Guiding the Player with Music in Video Games: An Analysis of Music as a Nonverbal Communication Method

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### Abstract

Nonverbal communication is often used in games to immersively assist the player navigate in game space. Because these communication methods are largely visual, the auditory domain, such as music, is predominantly a reactive element of game design. The aim of this thesis is to investigate how music affects the players navigational behaviour by creating a maze based video game where the effect of directional guiding music is analyzed. The research was evaluated by conducting a qualitative data analysis on ten university students who played through the game which involved two mazes. One maze had a more clear main path for the player to follow, where the music attempted to lure them towards side paths, and the other a more traditional maze where the music guided them down the correct path. The participants were divided into two groups of five, where one had guiding music enabled, while the other did not. The results showed that people with guiding music enabled made a total of less wrong turns than those who had it disabled, all while keeping the players immersed in the game. Guiding music however was not able to showcase any differences made for the player's curiosity to explore more of the game. These findings suggest that music can be used as a method of nonverbal communication regarding navigation to the player, but would need to be complimented by visual cues to reward exploratory behaviour.

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## **Chapter 1: Introduction**

Navigating spaces in video games often has the player going through carefully designed environments. These spaces are crafted seamlessly so that the players rarely notice the intentional design behind them. Game designers structure these environments to naturally guide players toward their intended destinations, without making the guidance feel forced or artificial, as it is the designers job to emulate freedom in the game world and create the spatial situations that fit the game [1]. A common ground within design features that video game environments share is that nonverbal communication between designers and players is done through visuals. Audio elements are mainly kept as a reactionary element to what is already happening in the game. This can be seen with music, as the job music does is to set the tone and mood of the game, along with conveying changes which the player is feeling in the moment, such as a sense of safety or when threatened by enemies, a sense of danger [2]. With music being kept as a reactionary element, it leaves room for experimentation to see if music is also capable of similar guidance that visuals can have in video game environments. Thus, the aim of this study is to find out how music can be used as a method of nonverbal communication to inform players about their surroundings and guide them through a video game level.

## **1.2 Research Question**

With the aim of this project being to find out how music can be used as a method of nonverbal communication, the following research question is proposed:

How can background music immersively inform the player of their surroundings to guide them through the game?

### **1.3 Report Outline**

This thesis covers the development process of a video game designed to test the effectiveness of music on guiding the player towards a directional goal. Chapter 2 focuses on the background research which includes looking into studies connecting music and immersion as well as looking into the existing methods of nonverbal communication within games. Following the background research, Chapter 3 presents the methodology, which establishes the methods used for ideating and prioritizing the game's features. Following methodology, Chapter 4 is the ideation phase which presents the stakeholders for this project as well as the reasoning behind the features of the final version of the game. The ideation phase ends with presenting the final concept for the game. Chapter 5 presents the requirements that the project should meet and their respective priority. Along with the requirements, this chapter also provides a technical overview of how the game works. Following is Chapter 6 which presents an overview of what the final version of the game looks like from start to end. Chapter 7 covers the testing procedure which is followed by the evaluation of this project. The evaluation chapter is then followed by Chapter 8 where a discussion of the results and recommendations for future work are presented. Lastly, Chapter 9 presents the conclusion of this thesis.

# **Chapter 2: Background Research**

This chapter presents the previous studies and works that relate to immersion and the role of music within it to provide context of the current state of our knowledge. This is done by making a literature review of related projects and creating a definition for immersion to use as a basis for this project. Additionally, various other immersive methods of guiding players are explored to understand the current state of nonverbal communication within games. By doing this, a foundation is built for this project.

## **2.1. Defining Immersion**

Immersion is a feeling that is encapsulated by multiple senses, such as hearing, seeing, feeling, which all play an important role within it. Due to this, it is important to first define a general definition for immersion, as that forms a basis to refer to. Along with this, it is important to mention what role immersion plays in the engagement the players have with the game because understanding that helps to further understand its relevance in games. Lastly, an important topic to consider is the flow state of the player, because immersion and flow state both drive player engagement.

Immersion is a deeply personal feeling that varies from person to person. There are many different interpretations of what immersion is. One widely accepted one according to Zhang and Song [3] is that immersion is the feeling of being completely surrounded and involved in something. This feeling of being completely surrounded by a medium is further supported by Evans [4] by stating that when players are immersed they often lose the sense of time by thinking they have played for less amount of time than they actually have. Because immersion surrounds the person and distorts their sense of time, it can be derived that immersion is a feeling that happens to the audience when what they are consuming hooks them and has their full attention.

For video games, immersion is no different in regards to having the player be hooked on what is happening in the game. In order for that to be the case, the type of game needs to first appeal to the player [5], [6]. When the game has appealed to the player and they continue to play, there are different levels of involvement between the game and the player, for which immersion is the highest level of [7]. The lowest level of engagement is where the players spend their time, attention, and effort. The second level is engrossment where they are emotionally invested in what's happening; the third and highest level is immersion, in which the players have been completely mentally absorbed by the game world. Getting to that third level is not always easy for games to do. Since in order to achieve that, the game has to appeal to the player's individual appeals. Figueiredo [1] gives one method of achieving such appeals by stating that the game world must create a certain identity which gives the player a sense of coherence, authenticity, credibility, immersion and identity. They continue to state that along with this, the virtual world needs to have an atmosphere that touches every scene and moment because that influences the mood and emotions of the player, because immersion ultimately covers emotions as well.

Within immersion it is also important to consider the sense of flow that the player should be feeling while playing the game. As previously discussed, when immersed, the players are completely surrounded by the game, and not by the real world around them. This in its essence is what the flow state is. Schell et al. [8] defines flow as a state in which the person is in complete and energized focus towards an activity with a large sense of enjoyment. This is supported by Huang [9] who states that flow is happening when the user goes into a state of unawareness. This state however is relatively difficult to stay in, since there are many contributing aspects to it which all need to be satisfied in order to maintain flow. Schell et al. [8] proceed to list such aspects as having clear goals, no distractions, direct feedback, and continuously challenging.

Overall, immersion in video games is a complex experience that varies from player to player. It consists of multiple factors that the designers need to stay aware of when creating the game. The game needs to resonate with the player, and the elements that make it so are a combination of keeping the player engaged by giving them a sense of mood and atmosphere while also maintaining a sense of flow. Because one of the defining features of immersion is keeping the player mentally surrounded by the game world, it means the experience needs to be emotionally compelling to the player. From all this, immersion can be defined as a strong feeling that happens to the audience when the media they are engaging with hooks them and has their full attention.

### 2.2. The Role of Music in Immersion

Similarly with immersion, video game music is a broad topic. It is important to explore in what ways music influences the immersion of the player, and how those methods are used in games, because that gives an understanding to how it can also be used to its fullest potential. Furthermore, it is also important to define what sets video game music apart from other mediums, because that demonstrates the difference between video game music and music in general.

Since immersion covers multiple senses, sound plays a crucial role in it. Within sound, music is one that communicates emotion to the player without ever needing to actually verbally say anything. The question however is to what extent does music help with [3] immersion? According to Evans [4] when testing the 2D platformer *Celeste*, a higher rate of immersion was found when the music was present compared to when there was no music. This is further supported by Wang [2] and Zhang and Fu [10] by stating that good game music makes the player feel more immersed along with promoting the development of the narrative and helping the game overcome its two-dimensionality. Therefore, it can be concluded that sound is an element of game design which elevates the player's sense of immersion and further affects the players losing their sense of time [11], [12], [13]. Furthermore, Wang [2] continues to state that the music needs to change overtime in context with the player's surroundings of the virtual environment by providing an example of the video game Watch Dogs 2 where the music is composed according to the cultural locations of the game environment, such that when the players enter a Chinese region in the game, the music changes to add instruments that are unique to China to further add to the

atmosphere of the game. This is further supported by Ribeiro et al. [14] by stating that atmosphere in games is directly related to the audiovisual coherence of the game.

Music in games can often be sorted into diegetic and non-diegetic music, meaning music that is heard in the context of the characters in game and music that plays in the background, only heard by the player. Non-diegetic music, found most commonly in games, is often used as a tool to set the mood and atmosphere that the designers specifically want the players to feel at that given time. It is the music that plays in the background [2]. Diegetic often covers sound effects more so than music, such as footsteps or the characters speaking, this however doesn't mean that game music cannot be diegetic. In games such as Watch Dogs 2 or Grand Theft Auto V the player often has control over the radio, letting them choose what music they prefer to listen to when playing the game. Giving the player control over the music can also have benefits since according to Zhang and Song [3], people often find it easier to focus their attention when they are exposed to self-selected music. Having self selected music positively affect attention is further supported by Cassidy and Macdonald [15] stating that when users were exposed to self selected music in a racing game, they showcased more engagement with the game. Additionally, Wang [2] states that due to music that can be changed manually by the player, one of the most unique aspects of modern video game music is the nonlinearity of it, which gives the music control to the players, since non-diegetic music is often similar to how film does it.

