating the artistic pieces, but the compositions remain artistic works driven by intuition. Pauses and silence emerge organically to evoke expressive moments within the music. For example, in two of the songs, abrupt pauses interrupt the flow of the music, creating expressive disruptions and



moments of silence amid the loud and noisy sounds that structure the songs in other ways.

Several composers have influenced the thesis author in their utilization of silence within their compositions. John Cage, whose experimental exploration of silence has been referenced in this literature review already a few times, laid the foundation for how composers and sound artists conceptualized silence thereafter (see Bindeman, 2017, pp. 13-19). While I acknowledge his experiments as crucial historical shifts in shaping the perception of the relationship between music and sound, artistically speaking, his works do not serve as the inspirational focus of this thesis project and therefore I will not address his works or thoughts more in-depth.

There is, however, an Estonian composer whose compositions sound very silent whenever I listen to his music. Arvo Pärt (b. 1935-) has been composing since the 1960s, and his music has been described as having an avant-garde spirit and from 1970 forward, also religious aspects (Arvo Pärt Centre, 2023). His works from 1976 onwards with his original composing style, *tintinnabuli*, have made a lasting impression on the author of this thesis. Pärt's music aesthetically silent, and without going more deeply into the relationship with silence and religion (which has been studied a lot in academic literature, yet intentionally left out from this literature review), it can be argued that key things affecting the aesthetics relates to the spiritual aspects Pärt has implemented in his music (see Arvo Pärt Centre, 2023).

In sound studies, scholars have explored various perspectives on silence, conceptualizing it as "the horizon of sound" and examining its role in diverse contexts, including urban environments, conversations, and its relationship with sound and film (see Sterne, 2012). John Mowitt (2015) contributes to this discourse by challenging existing models within the expanding field of sound studies. His work emphasizes the need for a humanistic approach to studying sound that goes beyond traditional classifications such as speech, music, industrial sounds, or signals. Mowitt introduces terms like echo,

whistle, whisper, gasp, and silence, which serve as chapter titles in his book, *Sounds: The Ambient Humanities* (2015). These terms highlight how sounds, often unnoticed, play crucial roles in shaping social and political concepts such as dialogue, privacy, memory, social order, and artmaking. What is interesting in Mowitt's terms, is their descriptiveness: they characterize and give very figurative names to different types of silences; for example, one of the songs in the Prototype uses echo, while another song uses both whispers and gasps, yet in a highly edited form.

## 2.4 Silence in virtual spaces

As introduced during the historical overview of silence in art, several video games, such as LIMBO, INSIDE, and Dear Esther, serve as interesting examples of using silence in virtual spaces. These games were mentioned earlier, as they have been listed in various compilations as art games<sup>3</sup>. Additionally, other video games have also left an impression on the author through their use of silence. For example, *Dark Souls* (FromSoftware, 2011) adopts a minimalistic sound design, incorporating music only in specific moments in the game, otherwise relying on ambience and sound effects. *Dragon Age: Inquisition* (BioWare, 2014) features an impactful sound design in various sections, such as a scene where the player walks through the snow, only hearing their character's exhausted breathing, footsteps in the snow, wind blowing, and wolves howling in the distance. Moreover, several blogs and lists of games that effectively use silence can be found online (e.g. Culture of Gaming, 2022; Natividad, 2022). However, this topic is not currently widely

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<sup>3</sup> For example, Wikipedia has an article for "list of art games" in which both LIMBO and Dear Esther are mentioned ([https://en.wikipedia.org/wiki/List\\_of\\_art\\_games#](https://en.wikipedia.org/wiki/List_of_art_games#)). Wikipedia also has a category page for Art games, in which all three are mentioned ([https://en.wikipedia.org/wiki/Category:Art\\_games](https://en.wikipedia.org/wiki/Category:Art_games)).

researched in academic fields such as game studies, musicology, or sound studies.

Contemporary perspectives on silence in virtual spaces can be gleaned from recent studies and theses. For instance, Tekrø (2018) explores the immersive and lonely aspects of 21st-century video game music in the master's thesis *Playing the Sound of Silence: Immersion, Loneliness, and Analysis of Multi-modal Intertextuality*. Another example is Luoma's work in 2022, which, although not primarily focusing on silence, delves into sound-oriented design and planning for a virtual reality app in landscape architecture. Luoma (2022) acknowledges the relevance of an immersive sound experience in the holistic design and planning process. While not explicitly addressing the artistic context, it aligns with the argument that virtual spaces become more immersive with a well-crafted soundscape, which also includes the contrast between sound and silence.

## **2.5 Interdisciplinary perspectives**

In media or sound studies, questions about silence from an artistic perspective in virtual spaces have not been addressed from a practical point of view, although silence as a topic has been a curiosity from many other perspectives and approaches. Writings about silence in virtual spaces exist, but they relate to the recent rise of online meetings and silence in social contexts, such as communication and interaction with people in virtual environments (e.g. Gajjala, 2013). From a more philosophical perspective, silence has been observed as part of the concept of space and place (e.g. Casey, 1997). Silence is also approached as part of space through religiopolitical inspections, through a theory called 'metaphysical mysticism' (Krüger, 2018). From the more sound-oriented perspective, there are books about environmental sounds affecting the human quality of life and the experience of well-being in a place (e.g. Aletta et al., 2020) and how silence, sound and place relate to each other

(Cubitt, 1998). Other aspects, such as silence and spirituality (e.g. Khatchadourian, 2015; Laird, 2011), soundscapes of silent tourism (Bindeman, 2017) and creating sacred quiet spaces (D. Hermanson & Mumford, 2016) have also been addressed.

In a bigger picture, silence, as a phenomenon, is a complex subject (see Dauenhauer, 1980) that supports an interdisciplinary approach across several academic disciplines, such as the humanities, including linguistics, philosophy, and arts; social sciences, which involve fields like communication studies; and the natural sciences, notably acoustics. Within these disciplines, the range of study fields with their respective approaches to researching silence is even more varied. For instance, in the edited collection *Silence: Interdisciplinary Perspectives* by Adam Jaworski (1997), examples of both linguistic and communication studies are presented. Silence is regarded as a "metaphor for communication", viewing silence as a unifying concept for addressing various communicative phenomena, such as linguistic, discursal, literary, social, cultural, spiritual, and meta-communicative aspects (ibid, p. 3). Nevertheless, texts about silence in virtual space have not been approached from the practical point of view in sound studies. Moreover, they have not been combined with the experimental approach in producing artistic work that also shares the methods and tools used to create different types of an experience of silence in virtual space. There is still a lack of research about aesthetic silence in virtual environments. Most of the research around silence and virtual environments is related to the social and political aspects of communication, and in that framework, silence is considered either unwanted or awkward (Boland et al., 2022; Gajjala, 2013) or forced upon those who have no right to speak, for example, which relates to the concept of silencing (e.g. Ephratt, 2008; Jaworski, 1997; Kahn, 1997; Schweiger, 2015; Thiesmeyer, 2003).

It is important to note that this thesis will not delve into the social or political dimensions of silence. However, it is worth mentioning that there is a

growing emphasis on these approaches, which share fundamental concepts and an understanding of the noun 'silence' and its synonymous words. For instance, a recent article on researching silence in International Relations by Schweiger and Tomiak (2022, p. 625) combines methodological approaches to silence from sociology and linguistics, initially influenced by philosophy and literature as well as acoustics, as exemplified by Michal Ephratt (2008). Even though Ephratt primarily focuses on eloquent silence in a communicative language model, their article provides a compelling overview of how silence has become one of the subjects of linguistic studies. Additionally, they explore closely related terms, such as absence, stillness, pause, and silencing. Ephratt distinguishes stillness as the absence of sound external to communicative interactions. Silencing, on the other hand, refers to external prohibitions or censorship. Ephratt also defines pauses as representing temporary breaks between specific actions.

As an artistic study, the primary focus of this thesis is to identify practical tools for constructing a silent virtual environment. The concept of pause, whether examined within a musical context or from a rhetorical perspective, directly intersects with considerations in music and sound-related discussions of silence. Additionally, absence and stillness are thematic concepts that can function as practical elements within a composition or as abstract representations of experiential qualities. These three terms hold significant conceptual relevance within the artistic context of this thesis and support the thinking process while building the prototype version of the audiovisual album concept presented as part of this thesis.

There is still a lack of research about aesthetic silence in virtual environments. Most of the research around silence and virtual environments is related to the social and political aspects of communication between people, and in that framework, silence is considered either unwanted or awkward. Additionally, there was no research literature found about contrast as a key element of creating silences in virtual spaces at the time of writing this thesis.

A practical book about sound design in theatre flashed the term contrast as a descriptive word while describing how they approached sound designing a scene in a play (see Kaye & LeBrecht, 2009).

In conclusion, this thesis explores the relationship between silence, music, and virtual spaces within the context of an experimental audiovisual album. The theoretical framework, focusing on key concepts such as absolute silence, aesthetically meaningful silence, and contrast, provides a foundation for understanding and artistically creating silence within virtual environments.

From an interdisciplinary perspective, this work bridges gaps in the literature, which often addresses silence in virtual spaces primarily from social and political viewpoints. However, the primary focus of this thesis is to identify practical tools for constructing a silent virtual environment within the artistic context. Silence is not merely an absence of sound but an expressive tool, as demonstrated by various authors like Edgar and Khatchadourian in their exploration of the meaning of silence within music and other temporal arts.

The artistic component of this thesis presents an experimental audiovisual album that is shaped by artistic intuition rather than a direct mirroring of theoretical discussions. The composition process aims to evoke expressive moments within the music, incorporating abrupt pauses and silence to create disruption and contemplative moments amid loud and noisy sounds.

Game audio serves as a practical medium for sound design and music, and this project builds upon those tools and practices. However, it should be emphasized that the aim here is not to create a game but an experimental audiovisual album within a virtual 3D space. The virtual world becomes a canvas for the album, with the space surrounding and between the tracks mirroring the concept of traditional albums. This approach allows for an exploration of silence and its expressive potential, offering a fresh perspective on the audiovisual album format.

In summary, this thesis endeavours to push the boundaries of sound and silence in experimental sound art, demonstrating how they can be harnessed as powerful tools for creative expression in the evolving landscape of virtual spaces.

## **2.6 Theoretical framework for this thesis**

The journey into exploring the role of silence in music and audiovisual composition began with an artistic and intuitive approach. However, as delved deeper into the theoretical framework presented by van Elferen, Edgar and Khatchadourian, it became clear that the creative process had been inherently entwined with these theories. What initially seemed like an intuitive approach revealed its alignment with the principles and concepts encountered during the research. The concepts were there and as a musicologist, an individual with a classical music background, passion for composing and sound design, the basic concepts were already built-in, yet the theoretical terminology was not readily set or known.