Music is ultimately a larger part of how the game wants the player to be immersed. Music's role in immersion is to set the emotional tone and atmosphere to the player along with empathizing the change of the game environment, which is often the role of diegetic music within games. As stated by Klimmt et al. [16], when studying the effect that soundtracks have on the game experience, music has consistently shown that it enhances the players experience, mainly emotionally. As for the games that also provide non-diegetic music, the role is more about letting the player tailor the music to their own personal taste, while still staying within the context of the game world, which is what ultimately makes the medium of video games different from film, the interactable element of it. Therefore, it can be concluded that when designing a new method of immersion through music, it is important to keep in mind its importance for intractability in games.

### 2.3 Previous Studies On Music's Effect On Immersion

Before a concept for the game can be ideated, an analysis of the previous studies related to music and immersion need to be investigated, as that can provide further insights into what criteria the game must follow in order to be a valuable contributor to research.

There have been numerous studies done which explore music's role in immersion. One such study, conducted by Ewans [4], found that while background music does result in players experiencing higher immersion, the objective measures did not result in significant results. It was concluded that immersion is a personal experience that cannot be easily measured through objective means. Similarly, study done by Zhang and Fu [10] concluded that participants who had background music on while playing a fighting game called *The King of Fighters* experienced higher senses of time distortion than the ones with no background music, however this experience was only shared amongst players with little gaming experience. These findings suggest that while immersion does positively affect player immersion, it is difficult to measure due to its nature of being so qualitative and thus varying greatly between individuals.

Additionally, game music does not always follow the traditional methods that film would use when being composed. It is more interactive, adapting to the player's state. According to Wang [2], this nonlinearity which interacts with the player is the most significant new feature of music within video games, which is what separates them from other mediums such as film. Therefore, it can be concluded that this nonlinearity of game music is also important for immersion, since it conveys information to the player about their current state in a nonverbal manner, meaning that the player will not actively notice that changes are communicated to them, and thus be more engaged with the game.

There are also areas within game background music which remain unexplored, but still providing significant potential for player immersion. According to Stevens [17], something that games should further explore is music systems which are aware of the player types and how they approach the game, thus being able to adapt to each player personally rather than being solely reactionary to the different game states. An example Stevens [17] provided is that music in games uses variables to determine the different states, but when escaping from an intense scenario, just because the player is in a safe area, does not mean that their emotions were also reset to the default rest state immediately.

From these prior studies, it can be concluded that the music in the proposed game would need to be nonlinear, meaning that it must change states along with the player in order to keep them engaged with the game, but this change of states should be made specific for the player and their respective playstyle, as it should not be solely reactionary to the game states. Rather, it should consider their actions beforehand and adapt accordingly with their emotions.

### 2.4 Methods of Immersion In Video Games

Communicating to the player where they must go all while keeping them immersed in the experience is a challenge of itself for game designers, as a common way to do it is to use the user interface, or UI in short, for communicating to the player about their tasks and the location of their objective. However, the abundant use of UI for these matters can often run the risk of taking the player out of the experience, since UI can also provide too much information to the player and visually obstruct the game. Due to this, game designers have often opted for giving contextualized cues to the player within the game world as to where they are supposed to go.

A popular method of immersively guiding players in video games has often been the use of lighting. When done correctly, lighting catches the attention of the eyes as the litten object or area in the game world stands out from the rest, and thus naturally draws the player towards it as shown in Figure 1 and 2 [18] [19]. Similar visual

communication methods with the player can also be seen in the specific placement of props within the game worlds. In *Alan Wake*, when the player is required to press a button to activate something, the button is placed in such a way that the player sees what they activated with its press as shown in Figure 3 [18]. Additionally, similar use of visuals can be seen in many open world games by their use of far away landmarks, enticing players to go there such as the three point of interest system that *The Legend of Zelda: Breath of the Wild* uses, as shown in Figure 4 [20].



Figure 1: Example of the use of lighting in Resident Evil 3 (2020) [19].



Figure 2: Example of lighting guiding the player in Alan Wake (2010) [18].



Figure 3: Button to open the gate is placed in view of the gate in Alan Wake (2010) [18].



*Figure 4: Use of point of interests in The Legend of Zelda: Breath of the Wild (2017)* [20].

A consistent theme throughout these methods for immersion is that it is all done nonverbally. We associate these cues with immersion because they are done diegetically (within the game world itself), and thus do not seem out of place such as map markers or waypoints that often have the criticism of being obstructive as shown in Figure 5. This is not to say that the use of diegetic cues is always immersive however, as subtlety needs to be kept to maintain immersion. A case can be seen for the 2023 remake of *Resident Evil 4*, where a common complaint for the game was the overuse of yellow paint on objects to mark them as interactable, seen in Figure 6 [21]. This case went as far as people modding the game to remove said yellow paint from

interactable objects [22], [23], further showcasing the importance of subtlety in game design. Without the subtlety, the communication from the game designer can become intrusive and hurt the player's experience. Ultimately, the line between too obvious and too subtle is not a clear one, however, and remains a design choice for the game designers. The subtlety also heavily depends on the player and their experience with video games, because a more experienced player may know what cues to look for while a less experienced one may not.



Figure 5: Use of waypoints in Assassin's Creed: Odyssey.



Figure 6: Example of yellow paint indicating the intractability in Resident Evil 4 2023 [23].

## **2.5** Conclusion

Overall, immersion can be defined as the feeling when a person is completely hooked in the medium and it has their full attention. Music plays the role of enhancing the already existing experience of immersion that the players are feeling, and for that reason most of the ways games guide players is done with visuals such as lighting or object placement within the game world. This project proposes the question of how such guidance can be done with music. An overview of the method for answering this question can be seen in the next chapter.

# **Chapter 3: Methods and Techniques**

The plan for this project is to build a game that can evaluate how background music can guide players to an objective. In order to design the game, the Creative Technology design process [24] will be used because it provides a systematic method for structuring projects that aim to find solutions. The first part of this chapter presents the Creative Technology design process model, while the second part presents the technique used for planning the priorities of the project, namely the MoSCoW method as well as the need for an expert interview for the sound design regarding this project.

## 3.1 Creative Technology Design Model

The Creative Technology design process, as shown in Figure 7, is realized by Mader and Eggink [24]. It consists of four phases: ideation, specification, realization and evaluation. This model helps structure the design process of projects that attempt to solve a specific problem.



*Figure 7: Illustration of the Creative Technology design process [24].* For this project the model was used in the following way:

The ideation phase began with creating a mockup level in the Unity game engine. Various ideas such as platforming and multiple pathways were considered and internally tested over the course of multiple iterations of the same level. The music was also ideated on by tinkering with the various MIDI tools as well as a guitar. This phase was deemed as complete when a clear vision for the final version of the game was established.

In the specification phase the implementation of music was worked on along with the visuals and mechanics of the game. This phase established the most efficient technical method for implementing the guiding music to the game and the key moments at which it should be played. Along with implementing the guiding music, this phase also covered the creation of the visuals for the game and implementing the player movement. The specification phase was considered complete when the game reached its final form after internal testing.

The goal of the realisation phase is to give a clear overview of the game. This phase also includes the descriptions of what the player experiences while playing the game and what the process of playing it is like. This phase was concluded when every important feature of the game was covered.

In the evaluation phase the functionality of the game was evaluated and the research question was answered. This phase was considered complete when the testing was over and all the results were analysed.

### 3.2 MoSCoW Method

The MoSCoW method is a tool used for prioritization within product design as well as project management and software development [25]. It divides the requirements of the project into a list of priorities of must have, should have, could have, and will not have. This will be used for this project as it will assist with planning out the priorities of the features within the timeframe of the project. This method will be explained in more detail in chapter 5 of this document.

The MoSCoW method helped create a list of requirements for the project. Once the requirements were created, they were organized into their respective prioritization labels. By implementing this method, it helped with organizing the workflow of the project within the time frame, because it helped decide between which features need to be implemented and which ones could be left out.

### **3.3 Interview With Expert**

In order to be able to tell how the music for the game needs to be designed, an interview will be conducted with an expert on sound engineering for video games, Rik Nieuwdorp. This interview will provide insights into how and what kind of music catches the players attention. Additionally, the most effective methods for creating such music will also be discussed, as that helps speed up the development of this project. Due to all this, the design for the music of the game will be created with considerations of the revelations of this interview.

## **3.4 Conclusion**

Overall, after establishing the methods this project will use to answer the research question, a more general outline of the whole process for making the game was created. By utilizing the Creative Technology design process, a structure plan for this project was established. This design process was then assisted by the use of the MoSCoW method for prioritization of goals within the project as well as an interview with an expert to answer important design questions. With the methods and techniques established, the first phase of the Creative Technology design process can begin, namely ideation.

# **Chapter 4: Ideation**

This chapter focuses on the different stakeholders involved in the project and the concepts for the prototype. The ideation of the game discusses the different design elements that should be considered for the final concept of the game and why they are relevant. At the end of the chapter, the final concept for the game is described.

## 4.1 Stakeholders

There are 2 main stakeholders within this project listed in the order of importance: video game designers and players.

- 1. Video game designers could potentially use the findings provided by this study to implement a similar system within their own games to engage players in new ways. Furthermore, it could also provide potential new insights into the use of music within video games, which could give designers more insight into player behavior regarding music.
- 2. For players this study could lead to games that use music in unique ways and therefore diversify the gaming landscape more. It could also increase their engagement with the games, and also thus the enjoyment of it as well.

## 4.2 Ideation of the Game

It is important that the objective of the game is neutral. Because the behaviour of the player will be analyzed. Having an objective which is to destroy or assassinate a target could result in a conflict of interest. The player opting for a passive playstyle might feel out of place because the objective inherently does not follow their playstyle. There are existing games which offer such freedom of choice for the player, while keeping the objective neutral. For example, there are levels in *Dishonored 2* which involve objectives that simply require the player to reach them, but due to the nature of the level design, reaching the goal is the difficult part, since there are obstacles like patrolling guards the player needs to either sneak by or neutralize, or closed gates that block off sections of the paths. Similarly, in the RPG *Cyberpunk 2077* developers used a non-linear level design for the various missions the player goes on in the game, which followed the design principles of having a discovery stage where the player considers their options, and an exploration phase where the player is committed to their option and are exploring within it, see Figure 8 [26]. A level design similar to this will be considered due to its ability to provide player freedom.



Figure 8: Illustration of the level design used in Cyberpunk 2077 [26].

Although it might seem easy to pick a genre for the proposed game and analyze the results for that specific genre, this categorization is not specific enough. Genre is a way to categorize media, and those which share the genre often share similar overall characteristics, but it is too broad to actually define any key mechanics or requirements in games, which by themselves often cover multiple genres alone. This issue of broad genres means that although the game won't be a specific genre, it will still follow the design logic which many games with an open level design implement.

The initial idea for the main features of the game was to have music inform the player how far they are from the end goal of the level by building up with more layers to the music as the player approached the end goal all while informing the player of dangers such as turrets and platforming obstacles. Therefore, the earliest prototype included a large open level where the player had multiple distinct paths to pick from, some requiring the player to do platforming, as that let the player have verticality as a path option as well. However, after internally testing such a prototype of the game, one of the main problems it faced was that the platforming would take too much focus from the player, thus having the sound be negated. Additionally, a level designed with all the aforementioned features in mind proved to not be feasible to fully develop, as it also had too many factors influencing each other to provide any genuine results. It was then decided that the focus should shift to how well the music is able to lead players down the correct path as well as catch their attention. A method of doing so would be to have music play from certain paths while quiet from others. In order to test such a method, it was decided that a level with multiple paths would then be required, to compare between paths with sound against the ones without it. With the focus being on an open level where the player could choose their direction, it became apparent that if the player picked a path due to the visual distinction, the music's effect was also undermined. Therefore, it was concluded that there should instead be a main road, or a so-called "golden path" for the player to take, without requiring any platforming. Having a road to the objective that seems like the most obvious choice ensures that the players start off understanding where they need to go as well as the optimal path to the objective. However, to test the effectiveness of reactive

background music, it will attempt to lure the players to take different paths that branch out from the golden path as shown in Figure 9 [27]. An important aspect of the side paths is that they should be less visually enticing to take than the golden path. That way it can be music on its own that lures the player to take said paths. A level designed as such was then drawn out and implemented into the game which can be seen in Figure 10.



Figure 9: Illustration of level design with side paths [27].



Figure 10: Ideation for golden-path level.

The focus of the music shifted to exclusively guiding the navigation and from that it was decided that the best way to guide the player through the game would be with the use of 3D stereo audio, where the player would hear a sound coming from a path and

then take it due to hearing it. Thus it was decided that the most efficient way to do that would be to place emitters around the game world which played the guiding music in a loop, ensuring that it was always playing when the player walked past it. However, because this type of decision making usually happens spontaneously, the emitters should be placed in such a way that the player would hear them at a moment when they still have time to make the decision whether they want to go past the path or through it. After testing out various placements of emitters, it was concluded that the best way to go about this would be to have the player hear the sound a few seconds before they are able to go down the path, as that way the music has enough time to create intrigue within the player before they make their decision, this can be seen in Figure 11. When the player picks a path that plays the guiding music, the music should play for the duration of the time the player is on that path, as that would highlight to the player that they are being led somewhere, a plan for this was drawn out in Figure 12.



Figure 11: Placement of the emitters.



Figure 12: Plan for what area the emitted sound should cover.

In order to evaluate how effective the music is at guiding the player, it would need to do more than grab their attention, as it should also be able to set them down a correct path. In order to see how effective music can be for that, it was decided that a second level would also be required. That level would not have a golden path such as the first one, but rather resemble more of a traditional maze. Having a second level would showcase the effectiveness of the music affecting the players decision making between two visually similar paths, as well as how well can the music actually lead the player to the objective.

Every player plays games in their own way, meaning that there could always be players who wish to explore everything no matter what the music communicates to them. It was decided that because of the variation of player types, a way to know beforehand what type of player the participant is would be to have a short level they play beforehand to familiarize themselves with the game's controls and objective. The level would follow a similar logic of having a golden path with many side paths like the main level, but much shorter. That would help the players adjust to the game before the actual level begins, as well as it providing a good insight into whether the player is an explorer type who will look for all possible paths before the main level begins. As for the way the game is played, it was decided early on that the game should be played in first person in order to avoid having to implement a 3D character with animations, but also to make the player feel more connected to the game. It was also decided early within testing that the simple goal of reaching an end point works well for this game, because the focus will be on the player's navigation. Additionally, while internally testing, it was noticed that having a simple main menu screen is beneficial for the testing, because in that case the player themselves decides when the game starts. By giving the players control over when they want the testing to start helps make the flow of the game feel more natural for the players. Another idea that could potentially help with the game's flow would be to give the player a short written story in the beginning of the game. Though it would have no mechanical importance, it would provide some context for the player to what they are doing in the game world and it also helps to draw the player in better.

### 4.3 Music Design

The music for the game will be non-diegetic because most game scores usually act as such. Having non-diegetic music means that additions to the score will be emitted by objects that are not within the game world and the player cannot directly interact with them. After discussions with the expert on sound, one of the key revelations was that the base music chosen for the game needs to be neutral in order to let the music that plays in the moments of decision to stand out and have no interference. Neutrality in music means that the standard background music will need to remain few notes that do not form a clear melody so as to not overshadow the music that is supposed to guide the player, but still be there as a form of foundation for the sound of the game. By doing so the musical cues that happen would need to be in the same key as the main background music, because this would mean they would flow naturally along with the existing background music.

As previously discussed, the aesthetics of the game are supposed to be simple as to not take the focus away from the sound, but a certain amount of visual style was still added to the game because that way it provides context for what sort of feeling the music is supposed to convey. The game's aesthetics evolved along with the music, as they go hand in hand. Initially an electric guitar with an amplifier connected to the computer was explored, but this method ultimately did not provide the desired results, and was also slower to work with. Online MIDI tools recommended in the expert interview were used instead, as they provided an easier workflow and more varied options for sound. After iterating on the aesthetics of the game, which initially began with a forest theme, a winter-oriented style was chosen out of personal preference and the music created for the game was made to accompany this visual style. The YouTube channel Cadence Hira [28] states that often in game music, parts of the game that take place in snowy areas or levels include instruments that we associate with Christmas, such as bells. This cultural familiarity makes us associate the area in the game with coldness and winter. They [28] continue to state that another method to make the music reflect the level in such a manner is to use musical techniques such as desolation of the notes with reverb as that reflects the quiet stillness of winter, further showcasing how music can reflect nonmusical feelings such as the weather of a season. The desolation of notes is also further supported by the expert interview where they stated that

"...like I said I would set up the sort of base melody with either just rhythm or rhythm and just a bass with 2-3 maybe at most 4 notes just to keep it super simple."

Keeping the desolation of notes in mind, the background music for the game needs to have notes with a considerable amount of space in between them. The background music is also accompanied by the sound effect of distant wind to create a further sense of cold atmosphere for the player, which plays quietly so as to not overshadow the music.