This entwining of the artistic process with the theoretical framework allowed the author to see how the work could be situated within this broader context. It became evident that the experimental audiovisual album not only resonated with these theories and concepts introduced in this literature but also offered a practical application of these ideas. The album serves as a demonstration of how silence, as a creative element, plays a pivotal role in evoking expressive and disruptive moments within the compositions.

In essence, the artistic journey in this thesis project, while initiated from a creative standpoint, evolved into a fusion of art and theory. This convergence highlights the practical relevance of these theories and showcases how an artistic approach fits within the broader theoretical framework yet also experiments with something new by testing whether the concept of an audiovisual

album works in a virtual environment with game design elements attached to it.

The theoretical framework for this thesis emerges from a comprehensive exploration of the complex concept of silence within the domains of art, music, virtual spaces, and interdisciplinary perspectives. (1) Absolute silence is approached as a metaphor for the absence of being, a silence that, while impossible to experience in the physical world, carries profound symbolic interpretations, reminiscent of death. (2) Aesthetically meaningful silence addresses the context-dependent nature of silence, emphasizing its role as an expressive tool within various forms of art, particularly evident in pauses and silences in literature, music, and the environment. (3) Contrast introduces a novel perspective that, while often implicit, plays a pivotal role in shaping the relationship between sound and silence. This theoretical foundation is vital in understanding how silence operates within the creative framework of the experimental audiovisual album prototyped in this thesis. Although the compositional approach is driven by artistic intuition, the theoretical framework provides a lens for joining the artistic process with established concepts, ensuring the alignment of the creative work within a broader intellectual context. This interdisciplinary framework not only explains gaps in existing research but also demonstrates the significance of exploring the aesthetic dimensions of silence within virtual spaces while acknowledging the complexities and diverse meanings associated with silence as a phenomenon.



### 3 RESEARCH MATERIALS AND METHODS

This chapter introduces the research materials and methods while explaining the prototype of the audiovisual album. The research materials consist of artistic sketches and unfinished sound compositions created primarily between Spring 2022 and February 2023. These materials underwent significant re-editing, several alternative versions and partial redesign to adapt them for the Prototype. Additionally, a personal thesis diary was maintained as private documentation regarding various aspects of the project's progress, and to keeping track of the evolution of artistic ideas and concepts. While this text document is not shared, it served as a valuable reference for tracking the development process and how the ideas evolved during the creation process.

As illustrated in Figure 1, the design process in this artistic project followed an iterative approach. The initial artistic idea, *the spark*, exists outside the iterative circle and is connected via a horizontal line to the pre-design phase, enclosed within *The Project* circle, signifying the iterative process. In the prototype phase, the proof-of-concept was created through experimentation, mainly by methods like trial and error. Another horizontal line extends from the circle, labelled as *future*, signifying the continuation of the same iterative process, and highlighting the project's evolution. The focus of this thesis lies in the selection of iterations from the prototype phase, encompassing descriptions of the pre-design and re-design, the construction of a prototype, planning future steps, and further iterations with the ideas (see Figure 1). The musical compositions were primarily written during the pre-design phase but were revisited, re-edited, and sometimes recomposed during the active phase of working with the prototype for this thesis.

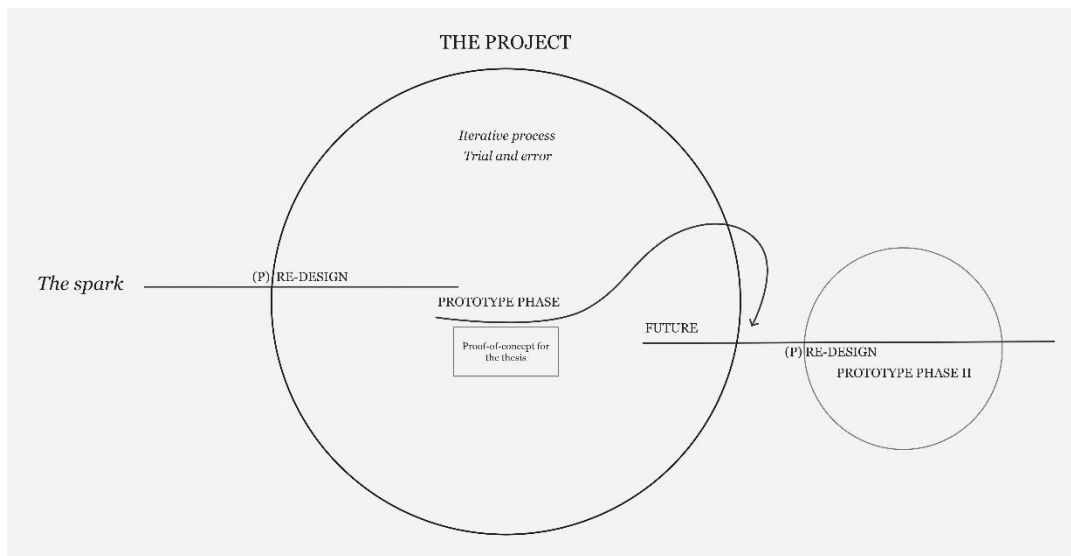


Figure 1. Iterative design process during this project.

The project's initial design phase involved multiple iterations, resulting in a substantial reduction in scope. The current Prototype represents an early proof-of-concept, featuring only a limited number of musical pieces from the original album, which included eight songs of various lengths, ranging from two to nine minutes. Additionally, the original concept encompassed a spoken word poem and a significantly larger virtual environment with several different areas of interest.

After deciding to use this artistic project as the thesis topic for Master of Arts in Sound in New Media studies, time management became a critical factor in shaping the scope and focus of the research. The initial research plan for the thesis project was formulated in October 2022, but it underwent revisions, and the final research plan was determined at the end of November 2022. However, the production phase was conducted during the following autumn, primarily in September and October 2023. The most substantial timing challenge arose from the amount of other work during the summer of 2023, which delayed the production phase tremendously. Additionally, adhering to the chosen deadline reduced flexibility in catching up with the project during

autumn. The following sections delve into the specific methods used in this practice-based research and discuss the challenges posed by the constraints encountered.

### **3.1 Methodological choices and constraints**

Given that this is an artistic research project, the primary methodological approach involved actively participating in the artistic process. The practice-based artistic research method was employed to gain insights into the sound design that aligns with a level design concept for the prototype conceived to construct a (silent) virtual environment. This virtual environment is intended to embody silence in both the audiovisual domain and the thematic layer, yet still giving room for interpretation.

#### **3.1.1 Artistic research methods**

In this qualitative research, one of the primary research questions was to determine how to create silent virtual environments through sound design. In other words, the aim was to identify best practices for achieving the desired atmosphere and experience in the virtual space. The qualitative aspects of this research stem from the goal of understanding the concept of silence as a phenomenon, explored through the literature review, and finding ways to comprehend various types of silences. Furthermore, the research aimed to identify methods for creating aesthetically meaningful silent experiences within a virtual space. The prototype serves as a proof-of-concept and can be viewed as a case study for this thesis.

In addition to the generally qualitative features, the following artistic research methods were employed during the research process: the artistic process was employed, which involved conceptualizing from both an intensive

insider engagement perspective and a more reflective outsider observation approach (Hannula et al., 2014). This methodology encompassed the creation of the Prototype, drafting various aspects of the prototype, planning, testing, encountering failures, and making iterative improvements. Silence was contextualized through the literature review, as well as through personal experiences that served as the inspirational spark for the artistic component.

During the conceptual work phase (Hannula et al., 2014, p. 17) a working hypothesis was formulated, with "contrast" identified as a key finding and framework guiding the development of the prototype level. Future iterations may involve further refinement based on feedback, potentially through a questionnaire. While formal user testing was limited due to time constraints, valuable insights were gathered from a few individuals who tested the Prototype. This external feedback played a crucial role in influencing various aspects of the Prototype. Furthermore, two play-through videos were recorded during the proof-of-concept phase.

Klein (2010) emphasizes the reflective nature of artistic experience, viewing it as a form of introspection and external observation simultaneously. Artistic research encompasses various methods, touching on motivation, inspiration, reflection, discussion, question formulation, conception, composition, implementation, and evaluation. Furthermore, artistic knowledge, whether conveyed through silence or words, implicitly or explicitly, is inherently sensory, emotional, and physically embodied, emphasizing the importance of a "felt" knowledge that encompasses the entire spectrum of human perception. This reflective nature was presented throughout the thesis process from creating the research plan to thinking about the working hypothesis and designing and building the Prototype. In addition, on a more abstract creative level of doing, the felt knowledge of silence and the closely related subjects, such as emptiness has been planted into the Prototype.

### 3.1.2 Sound design

The least experimental aspect of the production process focused on the sound design methodology, drawing from established practices within game audio. To this extent, the game audio middleware Wwise (Audiokinetic Inc, 2023) was utilized for integrating sounds and music into the Prototype. This decision was motivated by a deliberate desire to engage in a learning process aimed at mastering game audio practices, potentially for application in future game development work. Consequently, the practical choice was made to incorporate this learning process into the thesis project, even though the project's approach and content were not aimed towards game development. Furthermore, the decision was supported by a sense of curiosity regarding the adaptability of tools designed primarily for game production within an experimental context, such as their suitability as a medium for an audiovisual album.

It is noteworthy that all the current sounds and music in the Prototype are considered placeholder sounds, that serve the purpose of demonstrating the prototype phase. While they are not mixed and mastered for final production, they have undergone necessary editing to be suitable within the placeholder context: all audio has been appropriately normalized, and loudness adheres to EBU standards.

The audio in this project is a mix of various sources and recordings. Vocals have been recorded by the author specifically for this project. A machine sound, which can be heard at the start of the prototype level, is credited to Adam Wayne Gistarb<sup>4</sup> and sourced from Freesound.org. The machine sound

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<sup>4</sup> The original audio file *Generator#1.wav* was downloaded from Freesound.org several years ago. The original user account seems to be deleted, yet the recording and the credits for the person who recorded the sample are still found on the webpage from the following link [https://freesound.org/people/deleted\\_user\\_4401185/sounds/243735/](https://freesound.org/people/deleted_user_4401185/sounds/243735/) (accessed 10.11.2023).

underwent extensive editing, and it is used as a sound source for an instrument sampler in Ableton, which is then composed and used in the project as an ambience music track. Additionally, virtual instruments played a crucial role during the composing phase, featuring, for example, a piano sample from Spitfire Audio's LAB instrument packages and other samples sourced from Ableton 11's sound libraries. Footsteps and several of the sounds featured in the ambiences in the Prototype are from the author's recording library.