For a properly published game the music would ideally also flow in such a way that the musical additions that are added are kept in the background master score, ultimately all building up to a moment within the music when the player reaches the end of the level. However, for the purposes of this research, this kind of build up would interfere with the results and thus when a player makes a decision to go down a path, the additional music that was added when they heard it will be gone from the score by the time they reach the next part where the road branches again. By having the music transition to the default background music after exiting a specific pathway, the decision state will always be neutral whenever the player must make a decision between the paths.

### 4.4 Conclusion and Final Concept

The final concept is to build a 3D environment using the Unity game engine to create an open level which the players need to reach the end of. The game will consist of 2 separate levels that although look similar, follow a different styled path to the end. One level will focus on having a main path that the player can take, with optional side roads which branch out of it, while the other level will consist of no proper main path and is thus more mazelike. This allows for an analysis for how music is able to get the players attention towards taking it away from the main path as well as how it affects their decision making when no clear obvious path is presented. Each player will play through both levels in the same order. Additionally, the game should also follow a simple aesthetic style that remains consistent throughout the whole game, however, it should not interfere with the music meaning it has to be as neutral as possible. The technical implementation of this concept can be seen in the specification phase.

# **Chapter 5: Specification**

This chapter focuses on what the functional aspects of the project look like. It will also present the functional and non-functional requirements of the project as well as the overview of how the game system works. This will be done by utilizing the MoSCoW prioritization technique where each of the requirements are broken down into a priority of must have, should have, could have, and will not have.

## 5.1 Goals and Requirements

Based on the concept concluded in the ideation chapter, the following goals of the project will be listed:

#### Table I:

Goals	
Gain further insight into how music influences the players navigation	
Expand knowledge about nonverbal communication methods in games	
Study how players navigate in game environments without explicit guidance	

### 5.1.2 Non-functional requirements

The following list of non-functional requirements is concluded based on the final concept from the previous chapter:

### Table II:

Non-functional requirement	Priority
The game must not take more than half an hour to complete	Must
The game should have a small introduction level for the players to get adjusted to the game controls	Should
The game should follow a simple aesthetic style	Should
The game should have a main menu screen to let the player comfortably start when they are ready	Should
The background music should match the visual aesthetic of the game	Should
The game could have a small introduction story for the player to feel more motivated to reach the goal	Could
The game could have controller support implemented for players who prefer that type of control	Could

### 5.1.3 Functional requirements

The following list of functional requirements is concluded based on the final concept from the previous chapter:

Table III:		
Functional requirement	Priority	
The game must have two different levels for the player to navigate	Must	
The first level must have a clear main path for the player to follow	Must	
The second level must have no clear main path	Must	
The guiding music must never guide the player down a wrong path	Must	
There must be two different versions of the game: with guiding music, and without any guiding music	Must	
The background music must be simple in order to not interfere with the guiding music	Must	
Guiding music should be a short loop in order to catch the players attention quick	Should	
The visuals of the game will not interfere with the players' decision making.	Will not	
The game will not require the player to perform any tasks outside of navigating the environment	Will not	

## 5.2 System Overview

There are three levels that the player goes through when they start the game. The levels go as follows: tutorial level, first level with the golden path, and the second level that consists of a maze. The player is teleported to each level by entering a box collider, shown in Figure 12. Certain paths have been given sound emitters, as shown in Figure 13, which play at a range so the player can hear which side they come from when on the path. These audio emitters have been placed in a manner that when the player is following a path that the audio guides them through, the audio would play equally as loud on both sides of the road to let the player be surrounded by the sound when they entered the path they heard it from. When the player reaches the final area of the game there is nowhere further for them to go and the game is considered as finished.



Figure 12: Box collider that takes the player to the next level.



Figure 13: Example of a sound emitter.

## 5.3 Sound Design

All the sound in the game is implemented with FMOD which is integrated with Unity. Every sound file is stored in FMOD along with the parameters that affect it as shown in Figure 14, which Unity recognizes and enables or disables the parameters as required. The game sounds can be categorized into background music, guiding music, and sound effects. Background music includes the simple background track which plays on loop throughout the game. Guiding music includes the musical sound effects

which attempt to catch the players attention and guide them down the desired path. Sound effects include the player's footsteps, teleportation sound effect, and a background wind which quietly blows in a loop to further create a sense of a cold winter.



Figure 14: Example of FMOD interface with sound.

The guiding music is implemented into the game with the use of spatial audio, which is done by placing emitters around the game world that emit the desired sound effect as a loop. The emitters have a script attached to them that takes the instances from FMOD which loops the sound. The script of how the sound works on the Unity side can be seen in figures 15-17. The method of emitters was used because of the ease of use of them which helped with the time constraints of the project while keeping the desired spatial audio effect. The emitters are placed on both sides of the desired area to make it sound stereo as the player walks through the path, however if the player were to approach too close to one sound emitter, the music would play more loudly from that direction. The guiding music was done by using an online tool called Beepbox, as shown in Figure 18. The background music was composed in the online MIDI tool Signal as shown in Figure 19. For the background music the notes have a fast drop off but a high sustain, making so that there is never any complete silence between the notes. The guiding music itself is a series of upward melodies, meaning the melody has a climbing sound to it, this can be seen in Figure 18. This type of melody was decided upon after the interview with the sound expert, who stated that

"You can try to include little cues like an upwards melody is usually something positive. Also in pick up sound effects or in power up sound effects. Usually whenever something positive happens we need to communicate this in a short time which is also one of your issues I think."

The insights provided by the interview showcase the importance of having the music have the sound of moving upwards, as well as the need for it to be short, as the player will be making their decisions in quick succession. There were six different melodies created for the game, all with the same rhythm, instrument, and key. Having multiple similar melodies makes it so that the sound feels less monotonous for the player.

🔻 # 🖌 FMOD Studio	Event Emitter 🛛 🥹 👎	:
Play Event	Object Start	•
Stop Event	None	▼
▼ Event	event:/UpSonar1	t
GUID	{fa8b759a-3145-4495-b2a9-7	0
Banks	BackgroundMusic, SFX	
Panning	3D	
Stream	True	
Oneshot	False	
Override Attenuation	Min 1 Max 20	
Initial Parameter Valu	lêsid	
Advanced Controls		

Figure 15: Script attachment of the guiding music game object



Figure 16: Script retrieving FMOD buses and initializing the event lists.



Figure 17: Script providing access to FMOD event references.



*Figure 18 Beepbox interface for guiding music creation.* 



Figure 19: Background music in the Signal interface.

## 5.4 Visual Design

In order to make the process of creating the game space efficient within the time constraints of this project, it was decided that Unity asset store would be used where possible to construct the visual environment. The primary packs which were used were namely the modular medieval castle set by Advance Studios [29] along with environmental props from Innerverse Games [30] and fantasy landscape props from Pxltiger [31].

The tower, as seen in Figure 20, was created separately in Blender to be visually different enough from the rest of the environment so the player would understand what they would need to approach.



Figure 20: End tower of each level.

## **5.5** Conclusion

Overall, the game was created with the use of multiple programs and tools. The main focus of the game, the guiding music, was created using emitters that were placed down certain paths and played an upwards melody in a loop while the background music stayed as few notes with long spacing between the notes. Additionally, while creating the game the MoSCoW method assisted with prioritizing features. A more clear overview of what playing it looks like is given in the realisation chapter.

# **Chapter 6: Realisation**

In this chapter an overview of the final game created for this project is presented. It presents a showcase of what the final version of the game looks like by providing an overview of the game from the start to the end.

## 6.1 System Overview

When the player first opens the game they are presented with a menu screen with two buttons "Play" and "Exit" as seen in Figure 21.



Figure 21: Main menu.

When pressing the play button, the player is then presented with a short introduction story which can be seen in Figure 22. This helps to possibly draw the players in before they are put into the game world itself.



Figure 22: Introduction story.

After pressing continue on the story screen, the player is placed into the tutorial level that is shown in Figure 23. This small level doesn't contain any guiding music and follows a simple structure for the player to get used to the controls and mouse sensitivity.



Figure 23: Introduction level.

When the player reaches the end tower of the tutorial level they are then teleported into the first level, the one with the golden path as seen in Figure 24. From there the player follows the path to the end while guiding music plays from the side paths. The placement of the guiding music emitters can be seen in orange highlights in Figure 24 and 25.



Figure 24: Top-down view of level one.

When the player reaches the end they are then taken to the second level as shown in Figure 25. In this instance the sound is only playing from the side of the maze that takes the player most efficiently to the end point.



Figure 25: Top-down view of level two.

When the player reaches the end of the second level they are then teleported to a visually distinct area from the rest of the game as shown in Figure 26. This area acts as the end point of the game.



Figure 26: End area.