In terms of technical details, the recordings were primarily recorded at 96kHz and later downsampled to 48kHz during export from Ableton. This decision aligns with established practices in game audio sampling and was influenced by tutorials related to Wwise. It also serves the practical purpose of managing project size effectively.

### **3.1.3 Constrains in the scope of the thesis**

Within the scope of this thesis, various constraints, including resources, ethical considerations, and time management, played crucial roles. It is essential to clarify that the prototype discussed herein serves as the initial proof-of-concept for a more extensive artistic idea, still in progress and anticipated to require over a year of active development to reach completion.

In terms of resources, equipment constraints significantly influenced the project's shape. Software choices were based on accessibility and existing knowledge. For example, Unreal Engine 5 was chosen due to familiarity, supported by the fact that Epic Games offers a collection of freely available high-quality assets<sup>5</sup> suitable for prototyping within the game engine. Similarly, Wwise was selected for audio integration, considering its pre-installed status

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<sup>5</sup> The term "asset" is commonly used in game production. It refers to all content inside a game project, such as sound files, 3D objects, maps and more.

and basic knowledge acquired during Sound in New Media studies. Recording devices were employed based on availability, and while Aalto University's resources could have been utilized, the project's initial design and schedule did not align with this possibility, and I used equipment I already had at my disposal.

Skills and collaboration should have been a key consideration during the production planning phase. In hindsight, the production phase resembled a game production, and collaboration with others would have made a huge difference in how the original idea turned out to be in the first prototyping phase. Working alone necessitated the use of ready-made assets and frequent blueprint<sup>6</sup> revisions in Unreal Engine. Collaborating with someone proficient in 3D asset creation and programming would have allowed a more focused approach to functional aspects, enabling greater attention to artistic design and sound-oriented considerations.

In addition to the resource considerations, also ethical aspects constrained the prototype. The intimate theme prompted ethical reflections on the extent of personal disclosure within the thesis. Efforts were made to navigate a balance between addressing the theme of death, loss and bereavement yet avoiding excessive details on how they relate to the author's motivation and inspiration to produce this prototype or the actual artistic work in the shape of the experimental audiovisual album in the future. Another ethical consideration was to ensure the full accreditation of non-original materials, with a comprehensive list of used assets as additional digital documentation. Additionally, proper credits for asset packs were included within the Prototype, under the Credits option.

Regarding time management, it became evident that the project would require more than a year of full-time work for the realization of the complete original artistic idea. The project was scoped down multiple times, and

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<sup>6</sup> Blueprint is a Unreal Engine asset for visual programming functions in the game.

eventually even the user testing phase was left out of the scope of this thesis. One of the biggest constraints and issues during the thesis process was balancing studies and work life; combining these two negatively affected the thesis work, specifically on the production part of the project.

### **3.2 The implementation of the research**

When beginning the thesis project, there were already bits and pieces ready to be combined: some resources and literature already collected about silence and how it is (thematically) used in different fields of art. While the concept of art games had previously been a significant focus in the author's prior studies, the current project might have drawn inspiration from those subjects yet diverged from them and aimed towards the idea of an experimental audiovisual album. Distinct from an art game, the Prototype remains committed to its identity as a prototype of an experimental audiovisual album, featuring subtle interactive elements and utilizing tools conventionally associated with game production—specifically, the Unreal Engine 5 and the audio middleware, Wwise. Although the project drew inspiration from art games, these influences were not directly incorporated into the current project.

The project began with a creative and expressive part: writing poems, composing music and for some pieces, remaking and combining both poems and musical ideas into an enhanced idea combining both aspects. Various methods, techniques, and technological tools were employed throughout different phases of the project.

Key software and technology included Ableton Live 11 for composing music and editing sounds, Audacity for audio formatting to ensure the WAV files are following EBU R128 standards, and Wwise for audio middleware integration. Vocal recordings were captured using three different devices: the Zoom H2N recorder, HyperX Cloud II headset microphone, and Røde NT2-A



condenser microphone. The Focusrite Scarlett 2i2 3rd Gen served as the sound interface. All recordings were conducted in a non-professional setting, namely in the author's living room.

The technical implementation involved integrating Unreal Engine 5 with Wwise, constructing the audio system, establishing sound events<sup>7</sup>, and developing an interactive music system on a very small scale for the Prototype. Within Unreal Engine, the project included two block-out level tests, with *TestLevel\_01* dedicated to configuring interaction functions, while *LO1* served as the primary prototype level embedding audio within the project environment. The outcome resulted in the first, yet unpublished, prototype.

### **3.3 Methods**

Methods employed across the different project phases were diverse. Pre-production primarily involved artistic and creative practices, while the in-production phase included activities such as background research, literature review, composing, audio editing and production work. As discussed earlier in this chapter, the project's progression was iterative, involving trial-and-error, testing, reworking, and reflection processes. This iterative cycle persisted until it reached a point where the Prototype functioned as a proof-of-concept for the envisioned audiovisual album. Comprehensive documentation, including detailed notes, was maintained for subsequent developmental stages, outlining requisites for a version suitable for user testing.

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<sup>7</sup> Events are functions that are triggered between game engine and audio middleware based on preset conditions (such as playing a certain sound).

### 3.3.1 Pre-production

The practical methods employed in the project can be categorized into three distinct phases. The foundational concept idea was a fusion of two project ideas. The exploration of silence as an artistic tool had been a lingering curiosity for several years, lacking a clear practical starting point beyond the analysis of existing works of art. The other component of the idea, involving artwork creation within a game engine, evolved from a more extended contemplation of art games as a research subject, influenced by the author's recent acquisition of skills in game design studies. The third and most personal element, which catalysed the idea, emerged from a personal loss, compelling the need to navigate and express emotions through artistic means—primarily through writing poems and composing music to articulate emotions that lacked verbal expression.

Methods employed during the pre-production phase were predominantly creative and artistic in nature:

- Writing poems, lyrics, and streams of thoughts (documented on various platforms, ranging from physical paper to the author's phone's Note application).
- Creating sound pieces that conveyed "emotions without words", combining some poems as lyrics with the composed music and expanding upon them.
- Incorporating spoken word into the sound pieces.
- Utilizing mixed composing techniques.
- Audio editing.
- Maintaining a private art diary.

The software and technology employed during this phase included Ableton Live 11 for composition and audio editing. Vocal recordings were captured using three different recording tools (refer to section 3.2). Audacity was utilized to ensure that all tracks destined for Wwise adhered to loudness

normalization based on EBU R128 standards. Consequently, all placeholder sounds were set to -23 LUFS. The Wwise project was initially created during this phase; however, it was later reconstructed and initiated afresh when the production phase began. The author adopted a more systematic work process, tailored specifically for this thesis and its research questions.

### **3.3.2 Production phase**

During the production phase, most of the work occurred within Unreal Engine, focusing on blueprints, functionality, and the design of the prototype level. Simultaneously, the Wwise project underwent multiple revisions. Practical methods in this phase involved relying on YouTube tutorials to grasp the fundamental interactions between Wwise and Unreal Engine. The project plan was revisited and redesigned based on newly acquired knowledge and testing. This phase heavily relied on trial-and-error methods. Additionally, a master design document was constructed using Miro<sup>8</sup>; however, it became evident that effective design required testing. The utilization of premade Unreal Marketplace assets imposed constraints on the type of level that could be constructed, altering the approach from designing the level outside the game engine to experimenting with existing assets within the engine. Throughout the production phase, the author maintained a thesis diary, documenting progress, observations, and references. This diary served as a valuable resource during the writing process and aided in recalling the progression of the artistic project over time. Notes were also taken regarding possible references and findings made during this phase, ultimately leading to the identification of contrast as one of the key aspects to be tested in the Prototype.

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<sup>8</sup> Miro board is a visual workspace for design, workflows and presentation. <https://miro.com/> (accessed 11.11.2023).

## 4 THE PROTOTYPE

In this chapter, the design and production parts are explained in detail. The subchapters will explain different aspects of the design process and practical choices made while working on the project part as well as the iterative process of learning while doing.

### 4.1 Designing the project

The prototype introduced in this master's thesis is a proof-of-concept for an artistic idea that the author has been developing for over a year. It emerged by merging two distinct ideas when an unexpected, traumatic experience led to the creation of various creative sketches aimed at processing the emotions associated with the event. This experience triggered a series of thematically linked poems, musical pieces, and sound experiments, all centred around the concept of unpleasant silence and the feelings of absence and emptiness. The contemplation of silence as an artistic tool, a more neutral perspective, found its place amidst the numerous artistic sketches that had been created simultaneously.

The concept of an experimental album began to take shape, and the final decision to realize it in a virtual environment, utilizing a game engine and game audio tools, evolved from the author's curiosity and emphasis cultivated during their studies at Aalto University. This involved majoring in Sound in New Media and pursuing minor studies in Game Design and Development.

#### **4.1.1 The original idea: Experimental audiovisual album**

The experimental audiovisual album aimed to integrate silence as an artistic tool and explore an alternative approach to how albums are perceived. The core components included an exploration and reimagining of the traditional album concept within a virtual environment. Departing from a linear approach, where songs are arranged in a predetermined order, the author sought to challenge the conventional album structure. While listeners have the option to shuffle tracks or repeat a single song in a traditional album format, the primary goal was to reconceptualize album creation from a composer's perspective. Key areas of experimentation included (1) non-linearity, (2) the spatial relationship between tracks, and (3) the integration of a virtual, three-dimensional space. Furthermore, (4) the theme of audiovisuality and visuality played a crucial role, in influencing the spatial and dimensional aspects. In a virtual space, the listener engages not only in listening but also in interaction, essentially "being inside" the album and experiencing it with more control over the space.

#### **4.1.2 Theoretical background combined with artistic need**

In the development of the thesis project, an interdisciplinary approach was adopted, drawing upon the concept of intermediality as discussed by Fuchs and Thoss (2019), particularly in the context of video games. This perspective, along with the exploration of autobiographical games and existential video games, played a role in inspiring the theoretical foundation of themes related to aspects and narratives around bereavement. Due to the scope of this thesis and the focus on sound design aspects, the second chapter of the thesis did not deal with these themes but focused only on silence as a phenomenon. It is still important to mention, that background research on these topics was done as well, and they have affected some of the design choices

made during the project, even though it is not included in the textual presentation of the project.

Within the domain of game studies, the examination of autobiographical games and existential video games provided not only theoretical insights but also served as a background reference for conceptualizing the artistic aspects of the project. In addition, sound studies, including game audio, soundscapes, and experimental sound design provided inspirational information that had an indirect effect on how the Prototype gained shape. As a composer, the author drew inspiration from the musical elements embedded in video games, seeking to understand how music can be a powerful tool for conveying personal narratives and what kind of sound design games that touch similar concepts might have, even though this is also a part of the project that was not included in the scope of this thesis.

#### **4.1.3 Thematic approach**

The thematic inspiration for the artistic component of this thesis draws from a personal experience of loss, which is, unfortunately, also a universal human experience. Absolute silence is explored as a metaphor for death. The concept of painful silence is evoked through the soundscape and the quality of the sounds used depict these aspects and is chosen to show how one view of a painful silence sounds like. Additionally, the broader theme of mortality and the inherent silence associated with death provides a contemplative backdrop for the artistic exploration. While the specific personal experiences that influenced this thematic approach are not explicitly detailed, the aim is to create a space for contemplation and reflection on the shared aspects of silence, absence, and emptiness.

The audiovisual album is not a game, but there are a few game genres that can be considered as a thematic reference and share similarities with the approach, such as autobiographical games and existential games, or the way

the interactive parts of the work has been presented, such as walking simulators.

In autobiographical games, the game maker's personal experience is a crucial part of the design process and the main element of the game's narrative and theme. Matthew Farber and Karen Schrier define autobiographical games as "playable narratives based on the authors' or designers' lived experiences" (2021). Notable examples like *That Dragon, Cancer* (Green & Green, 2016) and *Depression Quest* (Quinn et al., 2013) have been studied in the context of death and bereavement, providing insights into how video games address these topics (e.g. Brooks et al; Newsome-Ward & Ng 2022). There are also several writings about a game called *Spiritfarer* (Thunder Lotus Games, 2020), in which the idea is a management game about dying (e.g. Steam - *Spiritfarer®: Farewell Edition*, 2020). One relatively recent article uses *Spiritfarer* as an example of casual art games as trauma therapy (Austin & Cooper, 2022), and there is also one conference paper which explores how the death-themed game can help players cope with the loss of a loved one (Eum et al., 2021).

Games like *That Dragon, Cancer*, *Depression Quest* and *Spiritfarer* can be considered as a point of curiosity, and as inspiring examples that give insight into how certain subjects, such as death and bereavement, have been tackled in video game format. In other words, if the focus shifts from the ludological aspects of video games into observing games as one form of interactive media, I would argue that they can be considered interactive virtual environments. Autobiographical games share similar thematic topics as the thesis author is exploring in their work. For example, in the artistic component of the thesis, interactive elements create freedom for the listener to control the virtual space. The work also resembles a virtual interactive installation. However, the core aspect is the experimental concept of an interactive audiovisual album. Instead of a passive listener-observer, the listener - or the experimenter, the visitor - can choose in which order and what they listen to, or if

they want to exit the experiment. In between the songs, there is the space of nothingness, the ambience, or no ambience at all. They are free to walk around and interact if they want to. In this sense, the functionality of the interactions available resemble games that are categorized as walking simulators, like the first-person game *Dear Esther* (The Chinese Room & Briscoe, 2012) which is an exploration game about love, loss, guilt and redemption. In the game, the player explores a remote island discovering fragments of the story through narrative and visual cues in the environment. In *Dear Esther*, though, there is no interaction with the object in the level, the player can only walk and experience the environment, while the narrative triggers as the player walks to certain areas and triggers a new part of the story.

However, the audiovisual album is not a game, even if it shares similarities with certain game genres. It can be considered as an interactive virtual environment and perhaps somehow drawing inspiration from video games as virtual environments and video games as one medium for interactive art with a strong emphasis on audiovisual traits.

## **4.2 Proof of concept**

Developing the artistic component involved reading and watching tutorials about Wwise and integrating events into Unreal Engine 5. Additionally, multiple tutorials related to Unreal Engine 5 were watched several times to achieve the desired implementation of specific functionalities. Despite having a basic understanding of programming, the author had to revise their blueprints multiple times to achieve even the basic functions they intended. Furthermore, challenges with Wwise events, such as ambience functionality issues—working, not working, and then working again without apparent reasons—added complexity. The lack of a well-defined initial concept made the level design a challenging trial-and-error process. Figuring out how to study silence and the tools for creating it also consumed a considerable amount of



time. While the author initially envisioned an experimental audio album, transforming it into a thesis project with a narrower focus became challenging until the realization of contrast as a key aspect helped everything fall into place.

The prototype of the artistic component is a mixture of sound design, game design techniques, composing methods, programming thinking, and testing the Prototype through trial and error. The working hypothesis—"a minimalistic approach to the number of sounds, adding reverb, and contrast are the key aspects in creating a silent atmosphere"—emerged during the construction of the first test level and the basic functionalities for the Unreal Engine project. In this context, contrast could entail comparisons between loud and quiet, movement and stillness, dark or lit, sound and music, sound, and silence.

Game design techniques are centred around creating a virtual environment and interaction within it. Drawing from game design terminology, this thesis adopts the following terminology to describe the artistic work and its creation: the virtual environment is referred to as a level and designing it as level design and objects in the level are called assets. As already mentioned before, the Prototype was developed in Unreal Engine 5, integrated with an interactive audio middleware Wwise and sounds were mostly edited in Ableton 11, exported to Audacity for loudness normalization and then placed inside Wwise for further functionality development.

#### **4.2.1 Contrast**

Silence, as an artistic tool in virtual spaces, covers diverse approaches. The working hypothesis, distilled from background research on silence and its conceptualization, narrowed down to three main points: contrast, movement, and reverb. Among these, contrast was explored more closely in the production phase of the thesis, resulting in a prototype level as a proof-of-

concept. While the theoretical part of the thesis explores these topics, the artistic component functions as an experimental study focusing on one theme—a prototype that delves deeper into the concept of contrast when creating audiovisual experiences of silence in virtual spaces.

The prototype level served as a platform for exploring three distinct approaches to sound design within the virtual space, with the aim of conveying a sense of a silent environment. Given the master's thesis's scope, the artistic experiment delves only into contrast in greater detail. Future development and testing would involve incorporating other aspects of the working hypotheses. This could include creating separate levels for individual testing or modifying the existing test level to include areas for exploring themes beyond contrast.

The results address findings related to contrast and assess its viability as a sound design method for crafting a silent virtual environment. In the Prototype, music functions as a counterpart to silence, allowing an examination of the contrast between the absence of sound and the presence of music, considering loudness as a factor. Ambience, positioned as the "in-between spaces", occupies the realm between music and silence. The exploration involves assessing how different scenarios, such as the presence of ambience, sound effects, or complete silence, evoke distinct feelings. The aim is to understand the experiential aspects of the space and the emotions, if any, elicited by the test level.

#### **4.2.2 Compositions featured in the Prototype**

During the pre-design phase of the project, several compositions were in progress and intended for inclusion in the experimental audiovisual album. However, only five pieces were eventually selected for the Prototype, with only two presented in their full-length form.

*Parane pian* is a simple and minimalistic piano piece created entirely in Ableton Live using Spitfire Audio's free virtual instrument pack<sup>9</sup>. Originating from a one-night improvisation session before the loss was in any way expected, its Finnish title ironically translates to "Get well soon," a message unheard by the intended recipient. Notably, the Ableton project was not saved, making the existing exported file the sole version of the song.

Another featured song, tentatively titled *Paranebiitti* is a reimagining of the original piece, *Parane Pian*. Transformed and fractured, this rendition narrates the journey from optimistic beginnings to bittersweet reflections. Both compositions serve as poignant reminders of unheard echoes.

The Main Menu screen features an introductory section of a longer composition cryptically named *ok2020*, although the actual name for the original song is meant to be *Silence Within*. While intended for broader use in the Prototype, it became evident that there was no room for the song at the actual test level and it was limited to the Main Menu to avoid overcrowding the environment and to maintain the essence of experimenting with silence.

*Ashes A* and *Ashes B* represent variations of a musical motif intertwined with a poem written during the initial months of dealing with loss. Evolving from this combination, the full piece, *Ashes*, underwent multiple iterations, from which the Prototype features the most recent variation, a more ambient-like rendition covering only the introduction section. Similarly, *You Promised (to come home)*, originally a complex sound composition with extensively edited vocals, was distilled in the Prototype to a small segment that better suited the level.

These compositions share similarities in their aesthetic sound qualities, connecting them to the overarching thematic vision characterized by rough low

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<sup>9</sup> Spitfire Audio's LABS is a free virtual plugin featuring a series of software instruments. [https://labs.spitfireaudio.com/?sortBy=prod\\_products\\_labs\\_latest](https://labs.spitfireaudio.com/?sortBy=prod_products_labs_latest) (Accessed 11.11.2023).

frequencies, buzzing basslines with noise and distortion, and the use of modified piano and manipulated vocals. These elements contribute to the representation of emotions and thoughts left unspoken. The music's aesthetics highlight ugliness, roughness, and loudness while maintaining minimal and repetitive patterns. Compositions like Paranebiitti and Ashes A and B employ structural contrasts, transitioning from peaceful to epic and loud, serving as artistic expressions of unspoken emotions now echoing in an empty mental space. In the concept of this work, the intentional manipulation of the author's own voice, an instrument chosen reluctantly, adds an ironic layer, symbolizing the audible solitude left behind when the other person can no longer hear. The music becomes a representation of the inner silence that is not truly silent—a loud and unsaid cacophony within the emptiness of the mind.

#### **4.2.3 Wwise project**

The technical specifications for the Wwise project of the thesis prototype were configured for both Windows and Mac platforms, although only the Windows build was utilized and constructed in Unreal Engine. The conversion settings in Wwise were the following: maximum sample rate was set at 48 000, and the format was designated as Vorbis with a quality setting of 6.

The current Prototype comprises a total of 52 audio sources, of which 41 are presently in use. The content in Wwise underwent multiple modifications, and the current project retains a few unused sound sources and events, temporarily excluded from the prototype level. Figure 2 displays all the currently utilized Wwise events, with the unused events indicated by a strikethrough. In Figure 3, a schematic view of the master-mixer hierarchy illustrates the creation of separate bus channels under the Audio Master Bus for various audio groups, ranging from SFX (sound effects) to Music and Ambient buses. Additionally, a dedicated bus for Reverb affects specific sound effects like

character footsteps, environmental sounds, and some UI sounds featured in the Prototype's Main Menu screen.