## 6.2 Conclusion

Overall, the game followed a structure that naturally evolved as the game progressed. When the player first started the game, they were presented with a story to draw them in, followed by a tutorial level to get adjusted with the controls, which was then followed by the two levels the players needed to navigate through. The first level was less of a maze and had no dead ends, while the second level was more difficult to navigate. In the first level the players heard guiding music only in the side paths, while in the second level they heard it from the most efficient path only. The actual experience that the participants had when playing the game can be seen in the next chapter which covers the evaluation phase.

# **Chapter 7: Evaluation**

This chapter presents the testing method for the game as well as what the results of the testing were. The first part of this chapter discusses the method and setup of the evaluation, while the second part focuses on the analysis of the results. The interpretation of the results from this evaluation can be seen in the next chapter which presents the discussion.

## 7.1 Testing Method

The evaluation involved a total of ten people. Two different versions of the game were created, namely one with background music and guiding music, while the other with just the background music. This method showcases the difference the guiding music has over not having it at all. Due to this, the testing method was chosen to be A/B testing, where group A had the guiding sound emitters enabled, while group B did not. Each group consisted of five people and all players went through each level in the same order as to not create too many variables to keep track of. Each participant's gameplay was observed by writing down notes of what they were doing in game and when they finished it, a short interview was conducted which discussed their experience.

#### 7.1.1 Ethical considerations

Participation for this project was entirely voluntary and all the participants were recruited for this project by personally asking people around the University of Twente and a time for the test was agreed upon in person. Each participant was free to withdraw from testing at any point during the session. Furthermore, each participant was informed beforehand that they will be playing a video game that involves mazes and that they would either need to bring their own headphones or use the ones provided, but not more than that. This was done so that the participants would not be actively seeking out the music in the game, as that could influence the results.

### 7.2 Testing Setup

The demographic for this test were university students, as their age range falls in the demographic that plays video games the most [32], [33]. The experience of video games within this demographic is further demonstrated by the fact that everyone who tested this project stated they had some level of experience with video games. For this project, the sex of the participant was not taken into consideration, because of the subjective nature of the goal of this study. As for exclusion criteria, people who were not interested in video games were evidently excluded. Additionally, people who experience audiovisual impairments were also excluded from the study.

The testing was done on the University of Twente campus in the study rooms which also included a tv screen. Participants were seated by the table and given a written briefing to read through (see Appendix C) as well as a consent form (see Appendix D). Participants were told approximately how long the experiment would last and given headphones if needed. Participants were then given the laptop with the main menu of the game open. The laptop was also connected to the tv screen in the room in order to make observations easier. The participants were then told to play through the

game as if the observer was not present. While playing the game, the players' behavior in the maze was observed based on their in-game path taking decisions as well as their reactions and facial expressions. When the participants finished the game, they were interviewed about their experience with it. All interviews were transcribed and can be found in the Appendix one of this report.

## 7.3 Analysis

The analysis for this project will compare the differences of what was said within and between testing groups and their responses and observations will be compared. Due to the small sample size as well as the nature of the study, the testing did not include any surveys or other types of data acquisition methods that could result in quantifiable data. With the focus being solely on qualitative data, the insights would provide information about the players motivations and emotional reasoning for their decisions.

### 7.3.1 Navigation

Participants in Group A, who played with guiding music, did generally pick up on the purpose for the guiding music's presence. In the first level, participants largely stuck to the main path, but paid attention to the branching paths from it, occasionally taking one of them. The most popular path in the first level was the first left turn as shown in Figure 27, however this was the most popular turn in both testing groups, where three out of five from Group A taking it and four out of five from Group B taking it. This lack of a difference suggests that most players would have taken this path regardless, as it seemed like a shortcut to many of the participants.

Test:	Number of side paths taken
A1	0
A2	3
A3	1
A4	2
A5	2
Total:	8

Table IV: First level side paths taken by Group A

Table V: First level side paths taken by Group B

Test:	Number of side paths taken
B1	2
B2	0
В3	1
B4	2
--------	---
В5	3
Total:	8



Figure 27: First and most popular side path.

In general, in the first level amongst Group A, 4 out of 5 participants took at least one of the side paths that included music. However, a similar result was seen amongst Group B participants, with 4 of them taking at least one of the side paths as well. Due to this, it cannot be said that music would be the key factor that takes the player away from the main path. However, for participants from Group A, 3 out of 5 stated that at some point the music had made them more curious to explore other areas of the game.

Participants in Group B, who played without the guiding music, most reported that their decisions were made either randomly or based on trying to find patterns in the geometry of the level. For a few B testers it was also noticeable that they were considerably more lost in the mazes. For the first level, the navigational patterns were not unlike the ones from A testers, however the reasoning behind their decisions was mostly random according to the interviews. One participant in Group B stated that

"Just stick them off, just randomly. Usually actually the shortest to the shortest corner."

This statement suggests that B testers' decisions were largely dependent on trying to find a logic in the maze, or simply picking the paths that made the most sense to

them. As for the second level, because of its less linear nature, the navigation became more varied, with 4 out of 5 B testers taking the looped path, as shown in Figure 28, either partially or completely.



Figure 28: Looped path.

Within the second level players who tested the A version did generally find it easier to navigate it than the participants from the B group, with A testers making a total of less wrong turns than the B testers as shown in tables VI-VII. This difference in wrong turns suggests that players are drawn to directional audio.

Test:	Number of wrong turns
A1	1
A2	1
A3	2
A4	3
A5	0
Total:	7

Table	VI:	Second	level	wrong	turns	Group A	4
-------	-----	--------	-------	-------	-------	---------	---

Table	VII:	Second	level	wrong	turns	Group	В
				0			

Test:	Number of wrong turns
B1	3

B2	3
В3	2
B4	5
В5	3
Total:	16

With the differences present between the groups, it still cannot be said that participants in Group A finished the mazes more efficiently than the ones in Group B however. Not only because time was not measured but also because some players were more curious to explore than others, meaning that even though they heard the guiding music, they first wanted to see what the other parts of the maze looked like. One participant in group A stated

"I mean like I got to the circular castle thing and I was like the music stopped, but I kind of want to see this....So I'm like, okay. I'll do this and then I'll follow the music."

Players who are more of the exploratory type, even though they pick up on the ways the game tries to guide them, their own curiosity has priority over it. The previous statement made by the participant also showcases the difference between simply observing the players and having them talk about their experience themselves, as observations can make it look like the players did not pick up on the guiding music while they wanted to experiment and see where the other paths would lead them.

#### 7.3.2 Influence of music on decision making

Based on what was seen in the participants' navigation of the maze, localized musical sound within the game is generally able to guide players in the correct direction. However, for some players, if they do not get immediate feedback from the decision to follow the music, they may be demotivated to follow it any further. One participant in Group A stated that

"Oh to be honest I did notice like, this has more audio, let me just quickly see. Then I did not see much difference in my opinion so I was ignoring it."

Although the music was able to catch their attention and take them away from the main path, due to the fact that in the first level, if the participant took a side path with the guiding music, they were then lead back to the main path, it could potentially demotivate the player from further following the sound. The importance of motivation is also further supported by another participant among the B testers, when asked about if sound would affect their navigation they stated that

"I think fifty-fifty, because depending on if there's a sound, I either go directly at it just to see what's there and then it wouldn't matter in the long run. But then, like if there's a consequence to going there, then it would have mattered a lot more."

So even though sound on its own is able to catch the player's attention towards a particular space in-game, if their decision to follow it is not rewarded, the player may ultimately turn apathetic towards it.

It should also be noted that a few participants from Group A initially reported that their path taking decisions were random, however, when later asked about the music they proceeded to point out that they did hear a difference in the music. One participant among the A testers stated initially that their navigation was random, however when asked to describe the music they stated

"It is quite a nice ambience. And I believe the extra music is the extra sound effects that only happen when I'm on the right path."

This suggests that players may not always be aware of what is guiding them, but when pointed out, they are able to pick up on it.

When asked about whether music would make the player be more curious or avoid certain areas, all participants stated that the music would never make them avoid any areas in the game. Amongst the participants of Group A, three stated that the music made them more curious to explore the areas, while two who did not pick up on the purpose of the music stated that it did not make them more curious. Among Group B, all participants reacted neutrally to the background music, stating that it did not influence their decision making. This contrast between the groups overall suggests that having the extra guiding music did influence players behavior in the maze, but it depends on whether the person catches on to it.

## 7.3.3 Music's effect on immersion

When it comes to players' immersion in the game, all participants among both groups stated that music made them feel more immersed. For Group A participants, none stated that the music took them out of the experience, meaning that the guiding music was subtle enough that it flowed with the rest of the sounds in the game. The participants from Group B were neutral about the music, as it was more of a background element for them. When asked about whether music affected their decision making, one participant from Group B stated that

"This kind of music, I think it's a bit too neutral, too neutral, too, plateaued basically, yeah. Not enough going on."