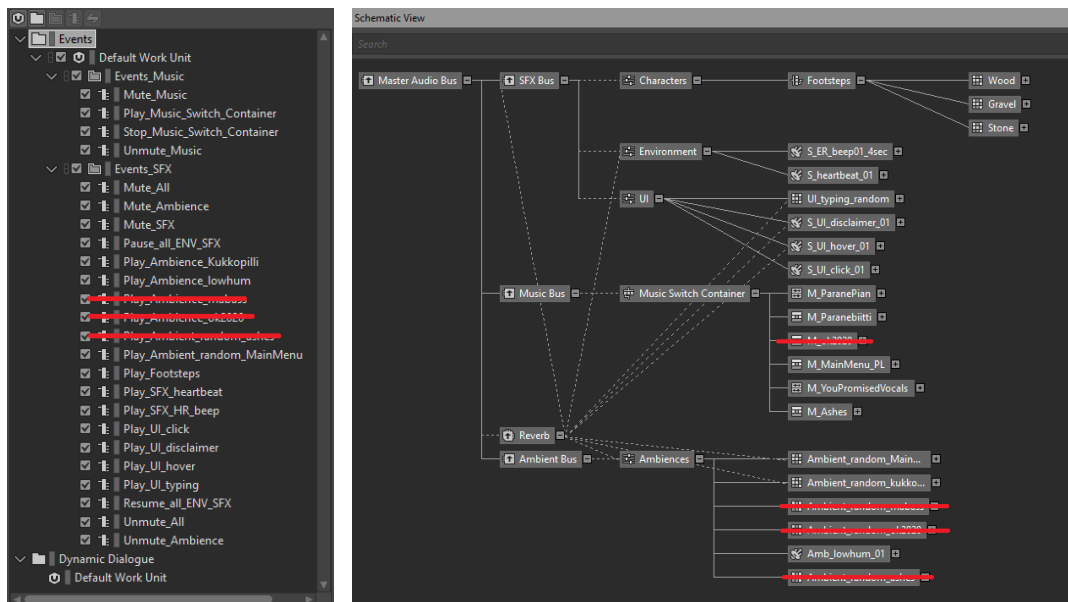


Figure 2. List of Wwise events.

Figure 3. Schematic view of the master-mixer hierarchy.

Not all events and sounds are currently in use in the Prototype, reflecting a discovery made during the artistic research process. It became evident that the space itself imposes restrictions on the types of sounds that 'fit' into it. This limitation is particularly relevant to the concept of silence. The empty space requires room to expand and evoke a sense of emptiness or nothingness. Therefore, the sounds and music in the level must adapt to the size of the space. This realization is a key factor in the decision to feature only two full-length music pieces, Parane Pian and Paranebiitti, while other pieces serve as short fragments or 'teasers' providing a glimpse of the music intended for the experimental audiovisual album.

#### 4.2.4 Level design

The Prototype includes a simple Main Menu screen (see Figure 4) that begins with a disclaimer, signifying its status as a prototype for an experimental audiovisual album. Constructed using Unreal Engine Widget<sup>10</sup> blueprints, emphasis was placed on correct functionality over visual aesthetics at this stage. The intentional minimalistic design aims to convey a sense of emptiness and nothingness, even within the main menu. This design choice avoids unnecessary elements to give audio features more room to stand out. Moreover, the disclaimer section instructs us to pay attention to the sounds in the prototype and to find an "Exit" sign, when wanting to quit the experience.

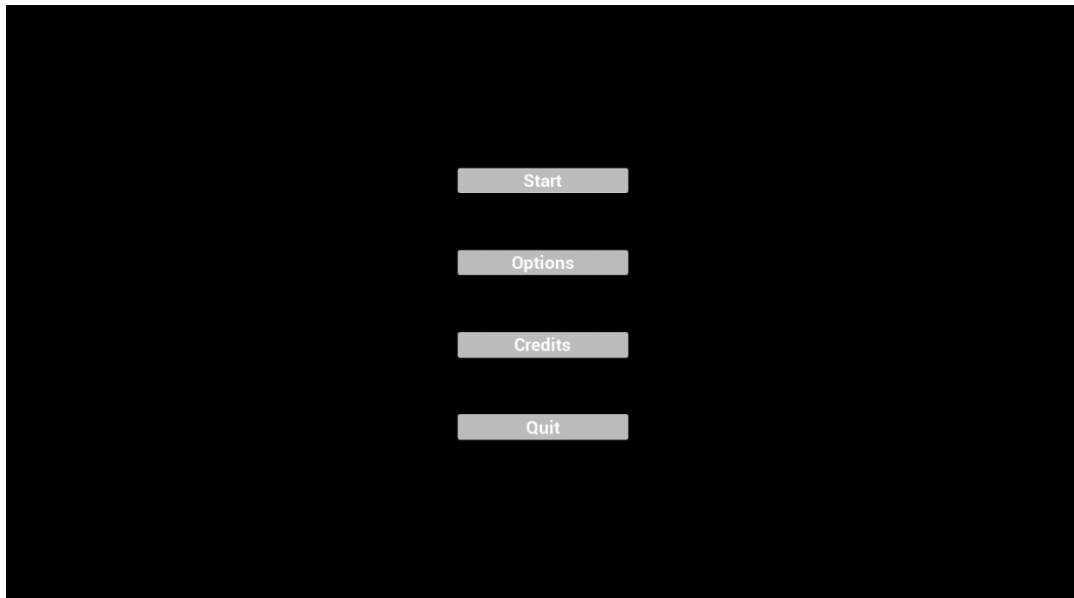


Figure 4. The Main Menu screen of the Prototype.

Regarding the sound design in the Disclaimer and Main Menu screen, a hollow ambience is playing in the background. The ambience is composed of eerie recordings of a rooster whistle (in Finnish 'kukkopilli'), edited with reverb, and occasionally appearing sounds of clay pieces tinkling inside the

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<sup>10</sup> A widget is a special type of 3D UI element in Unreal Engine 5.

rooster whistle. The Disclaimer screen has a sound effect for the letters, which appear as if they were typed in in real-time. The sound effect is originally a recording of a vintage/industrial type ceiling light which has a metallic dome and a chain from which it is hanging. The sound of the chains touching the dome was recorded, edited, and used as the typing sound of the disclaimer screen with two length variations (one second and two seconds), which were combined as one random container event in Wwise.

In addition to the ambience, a music track starts playing when the Disclaimer screen ends, and the Main Menu screen becomes visible. There are also sound effects for the mouse hovering over the buttons, as well as a sound when a button is clicked. These sounds are also made from the same ceiling light recording.

The prototype level, *LO1*, is designed with two Exit points (see Figure 5) and four points of interest (see Figure 7). These points of interest represent the four songs strategically placed within the level, serving as a demonstration of the tracks featured in the experimental audiovisual album. This placement aims to create a contrasting element between the empty space and silence. The entire level is roughly divided into three rectangular areas, as illustrated in Figure 5. The starting point, where the visitor spawns, is located on the left edge of Area 1. Figure 5 shows the level from the top view with the different areas, a starting location and Exit points marked. The area numbering in this figure is for demonstration purposes only; visitors are not required to explore the areas in any specific order. Multiple points of interest are visible upon entering the level, allowing visitors the freedom to choose where to go and what to explore, as shown in Figure 6.

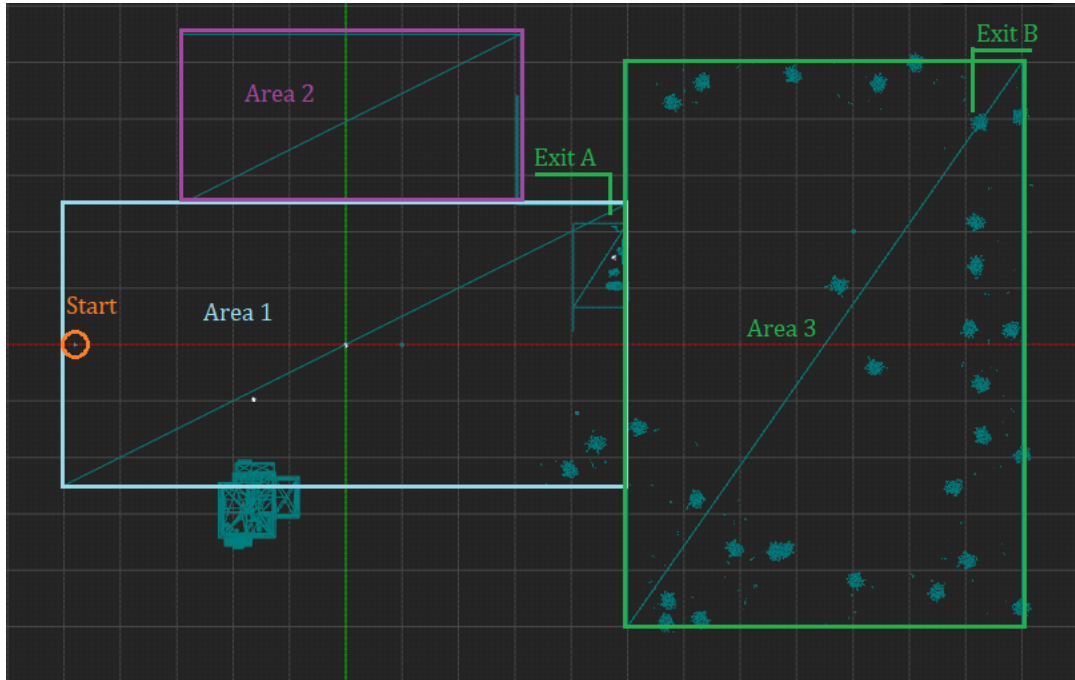


Figure 5. L01's layout from the top view.

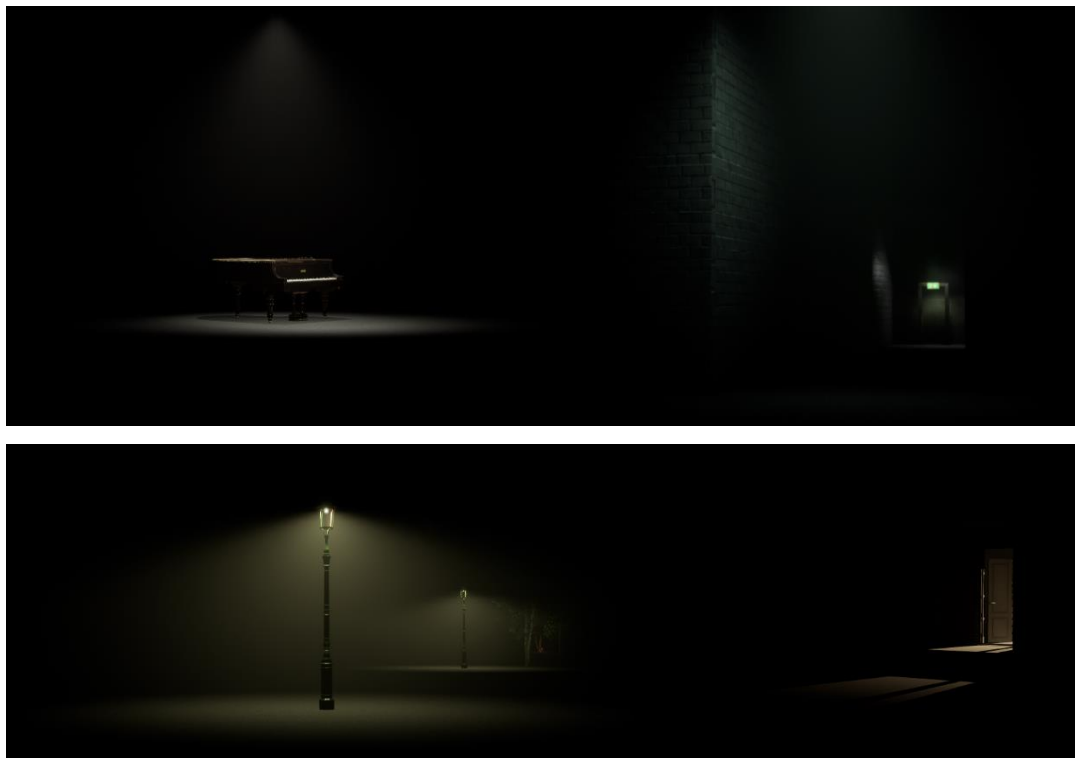


Figure 6. Four objects the visitor sees when entering L01.



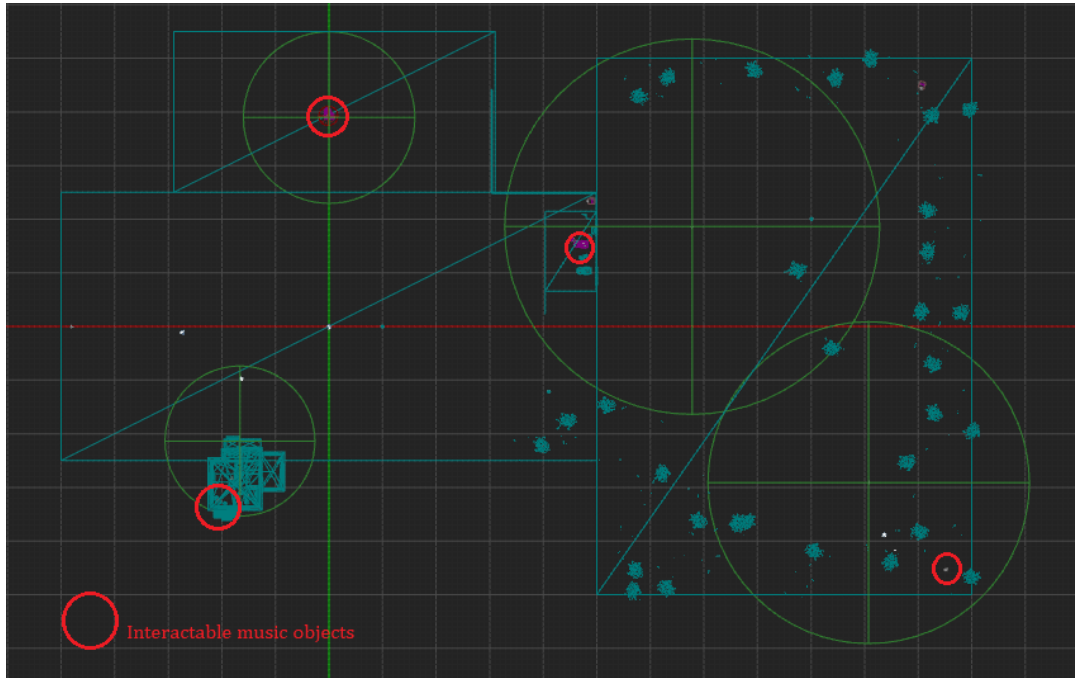


Figure 7. The locations of the music triggers and the interactable objects.

The four points of interest mentioned earlier are music trigger spheres, each containing interactable music objects (see Figure 7). From left to right in Figure 7, the interactable objects trigger the following music pieces: a laptop inside the building triggers the music for *You Promised* (to come home); a grand piano in Area 2 triggers the piano piece *Parane Pian*; in the middle of the level, a hospital scene with a bed triggers the longest music piece, *Paranebiitti*; and in the woods at the bottom right corner, an android (Unreal Engine mannequin character) triggers a short animation sequence and simultaneously the song *Ashes A*. The level also features two area ambiances, as shown in Figure 8. The first ambiance in the lower left corner combines the rooster whistle with a low machine hum. The second ambiance in the middle of the map is a hollow heartbeat, connecting the songs *Paranebiitti* and *Ashes* by re-emerging shortly in both music pieces. Additionally, there is one

environmental object making a beep sound, and in addition to that, the visitor can hear their own footsteps while exploring the level.

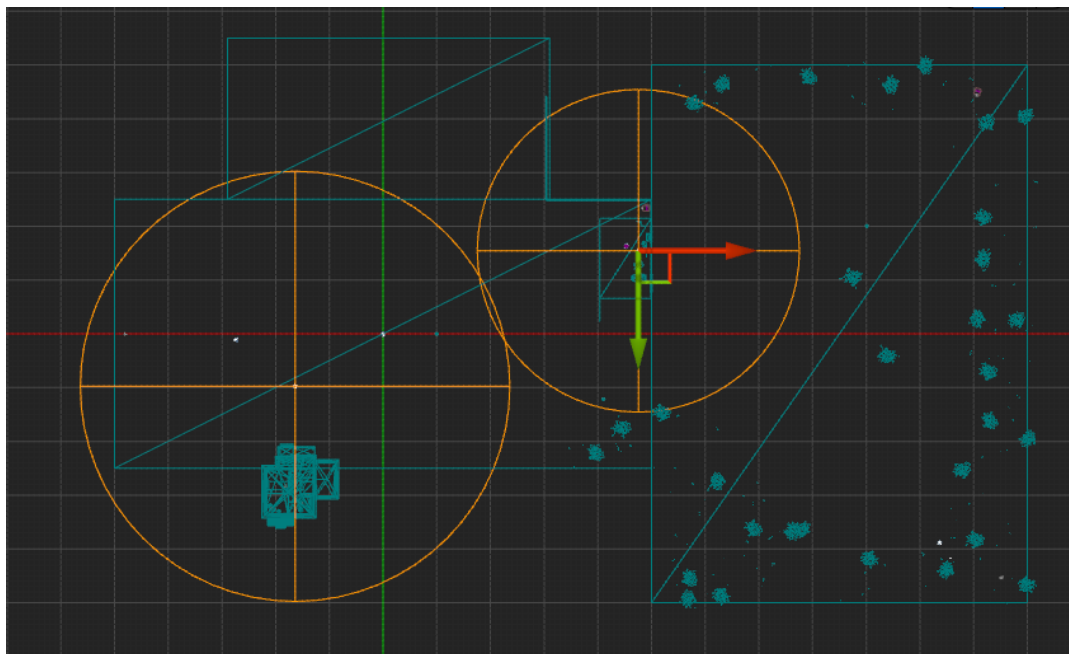


Figure 8. Two ambience sounds and their attenuations in L01.

Contrast was implemented and tested at the level through specific design choices. Music tracks serve as counterparts to no-sound, acting as album tracks, while silence and other sounds in the virtual environment represent the space or what lies in-between the tracks. Ambience tracks function as the sounds in-between, enhancing the atmosphere, particularly in areas like Area 1, where background ambience is present until the visitor interacts with a music object. Another visual contrast is introduced by illuminating only the points of interest, leaving the rest of the environment dark and empty. The third aspect involves the progressive reduction of sounds, leaving eventually only footsteps. This contrast becomes more audible from the middle of the level onward, where the heartbeat serves as the sole environmental sound unless the visitor enters the hospital scene. If the visitor listens to Paranebiitti, the music evolves into a loud phase. In Area 3, there is no background ambience if the visitor has interacted with any of the music tracks; only the sound of footsteps remains.

Throughout the level, deliberate exploration of contrast in sound effects, ambience to music, and back, as well as from music to silence, was conducted. Although feedback on the effectiveness of these contrasts is pending, and visitors can interact with objects in any order, a narrative buildup and tension emerge when exploring the areas in a certain order, even though the original plan was to break the concept of linearity in this sense. Concerning the soundscape in the environment, listening to certain songs, and allowing the space to breathe afterwards significantly impacts the experience of emptiness and silence at the test level.

These observations are solely based on the author's evaluation. However, a crucial finding during the construction of these contrasting elements was that a larger space is essential to allow different elements more room to create a sense of silence, absence, or emptiness.

### **4.3 Uncompleted features and future development**

At this early stage of development, the Prototype serves as a foundational proof-of-concept for the experimental audiovisual album. Several key areas for improvement have been identified for the next production phase. A top priority is addressing bugs within the level and refining blueprints to enhance functionality. The project's optimization, starting with the removal of unnecessary assets, is also crucial.

Future development involves enhancing visual elements during musical segments and considering the expansion of the level to allow visitors to move around while experiencing the music and subsequent silence. Strategic steps, such as fixing bugs, refining blueprints, and optimizing the project, are immediate priorities.

Visual refinement for future iterations includes fine-tuning the Main Menu and Disclaimer widgets. This involves aesthetic adjustments, such as

incorporating a custom font, purpose-built buttons to replace standard grey ones, and a meticulous reassessment of button size and placement in forthcoming production phases.

User testing is pivotal for refining the project. This entails creating a comprehensive questionnaire to gather valuable insights into testers' perceptions of the virtual space. Considerations also extend towards a more expansive level design or the incorporation of multiple levels, moving beyond the current focus on truncated teasers.

Future milestones involve replacing placeholder assets with bespoke creations and a comprehensive level remake. Augmenting functionality and interaction represent a key trajectory, empowering audio to dynamically control and respond to visitor interactions. This progression involves a deepened exploration of conceptual nuances and varied interpretations of silence.