Comparatively, when asked the same question from a Group A participant, one stated that

"Yeah, in the last last round, yeah, I heard this extra effect. So I think, yeah. Then I think that's maybe just a direction." The contrast regarding the music's influence between the groups showcases that the background music achieved its goal of staying neutral, while the guiding music largely managed to influence the way that most from Group A engaged with the game. Additionally, since none of the participants from Group B stated that the music affected their decision making, they remained either neutral or indifferent about its inclusion, but still reporting that it did not take them out of the experience at any moment. Overall, the music successfully kept the players immersed by never taking them out of the experience.

# 7.4 Conclusion

In general the evaluation of this project showcased that the biggest differences between the testing groups were present in the second level, while the navigation of the first level remained similar whether the participant heard the guiding music or not. Additionally, the interviews with the participants showcased that the music managed to keep the players immersed in the game in both versions of the game. A discussion and interpretation of these results can be seen in the next chapter.

# **Chapter 8: Discussion**

The first part of this chapter presents a discussion of the key findings from results of the evaluation chapter along with highlighting the improvements and limitations of this project. The discussion presents the key takeaways from this project which highlight where to further take this topic, which is discussed in the last part of this chapter under future work.

# 8.1 Implications of Evaluation

Based on the findings presented in the previous chapter, utilizing stereo audio for music that stands out from the rest suggests it can inform the player of the right path. For a well made video game however, both the visuals and sound work together in tandem. It should also be noted that when discussing the aesthetics of the game, the findings apply to games with a similar level of visual fidelity as the one in this project, meaning that a game with more basic or complicated visual style can showcase different results. The lack of visual variety in the game was noticed among a few of the participants, because some were not as keen to continue to follow the sound as following it ultimately lead to more of the same maze, at least initially in the first level. This lack of visual feedback for following the sound rather confuses the player and causes them to ignore the music instead, which was also seen amongst one of the participants in Group A. It showcases that for some players, it is important to receive feedback that the decision they made was worth it. That feedback could range from anything that extrinsically rewards the player with something to improve their performance in the game, but could also potentially be an intrinsic motivator such as something more visually interesting for the player to see. Auditory cues being tied together with meaningful visual or gameplay changes ensures that players feel that their choices lead to tangible outcomes. For this reason, music and visuals need to play off of each other in such a way that both react to what is happening in the game currently. Within the second level however, it was noticed that because of the lack of an optimal path, players were largely drawn to the additional music they heard and thus decided to follow it. This behaviour suggests that although audio may seem as a secondary element in games to some, it is still capable of affecting the players decision making, having the potential to be the primary element that helps the player navigate an environment with enough emphasis put on it.

Game music is largely a reactive element of game design, meaning that it mostly reacts to the different game states that the player is at, providing an emotional tone to enhance what is happening on the screen. Likewise, visuals are easier for most to relate to, as we as creatures rely more on our vision in our daily lives than hearing. Due to these factors, music is often not used as a method of communicating information to the player and these things are rather kept to the visual side of the game. Our accustomed reliance on visuals is not to say that music does not have its place in nonverbal communication in video games however. When combined with either visuals or some sort of reward system for the player, there is a reason to believe that music can also be used as a method of communication, as the findings from this study suggest that directional music can help people navigate through a video game level not unlike how lighting is capable of indicating the correct direction of navigation in many existing games. It does seem that if players are on a path that

already seems like the most optimal one, music alone is not enough to make the player take potential side paths to explore further, as that largely depends on the type of player playing the game, but also how rewarded the player feels for then following the side path. Ultimately, this study highlights that while music alone is not able to reward the player's curiosity for going down a path they hear it from, it is, however, capable of guiding them in an environment where they are presented with a dilemma between two visually similar paths.

# 8.2 Improvements and Limitations

One of the key areas that could have been improved for this project would have to be the audio emitters themselves. The emitters were placed in such a way that when the player takes a path that they hear, while they are on that path, the emitters would play from both sides of the path in order to create a stereo effect. However, this was not done perfectly, as the music still goes from loud to soft when the player moves in between the sets of emitters. Although none of the participants seemingly took an issue with it, for future work, it would be recommended that if a similar system were to be implemented, when the player picks a path, the sound should transition into a 2D version and play directly to the player similarly to how the background music is played. The transition from 3D to 2D sound would help with the issue of the player walking past the location of the emitters placement, causing the sound to be louder from that certain direction.

Additionally, this research was a qualitative study and the number of participants was low, meaning that further understanding would be required to showcase these results in a more objective manner. Because the participants of this study were all acquired at the university campus, these results can only be generalized about university students who play video games, and thus results may vary amongst different demographics of people. Introducing a larger sample of participants would potentially also change the results as variation was already noticed within the two evaluation groups of the participants of this study. It would be insightful to see how different age demographics pick up on audio cues for video games differently, because the appeal of video games spans a wide range of ages.

It should be noted that in general sound is not a common way to help players navigate through visual environments and as such people who have less experience with games may have a different experience with it. The difference between having less experience with games was also seen during the evaluation of this project, as the participant who reported having the least experience with games compared to the others did not pick up on the music attempting to guide them. In the case of this evaluation however, there was only one person with a lack of experience, so it remains to be seen to what extent does the amount of gaming experience have on the players ability to pick up on nonverbal cues.

# 8.3 Future work

Ultimately, this research is all a small piece of the larger topic of nonverbal communication in video games. Because this project focused on comparing the differences between having and not having guiding music, and suggesting a positive result for having guiding music, future research should look into how players would react to both positive and negative music. Namely, to have one type of music reinforce to the player that what they are doing is correct, while the other for when they are doing something wrong, such as navigating the wrong way. Players may behave differently when they are told that certain music exists due to a negative association, which has the potential to alter their levels of engagement as well as their decision making process.

There was no visual variety introduced in the game, thus the players were left to navigate very similar looking pathways. Due to the lack of visual and mechanical variety present in this game, it would be insightful to examine what the results would look like if the player was also rewarded for following the music either intrinsically with getting to see something different, or extrinsically with something to improve their performance. Having a rewarding system is also important for the different types of play styles that people have, as some like to explore more than others, as also noticed in this study. For this reason, future work comparing the differences between music guiding the player towards an intrinsically motivated goal with an extrinsic one would also be insightful to further understand how music could influence the players decision making and behavior.

The participants of this project all had gaming experience to an extent, meaning it would also be interesting to see how directional music could potentially compare for those experienced with games and those with barely any. It should be kept in mind that because video games appeal to a wide range of people, all with different levels of experience with games, what may seem obvious to those with more game experience may not always be as clear to those with less. For this reason a similar examination of musical communication which takes two groups of players based on their experience would also be an insightful addition to further understanding the effectiveness of audio oriented nonverbal communication methods in games.

# 8.4 Conclusion

Overall, the results from this project showcased that by utilizing 3D sound, music is able to immersively inform the player about directional navigation best when the player is presented with no clear main path to follow, and rather are faced with dilemmas. Future work should assess how player behaviour changes when sounds are added to positive and negative outcomes as well as how guiding music can interact with intrinsic and extrinsic goals. The conclusion along with the answers to the research question of this project can be found in the next chapter where the research is concluded.

# **Chapter 9: Conclusion**

Video games often communicate with the player about where they need to go in subtle ways to keep the players immersed in the experience. These methods are mostly all visual however, with music staying as a reactive element of immersion. The goal of this study was to find out how music is capable of nonverbal communication with the player to guide the player in the correct direction. With this the following research questions was proposed:

Research question: How can music immersively inform the player of their surroundings to guide them through the game?

This research question was answered by creating a maze game in Unity where the player had to get to the end, all while music was playing in specific paths which would lead the player to the end goal. The evaluation of this project consisted of two sets of participants, one group with guiding music and the other without.

The findings from this study suggest that music is capable of immersively informing the player of directional navigation in their surroundings by playing from the direction that the game designer wishes the player to follow. This study suggests that if a player is already on an optimal path, the urge to strive away from it cannot be created by music alone, and would need to be reinforced by meaningful visual or gameplay changes. When on a path that presents dilemmas to the player regarding which direction to go, the findings from this research suggest that players prefer to follow the music.

When it comes to the player's immersion within the game, previous research has shown that music's role is to enhance the immersion that the player is experiencing. This is further supported by the findings from this study which suggest that music which follows the themes set with the visual aesthetics keeps the player immersed in the experience. Additionally, this study indicates that music which communicates with the player does not take the player out of the experience, suggesting that the player stays immersed while the music is communicating with the player.

# **References:**

[1] C. Figueiredo, "Production Design and Game Design in Videogames: Action, Emotion and Immersion in the Player Lived," Advances in Intelligent Systems and Computing, pp. 665–673, 2016, doi: <u>https://doi.org/10.1007/978-3-319-41983-1\_60</u>.