If, in the future, a questionnaire is to be conducted, then extensive user testing is also required. For now, the evaluation of the Prototype and the artistic aspects are based on critical self-reflection and a few comments received from people who tested the project while it was a work-in-progress.

## 5 RESULTS

This chapter presents the results of the artistic study. It answers the research questions asked earlier in the thesis. There is also a critical review of the results and interpretation of them.

### 5.1 Key findings

The primary research questions in this study were two-fold: first, the aim was to explore the process of using sound design methods to create virtual spaces characterized by silence. Second, the idea of an experimental audiovisual album as a creative concept was to be tested. The study also addressed the following subordinate questions: (1) What sound design tools and techniques are available for the construction of silent virtual environments? (2) How do these tools and techniques synergize with the conceptualization and design of an experimental audiovisual album?

During the artistic research process, a working hypothesis was formulated to find a few key points that could serve as a starting point for experimenting with different sound design techniques in building a silent virtual environment. First, it was formed through an intuitive approach and personal thoughts. After getting acquainted with the literature and the concepts presented, the former thoughts were redefined. In addition to attaining more knowledge as well as better wordings for thoughts, the hypothesis of a minimalistic approach to the number of sounds, adding reverb and contrast are the key aspects in creating a silent virtual atmosphere, transformed into an experimental study on only one of the characteristics, contrast, that was further explored and studied in the Prototype.

The Prototype serves as a proof-of-concept for the audiovisual album, yet additional findings during the design and production phase were that the

concept and audiovisual album is a lot bigger artistic project than the thesis scope can provide. More interestingly, what was observed and noted during the process was that the environment needs space—empty space—to help the sounds stand out more.

The Prototype's design was notably influenced by the application of the contrast concept. Additionally, key findings and observations emerged during the process. First, the principle of "less is more" guided the decision to incorporate only two songs and two sound art pieces instead of the initially planned eight, demonstrating the effectiveness of a minimalist approach in conveying the intended experience. Second, the realization that "bigger is better" led to the creation of shorter song snippets to fit a larger space, enhancing the Prototype's current environment, and aligning with the overarching design goals.

## **5.2 Critical review of the results**

According to Hannula, Suoranta and Vadén (2014, p. 17), artistic processes often start with intuitive ideas driven by theoretical considerations. These processes involve substantial theoretical and conceptual work. Additionally, the creative aspect of contextualization and conceptualization means that one truly grasps their thoughts by putting them into writing. This approach reflects the methods used in developing this thesis, and as Klein (2010) underlines, reflection is also part of the artistic research process. To acquire more credible data and confirm the self-observations, more iterations on the Prototype are needed as well as a proper user testing.

As already mentioned in chapter three regarding the constraints in the scope of this thesis, collaboration should have been a key consideration during the production planning phase. Collaborating with someone proficient in 3D

asset creation and programming would have allowed a more focused approach to artistic design and sound-oriented considerations.

The Prototype delivers a positive outcome regarding whether the original idea of an experimental audiovisual album is a viable concept that could be explored further. It does work as a proof-of-concept, and with a little bit more work regarding the optimization and fixing of a few existing bugs, as well as tweaking the level size and audio content, it would be ready for user testing and further development.

In line with this, the two playthrough videos reveal interesting points highlighting possible differences in tester behaviour and supporting the positive outcome regarding the viability of the experimental audiovisual album, provided the key findings are considered in future iterations. The primary purpose of the videos was to serve as audiovisual documentation during the proof-of-concept stage, and no official analysis has been presented for these recordings. However, two playthrough videos from different testers were recorded—one familiar with the level and the other relying solely on written information.

Although exploring the Prototype in a slightly different order, both recordings have a similar duration (9 minutes and 21 seconds for one, and 9 minutes 51 seconds for the other). Both testers covered the entire level, dedicating the full duration to listening to *You Promised (to come home)*. This aligns with the assumption made during the iterative prototyping process, concluding that the current level might be too small for longer musical pieces. A potential solution could involve expanding the level to enable music to play in a more extensive area, gradually fading into a silent ambience or just footsteps after a certain distance from the audio source or incorporating visually intriguing elements that react to the music. The observed behaviour of the testers slightly supports this conclusion, emphasizing the importance of conducting interviews or collecting additional feedback on their thoughts and experiences in future iterations of the project.

### **5.3 Reliability of the material used in the study**

The literature review requires a critical perspective. Academic writings on silence proved challenging to locate beyond the realms of philosophy, linguistics, communication, or music. Despite an emphasis on approaching silence through sound design and sound art rather than primarily music, the literature predominantly addressed silence within the musical domain—and music was the artform mentioned, if discussed about auditory arts in addition to opera and dance. It is therefore relevant to acknowledge the possibility of limitations in the search strategy, potentially overlooking relevant results due to specific keywords or areas. The decision to prioritize music-related findings based on search outcomes is a recognized constraint in this literature review.

In connection with this, similarities surfaced between the composed music and the read literature, even though the compositional aspect was not the primary focus of this thesis. This intersection may have influenced the selection and emphasis on specific background materials. Beyond these considerations, sincere efforts were made to transparently document sources, crediting them to the best of the author's ability. Additionally, the design process was documented systematically.

The identified key findings could serve as a valuable conceptual tool for other sound designers, aiding them in constructing virtual environments that extend beyond silence, considering spatial dynamics, the notion of absence, and movement. To confirm their usefulness, sound designers would need to explore these findings in their work, potentially reaching similar conclusions to mine, even though user testing was not conducted.



## 6 CONCLUSIONS

This artistic research took a qualitative and interdisciplinary approach, integrating practices from sound design, musicological aspects, and game design. The study explored silence as an artistic tool, drawing insights from a literature review that investigates the theoretical foundations of silence as a phenomenon, generally in arts and more particularly in virtual environments. The theoretical foundation not only supported the contextualization of the production phase but also provided a framework for the artistic component—an exploration of silence in virtual spaces realized through the conceptualization and realization of a proof-of-concept experimental audiovisual album, identified as the Prototype.

Guided by two primary research questions, the study aimed to explore the use of sound design methods to shape virtual spaces with silence and investigate the viability and effectiveness of an experimental audiovisual album. Subproblems within this framework addressed the available sound design tools and techniques for constructing silent virtual environments and their synergy with the conceptualization and design of an experimental audiovisual album.

During the iterative prototyping process, a working hypothesis was formed. It further defined the boundaries of the Prototype and highlighted the key aspects, which were explored further in the test level LO1. The working hypothesis suggested that a minimalistic approach, with a focus on reverb and contrast, plays a crucial role in crafting a silent virtual atmosphere. Eventually, the research angle narrowed down to one of these aspects, contrast, which was experimented with within the Prototype both in sound design and on the visuals, mainly between light and darkness and point of interest versus empty space.

Valuable insights from the artistic research highlighted the concept of contrast as a fundamental framework influencing both sound and level design

within the silent virtual environment. Through iterative design and prototyping, the concept of contrast was implemented in various aspects, including comparisons between silence and sound, and silence and music. Visual elements, such as well-lit and dark areas, were also explored in the context of contrast.

The other two key concepts in the theoretical framework—absolute silence as a metaphor for death and the aesthetic significance of every sound and absence of sound as aesthetically meaningful silence—mainly influenced the aesthetic approach and thematic layer of the artistic component.

Insights gained during the prototype phase underscored the critical role of empty space within the level. Recognizing the necessity for the environment to breathe, it became evident that enlarging the level provides ample room for audio to shape the ambience, whether creating a silent or empty atmosphere. Additionally, feedback from early testers highlighted considerations for music track lengths, suggesting a need for adjustments either in the music or the area where it is playing, and visual reactions to the music to enhance the overall experience.

Future ideas include conducting additional iterations with comprehensive user testing and questionnaire implementation. Subsequent research could explore various components identified in the working hypothesis, building upon the minimalistic approach introduced in the iterations. This involves further refining sound materials, exploring spatial audio design approaches, and addressing identified bugs. Additionally, collaboration with someone skilled in 3D asset creation and programming is considered for a more focused artistic design and sound-oriented approach.

Regarding the creative process and designing the Prototype, multiple practical future ideas were collected for the next iterations, starting from fixing bugs and finding a team to collaborate with the assets' creation and programming. Other future enquiries also involve thoughts about aiming for a phase

where the Prototype would turn into the actual, finished experimental audiovisual album that could be released. Questions related to when, on which platform, service, or place to release the album are also points for future consideration.

Additional questions arise concerning the viability of the experimental album and its relation to the 'traditional' album format. It would be interesting to investigate which format proves more impactful in terms of musical content. More objective questions could include whether listening to the music tracks from the album on platforms like Spotify or SoundCloud would affect the overall experience of the album. Also, how would silence be perceived differently in these two formats?

While this study sheds light on the role of silence in virtual environments, acknowledging its limitations is crucial. The study's primary focus on sound design, musicology, and game design may have overlooked perspectives from fields like media studies or computer science. Additionally, the exploration of artworks beyond a few music and game examples presents opportunities for further investigation.

In conclusion, this research delved into the influence of silence in virtual environments, exemplified by a prototype of an experimental audiovisual album. By examining the intersection of sound, music, and game design, this thesis offers insights that could inspire future creators to experiment with the interplay of silence, contrast, and the immersive potential inherent in the concept of an experimental audiovisual album. As scholars and practitioners engage with these ideas, this work may contribute to the academic discourse, fostering continued exploration in the dynamic field of silence studies within virtual environments.