[2] R. Wang, "The Research on the Relationship between Music and Player Interaction in Video Games: A Case Study of the RPG Genre," Communications in Humanities Research, vol. 4, no. 1, pp. 561–569, May 2023, doi: https://doi.org/10.54254/2753-7064/4/20220871.

[3] Y. Zhang and Y. Song, "The Effects of Sensory Cues on Immersive Experiences for Fostering Technology-Assisted Sustainable Behavior: A Systematic Review," Behavioral Sciences, vol. 12, no. 10, p. 361, Sep. 2022, doi: https://doi.org/10.3390/bs12100361.

[4] R. Evans, "An Investigation into the Effect of Music on Immersion in Video Games." doi: <u>https://musicscience.net/wp-content/uploads/2018/10/evans.pdf</u>

[5] G. Christou, "The interplay between immersion and appeal in video games," Computers in Human Behavior, vol. 32, pp. 92–100, Mar. 2014, doi: https://doi.org/10.1016/j.chb.2013.11.018.

[6] R. Leroy, "Immersion, Flow and Usability in video games," Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems, May 2021, doi: https://doi.org/10.1145/3411763.3451514.

[7] E. Brown and P. Cairns, "A grounded investigation of game immersion," Extended abstracts of the 2004 conference on Human factors and computing systems - CHI '04, pp. 1297–1300, 2004, doi: <u>https://doi.org/10.1145/985921.986048</u>.

[8] J. Schell, The Art of Game Design, 3rd Edition. A K Peters/CRC Press, pp.144-149. 2019.

[9] R. F. Huang, "The Impact of Flow State and Immersion in Video Games," Communications in Humanities Research, vol. 5, pp. 43–48, Sep. 2023, doi: <u>https://doi.org/10.54254/2753-7064/5/20230028</u>.

[10] J. Zhang and X. Fu, "The Influence of Background Music of Video Games on Immersion" *J Psychol Psychother*, vol. 5, p. 4, 2015, doi: https://doi.org/10.4172/2161-0487.1000191.

[11] T. Sanders and P. Cairns, "Time perception, immersion and music in videogames," Time perception, immersion and music in videogames, Sep. 2010, doi: <u>https://doi.org/10.14236/ewic/hci2010.21</u>.

[12] V. Cesário, M. Ribeiro, and A. Coelho, "Design Recommendations for Improving Immersion in Role-Playing Video Games. A Focus on Storytelling and Localisation," Interaction Design and Architecture(s), no. 58, pp. 207–225, Oct. 2023, doi: <u>https://doi.org/10.55612/s-5002-058-009</u>.

[13] S. Gormanley, "Audio immersion in games — a case study using an online game with background music and sound effects," The Computer Games Journal, vol. 2, no. 2, pp. 103–124, Aug. 2013, doi: <u>https://doi.org/10.1007/bf03392344</u>.

[14] G. Ribeiro, K. Rogers, M. Altmeyer, T. Terkildsen, and L. E. Nacke, "Game Atmosphere," Proceedings of the Annual Symposium on Computer-Human Interaction in Play, Nov. 2020, doi: <u>https://doi.org/10.1145/3410404.3414245</u>.

[15] G. G. CASSIDY and R. A. R. MACDONALD, "The effects of music on time perception and performance of a driving game," Scandinavian Journal of Psychology, vol. 51, no. 6, pp. 455–464, Jun. 2010, doi: https://doi.org/10.1111/j.1467-9450.2010.00830.x.

[16] C. Klimmt, D. Possler, N. May, H. Auge, L. Wanjek, and A.-L. Wolf, "Effects of soundtrack music on the video game experience," Media Psychology, vol. 22, no. 5, pp. 689–713, Aug. 2018, doi: <u>https://doi.org/10.1080/15213269.2018.1507827</u>.

[17] R. C. Stevens, "The inherent conflicts of musical interactivity in video games," eprints.leedsbeckett.ac.uk, Apr. 01, 2021, doi: https://doi.org/10.1017/9781108670289.

[18] 7 Ways to Effortlessly Guide the Player with Level Design As Seen in Alan Wake," www.worldofleveldesign.com/categories/level\_design\_tutorials/alan-wake-gui de-the-player.php.

[19]"The Lighting In Resident Evil 3 Remake – Thiago Klafke." https://www.thiagoklafke.com/blog/the-lighting-in-resident-evil-3-remake/.

[20]MY.GAMES, "How to make an exciting Open World: the POIs Diversity Rule," MY.GAMES, Aug. 09, 2023. https://medium.com/my-games-company/how-to-make-an-exciting-open-world-the-p ois-diversity-rule-90de6d748eac

[21]A. W. published, "Debate over Resident Evil 4 Remake's yellow paint resurfaces as devs explain just how much help players really need: 'Realism is less immersive,'" gamesradar, Oct. 06, 2023. https://www.gamesradar.com/debate-over-resident-evil-4-remakes-yellow-paint-resur faces-as-devs-explain-just-how-much-players-really-need-realism-is-less-immersive/.

[22]"No Ugly Yellow Paint Everywhere," Nexus Mods :: Resident Evil 4 (2023),May17,2023.https://www.nexusmods.com/residentevil42023/mods/73?tab=description.

[23]J. Coulson, "Resident Evil 4 Remake Mod Removes Yellow Paint For 'Immersion,"" TheGamer, Apr. 04, 2023. https://www.thegamer.com/resident-evil-4-remake-mod-removes-yellow-paint-immer sion/.

[24] A. H. Mader and Wouter Eggink, "A Design Process for Creative Technology," University of Twente Research Information, pp. 568–573, 2014, Available: https://research.utwente.nl/en/publications/a-design-process-for-creative-technology.

[25] ]ProductPlan, "What Is MoSCoW Prioritization? | Overview of the MoSCoWMethod,"Productplan.com,2024.https://www.productplan.com/glossary/moscow-prioritization/

[26] GDC, "Benefits of Missing Out: What 'Cyberpunk 2077' Taught Us About Non-Linear Level Design," YouTube, Jul. 06, 2023. https://www.youtube.com/watch?v=IXLRd5Kah-I.

[27] "Level design for beginners: paths, secrets and shortcuts - KREONIT," KREONIT,

https://kreonit.com/idea-generation-and-game-design/level-design-for-beginners. Mar. 29, 2021.

[28] Cadence Hira, "Why Does Snow Level Music Sound COLD?," YouTube, Nov. 23, 2024. <u>https://www.youtube.com/watch?v=0X4DTfDT4xo</u>.

[29] "Medieval Castle - Modular," @UnityAssetStore, 2024. https://assetstore.unity.com/packages/3d/environments/fantasy/medieval-castle-modul ar-282498

[30] "Innerverse Games - Asset Store," @UnityAssetStore, 2019. https://assetstore.unity.com/publishers/44981

[31] "Fantasy landscape - Asset Store," @UnityAssetStore, 2019. https://assetstore.unity.com/packages/3d/environments/fantasy-landscape-103573

[32]J. Howarth, "How Many Gamers Are There?," Exploding Topics, Jun. 11, 2024. https://explodingtopics.com/blog/number-of-gamers

[33]B. Engelstätter and M. R. Ward, "Video Games Become More Mainstream," Entertainment Computing, vol. 42, p. 100494, Apr. 2022, doi: https://doi.org/10.1016/j.entcom.2022.100494.

# **Appendix A - Interviews With Participants**

During the preparation of this work, I used no artificial intelligence tools

# **Interview 1:**

Interviewer: So let's start with some first very basic questions. How much experience do you have with video games?

Respondent: Quite a lot. Quite a lot.

Interviewer: Consider yourself a gamer?

Respondent: Sure. Yes, absolutely.

Interviewer: So which leads me to my second question. What kinds of games do you play?

Respondent: I mostly play first person shooters. Yes, and some story games, RPGs.

Interviewer: OK cool, so now to the game you just played. Can you describe to me how you decided which paths to take?

Respondent: No, just randomly.

Interviewer: That's fair enough.

Respondent: I just don't really go straight.

Interviewer: No, that's fair. So there wasn't any reason to pick one path over another for you.

Respondent: No, I think I'm always just used to going the non straight option.

Interviewer: That's fine. Good point. Okay so could you describe the music that you heard when playing the game just in general?

Respondent: It is quite a nice ambience. And I believe the extra music is the extra sound effects that only happen when I'm on the right path. And yeah, the music is interesting. Is a bit scary, but yeah, that fits the map. Yeah also this 3D effect is also quite decent, I think. Interviewer: Alright. So did the music at any point influence your decision on which path to take?

Respondent: Yeah, in the last last round, yeah, I heard this extra effect. So I think, yeah. Then I think that's maybe just a direction.

Interviewer: Yeah, fair. So were there, like any moments when the music made you curious to explore certain areas or avoid others?