## REFERENCES

- Aletta, F., Aletta, F., & Kang, J. (2020). *Promoting Healthy and Supportive Acoustic Environments: Going beyond the Quietness*. MDPI - Multidisciplinary Digital Publishing Institute.
- Altman, R. (1996). The Silence of the Silents. *The Musical Quarterly*, 80(4), 648-718. <http://www.jstor.org/stable/742402>
- Arvo Pärt Centre (2023). *Arvo Pärt Centre*. Arvo Pärt Centre. <https://www.arvopart.ee/en/>
- Audiokinetic Inc. (2023). *Wwise*. In (Version 2022.1.5.8242) Audiokinetic Inc. <https://www.audiokinetic.com/en/products/wwise>
- Austin, H. J., & Cooper, L. R. (2022). Feeling the narrative control(ler): Casual art games as trauma therapy. *Replay. The Polish Journal of Game Studies*, 8(1), 119-133. <https://doi.org/10.18778/2391-8551.08.07>
- Bindeman, S. L. (2017). *Silence in philosophy, literature, and art*. Brill.
- BioWare. (2014). *Dragon Age: Inquisition* (PC) [Video game]. Electronic Arts. <https://www.ea.com/en-gb/games/dragon-age/dragon-age-inquisition>
- Boeck, A., & Tepe, P. (2021). What is Artistic Research? *w/k–Between Science & Art Journal*. <https://doi.org/https://doi.org/10.55597/e6798>
- Boland, J. E., Fonseca, P., Mermelstein, I., & Williamson, M. (2022). Zoom disrupts the rhythm of conversation. *Journal of Experimental Psychology: General*, 151, 1272-1282. <https://doi.org/10.1037/xqe0001150>
- Cage, J. (1952). 4'33". [https://johncage.org/pp/John-Cage-Work-Detail.cfm?work\\_ID=17](https://johncage.org/pp/John-Cage-Work-Detail.cfm?work_ID=17) (Peters Edition EP 6777 EP 6777a (original version))
- Cage, J. (1961). Experimental music. *Silence: Lectures and writings*, 7, 12.
- Casey, E. S. (1997). *The fate of place a philosophical history*. University of California Press. <https://doi.org/10.1525/9780520954564>
- Clifton, T. (1976). The Poetics of Musical Silence. *The Musical Quarterly*, 62(2), 163-181. <http://www.jstor.org.libproxy.aalto.fi/stable/741335>
- Collins, K. (2008). *From Pac-Man to pop music : interactive audio in games and new media*. Ashgate.
- Cubitt, S. (1998). *Digital aesthetics*. SAGE.

- Culture of Gaming. (2022, 26.7.2022). The Sound of Silence: The Use of Silence In Games. <https://cultureofgaming.com/>. <https://cultureofgaming.com/the-sound-of-silence-creative-uses-of-silence-in-games/>
- D. Hermanson, R., & Mumford, C. (2016). *Giving voice to silence*. Inter-Disciplinary Press.
- Dauenhauer, B. P. (1980). *Silence The Phenomenon and Its Ontological Significance*. Indiana University Press. <https://muse.jhu.edu/book/84734>
- Ephratt, M. (2008). The functions of silence. *Journal of Pragmatics*, 40(11), 1909-1938. <https://doi.org/https://doi.org/10.1016/j.pragma.2008.03.009>
- Epic Games, I. (2004-2023). *Unreal Engine 5*. In (Version 5.2.1) Epic Games, Inc. <https://www.unrealengine.com/en-US/unreal-engine-5>
- Eum, K., Erb, V., Lin, S., Wang, S., & Doh, Y. Y. (2021). *How the Death-themed Game Spiritfarer Can Help Players Cope with the Loss of a Loved One* Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems, Yokohama, Japan. <https://doi.org/10.1145/3411763.3451608>
- Farber, M., & Schrier, K. (2021). Beyond Winning: A Situational Analysis of Two Digital Autobiographical Games. *Game Studies*, 21(4). [https://gamestudies.org/2104/articles/farber\\_schrier](https://gamestudies.org/2104/articles/farber_schrier)
- FromSoftware, I. (2011). *Dark Souls* (PC release in 2012; Xbox 360 and PS3 in 2011.) [Video Game]. FromSoftware, Inc. <https://en.bandainamcoent.eu/dark-souls/dark-souls>
- Fuchs, M., & Thoss, J. (2019). *Intermedia games--games inter media : video games and intermediality* (First edition. ed.). Bloomsbury Publishing. <https://doi.org/10.5040/9781501330520>
- Gajjala, R. (2013). *Cyberculture and the subaltern: weavings of the virtual and real*. The Rowman & Littlefield Publishing Group.
- Gann, K. (2010). *No such thing as silence : John Cage's 4'33"*. Yale University Press.
- Gasparian, H. (2019). *Investigating the Making of Cinematic Silence* University of York]. York. <https://etheses.whiterose.ac.uk/25474/>
- Green, R., & Green, A. (2016). *That Dragon, Cancer* (PC game) [Video Game]. Numinous Games. <http://www.thatdragoncancer.com/>

- Haertel, N. G. (1985a). *The Magic of Silence in the Visual Arts* [Art history paper, Colorado State University]. Fort Collins, Colorado.
- Haertel, N. G. (1985b). *Shapes of Sounds and Silence* Colorado State University]. Fort Collins, Colorado.
- Hannula, M., Suoranta, J., & Vadén, T. (2014). *Artistic research methodology : narrative, power, and the public*. Peter Lang.
- Jaworski, A. (1997). *Silence interdisciplinary perspectives* (Reprint 2010 ed.). Mouton de Gruyter. <https://doi.org/10.1515/9783110821918>
- Kahn, D. (1997). John Cage: Silence and Silencing. *The Musical Quarterly*, 81(4), 556-598. <http://www.jstor.org.libproxy.aalto.fi/stable/742286>
- Kaye, D., & LeBrecht, J. (2009). *Sound and music for the theatre : the art and technique of design* (3rd ed.). Elsevier/Focal Press. <https://doi.org/10.4324/9780080927732>
- Khatchadourian, H. (2015). *How to do things with silence*. De Gruyter. <https://doi.org/10.1515/9781501501449>
- Klein, J. (2010). What is artistic research. *Journal for Artistic Research*.
- Krüger, J. S. (2018). *Signposts to Silence. Metaphysical mysticism theoretical map and historical pilgrimages*. AOSIS.
- Kulezic-Wilson, D. (2009). The Music of Film Silence. *Music and the Moving Image*, 2(3), 1-10. <https://doi.org/10.5406/musimoviimag.2.3.0001>
- Laird, M. S. (2011). *A sunlit absence silence, awareness, and contemplation*. Oxford University Press.
- Lissa, Z. (1964). Aesthetic Functions of Silence and Rests in Music. *The Journal of Aesthetics and Art Criticism*, 22(4), 443-454. <https://doi.org/10.2307/427936>
- Little, S. (2018). Listening in the Dark: A Response to “Noise and Silence in Analytic Talk”. *Contemporary Psychoanalysis*, 54(2), 373-382. <https://doi.org/10.1080/00107530.2018.1458580>
- Luoma, L. (2022). *Immersive sound experience as a tool for landscape architecture*
- Merriam-Webster. (n.d.). Silence. In *Merriam-Webster.com dictionary*. Retrieved July 3, 2023, from <https://www.merriam-webster.com/dictionary/silence>
- Miller, A. (1990). *John Cage. I Have Nothing to Say and I Am Saying It* R. Arts, M. P. f. Television, T. WNET, & L. Films; Arthaus Music - Monarda Arts.

- Mowitt, J. (2015). *Sounds : The Ambient Humanities*. University of California Press. <https://doi.org/10.1525/9780520960404>
- Natividad, S. (2022, 27.12.2022). 9 Games That Make Great Use Of Silence. *Game Rant*. <https://gamerant.com/games-best-use-silence/#alien-isolation>
- O'Rawe, D. (2006). The great secret: silence, cinema and modernism. *Screen*, 47(4), 395-405. <https://doi.org/10.1093/screen/hjl031>
- Ollin, R. (2008). Silent pedagogy and rethinking classroom practice: structuring teaching through silence rather than talk. *Cambridge Journal of Education*, 38(2), 265-280. <https://doi.org/10.1080/03057640802063528>
- Playdead. (2010). LIMBO (PC) [Video game].Playdead,. <https://playdead.com/games/limbo/>
- Playdead. (2016). INSIDE (PC) [Video game].Playdead. <https://playdead.com/games/inside/>
- Quinn, Z., Lindsey, P., & Schankler, I. (2013). Depression Quest (PC version) [Video game].The Quinnspracy. <http://www.depressionquest.com/#top-section>
- Schweiger, E. (2015). The risks of remaining silent: international law formation and the EU silence on drone killings. *Global Affairs*, 1(3), 269-275. <https://doi.org/10.1080/23340460.2015.1080036>
- Schweiger, E., & Tomiak, K. (2022). Researching Silence: A Methodological Inquiry. *Millennium*, 50(3), 623-646. <https://doi.org/10.1177/03058298221083999>
- Sontag, S. (1967). The Aesthetics of Silence. *Aspen*, 5 + 6(The Minimalism issue). <https://www.ubu.com/aspen/aspen5and6/threeEssays.html#sontag>  
(Published Fall-Winter 1967 by Roaring Fork Press, NYC.)
- Steam (2020). *Spiritfarer®: Farewell Edition*. Steam. Retrieved 31.10.2023 from [https://store.steampowered.com/app/972660/Spiritfarer\\_Farewell\\_Edition/](https://store.steampowered.com/app/972660/Spiritfarer_Farewell_Edition/)
- Sterne, J. (2012). *The sound studies reader*. Routledge.
- Syroyid Syroyid, B. (2020). *Analysis of Silences in Music: Theoretical Perspectives, Analytical Examples from Twentieth-Century Music, and In-Depth Case Study of Webern's Op. 27/iii* [1952, KU Leuven.
- Tekrø, E. Å. N. (2018). *Playing the Sound of Silence: Immersion, Loneliness, and Analysis of Multimodal Intertextuality in 21st Century Video Game Music*

- The Chinese Room, & Briscoe, R. (2012). Dear Esther (PC) [Video game]. The Chinese Room. <https://www.thechineseroom.co.uk/games/dear-esther>
- Thiesmeyer, L. J. (2003). *Discourse and silencing representation and the language of displacement*. John Benjamins Publishing Company.
- Thunder Lotus Games. (2020). Spiritfarer (PC game) [Video Game]. Thunder Lotus Games. <https://thunderlotusgames.com/spiritfarer/>
- van Elferen, I., & Raeymaekers, S. (2015). Silent dark: the orders of silence. *Journal for Cultural Research*, 19(3), 262-273. <https://doi.org/10.1080/14797585.2015.1021993>
- Vienna Declaration on Artistic Research. (2020). In. Culture Action Europe: Culture Action Europe.
- Waters, M. (2023, May 3, 2023). Embrace the Awkward Silence. *The Atlantic*. <https://www.theatlantic.com/family/archive/2023/05/awkward-silence-in-conversation-zoom-video-chat/673937/>
- Whalen, Z. (2007). Case study: Film music vs. video-game music: The case of Silent Hill. *Music, sound and multimedia: from the live to the virtual*, 68-81.
- Wierzbicki, J. E. (2012). *Music, sound and filmmakers : sonic style in cinema*. Routledge. <https://doi.org/10.4324/9780203343098>
- Wolf, W., & Bernhart, W. (2016). *Silence and absence in literature and music*. Brill Rodopi.
- Wood, M., & Tribe, R. (2016). In a silent way: student perceptions of silence in community. *Pastoral Care in Education*, 34(3), 144-155. <https://doi.org/10.1080/02643944.2016.1202308>