Respondent: Not avoiding. That's definitely just if I heard music, I'll just keep going to that path I'm choosing.

Interviewer: So did the music make you feel immersed in the experience, or did it take you out?

Respondent: No, definitely more immersed, OK.

Interviewer: So how? If you have any, I mean it is just sort of an idea.

Respondent: Yeah, I don't know. Like it is, if it's the scenario, yeah, it has a sort of. witchcraft sort of thing in it, and the map is a mid century castle and so on. So I think in general they combine each other pretty much, yeah, they matched.

Interviewer: So did it feel like the music was trying to communicate something to you?

Respondent: No, yeah what I mentioned, it feels like a direction.

Interviewer: Yeah. OK. Cool. Do you have any other further points, questions or marks?

Respondent: No.

Interviewer: All right, that's fair. So basically, yeah, that's actually it for the interview.

# **Interview 2:**

Interviewer: So let's get started with the interview. Alright, so first of all, how much experience do you have with video games?

Respondent: Quite a lot over a decade. I mean.

Interviewer: So what kind of games do you usually play?

Respondent: Differs a lot. I've played a lot of different genres from 3D to 2D to platformers, whatever.

Interviewer: All right. So would you like, say you stick to like, more multiplayer games, single player or just play everything?

Respondent: Everything, I enjoy multiplayer with friends or a good single player story games.

Interviewer: Fair enough. Alright, cool. So can you describe what you just went through?

Respondent: Like my emotions?

Interviewer: The Maze, Your emotions, everything.

Respondent: Pretty basic controls, yeah. Yeah, it was fun.

Interviewer: Amazing. So can you like describe how you decided what paths to take in that maze?

Respondent: At the beginning I was just picking random directions, just seeing what it looked like. Eventually I was able to spot the tower over the walls, and then I started trying to head in that direction.

Interviewer: Yeah, so could you describe the music that you heard when playing the game?

Respondent: Yeah, I mean it was just sort of a calm ambience, music, I guess to me at least I didn't think it was really necessary to complete the game, no. Interviewer: Yeah, for sure. So would you say that the music influenced your decisions at any point?

Respondent: I don't think so.

Interviewer: Fair.

Respondent: I was checking at one point if the music was directional, whether like the pings were coming from a certain direction, but then yes.

Interviewer: So would you say, like the music made you at any point avoid certain areas or go there if at all?

Respondent: No.

Interviewer: Yeah. Fair. So in terms of just the background music then would you say it made you feel more immersed or would or did it rather take you out?

Respondent: I mean I guess it does add to the ambience of like a bit of a medieval fantasy. Yeah, magical rune delivery service.

Interviewer: Yeah, exactly so, did it feel like the music was trying to communicate something to you or not?

Respondent: Not to me.

Interviewer: That's fair. So this is because you were a B tester and I turned all the adaptive music off.

Respondent: Oh, right..

Interviewer: Yeah. So, because you're a B tester, I do wanna quickly show you the other version of the game and ask you one quick question about that. Let me just open it up. Yeah, you can just quickly go through that. Just do like the little bit of first level.

Respondent: Oh yeah, I'm right on the audio.

Interviewer: Yeah, yeah, I'll, I'll share the behind the scenes in a bit, but that's all that

I wanted to just quickly show you. So would you say that like had there been kind of just audio that was different in those other paths with that in for you personally, would that have enticed you to explore something or not?

Respondent: Yes. Yeah. Like if suddenly the audio changed or it was coming from a

# **Interview 3:**

Interviewer: First some basic questions, how much experience do you have with video games?

Respondent: I would say quite the experience.

Interviewer: Consider yourself a gamer?

Respondent: I consider myself a pro gamer.

Interviewer: Yeah very good. So what types of games do you play?

Respondent: I play first person shooters, strategy, adventure, puzzle, are there more? Don't remember.

Interviewer: It's fine, you play many types of games, all genres?

Respondent: Yes.

Interviewer: So now to the testing a bit. Could you describe what you just went through? I know it sounds a bit of a menacing question but I mean like the game.

Respondent: Well, I went through a game that's not finished, because I could notice because I could escape the map. Yeah it was quite clear, just had to find the tower.

Interviewer: Yeah.

Respondent: One level was easier than the other. It's just a puzzle game.

Interviewer: Yeah, it's a very basic puzzle game. So, can you also describe how you decided which paths to take in the maze?

Respondent: Random, but mostly just staying to the right.

certain direction, I would be very inclined to walk that way, yeah. So that makes sense.

Interviewer: That's good to know in terms of interview, that's actually it. Alright, that's all I wanted to know. Cool. So thanks for that.

Interviewer: Random, but mostly sticking to the right, okay.

Respondent: Except like a couple where it was like this ally looks suspicious.

Interviewer: So you heard music when you were playing?

Respondent: Yeah.

Interviewer: So did the music at any point influence your decisions?

Respondent: Oh to be honest I did notice like, this has more audio, let me just quickly see. Then I did not see much difference in my opinion so I was ignoring it.

Interviewer: That's fair. So that was for the first level right? Well both, there was audio in both.

Respondent: Yes, but like with the first actual maze I paid attention to it a bit, but with the second maze no.

Interviewer: Alright, cool. So did the music influence your decisions at any point?

Respondent: Well, yes. Technically yes, because at some point it was like, okay, I heard music before when I took this other one, and I hear music now, let me just take this one.

Interviewer: So, going on from that, were there moments when music made you more curious to explore certain paths, or avoid others?

Respondent: This type of music would never make me avoid it. And technically I was curious because that one time when I chose that path like okay does it actually have something special? No, so my curiosity died very quickly.

Interviewer: Yeah that's fair. So, going from there, did the music make you feel more immersed in the experience or take you out from it? That means, both the adaptive music and the background music.

Respondent: I would not say it would take me out of the immersion, but like the adaptive music and background music was

# **Interview 4:**

Interviewer: So first of all, let's go through some basic questions. Yes. So how much experience do you have with video games?

Respondent: Depends on the type of game, but I played a lot of hours in video games.

Interviewer: Do you play mostly single player multiplayer?

Respondent: Both, I think, mostly multiplayer. Like sometimes I play single player mostly survival games. Sometimes a story game, but. Yeah, mostly multiplayer, because I can play with friends.

Interviewer: Yeah, that's fair.

Respondent: Like I can play Minecraft single player. It's fun to play Minecraft with friends.

Interviewer: Yeah, of course. So can you describe what you just went through? Just the game.

Respondent: Well, I had to walk through a maze. There were some basic geometry which led me to some conclusions, some of which were wrong. Which was not as annoying as you would think because it was not very punishing to go there. And like if the walking speed would be like most walking simulators, like sort of Edith finch or something.

Interviewer: Yeah, yeah, it'd be very, very, very slow.

just there. It started to be both background music for me. Something to listen to while I just walk around.

Interviewer: Fair, that's a good way to put it. Did it at any point feel like the music was trying to communicate something to you?

Respondent: No.

Interviewer: Thank you, that is it for the questions.

Respondent: Yeah. So, that makes it way more annoying to go into. Like if you have a more fast-paced walking speed, yeah, you can go wrong more often because it isn't as punishing.

Interviewer: OK, fair enough. So can you describe how you decided which paths you decided to take?

Respondent: Of course I can. So in the beginning there were all these big buildings that you cannot look past like you have like the walls. The amaze you can sort of look past them and I decided to stay in the middle for as long as possible. And just checked if the paths going to the side around those tall buildings would catch up with the main roads again. Like then there would be like a walkway always straight. It's kind of a chance that something is behind the building. Another diversion that you can walk through. But I went with the assumption that that wouldn't be the case, yeah, as I found out during playing the game and the less tall structures that you can walk around do tend to lead to. I once tried to walk because there was geometry built in a certain direction. I couldn't see geometry build in the other direction. So I went with the geometry. Turns out that was a dead end. But like I said, it wasn't very punishing.

Interviewer: So this brings me to the other question, which is that can you describe the music that you heard during the game?

Respondent: I would say, like relaxing music with not a lot of sounds going on? The tempo was very slow and was just like. I believe it's some kind of a radio or whatever. Yeah, it was relaxing enough. That's very repetitive, so.

Interviewer: Okay. So the next question is, did the music influence your decisions at any point?

Respondent: No, because I haven't gotten annoyed with it yet.

Interviewer: Yeah, fair. So. Going on a little bit from that, would you say that the music made you avoid certain areas or not at all, or was it more just indifferent?

Respondent: It was mostly indifferent, I would say, the point where the music would start to influence me was that because it's very repetitive, I would get bored of the music and start to be annoyed by the music. Yeah, and then wish to finish the maze as soon as possible, and that might influence my decision making. But as of now, the music wasn't intrusive.

Interviewer: Yeah.

Respondent: So it wasn't influencing my decision making. Maybe if you put a very high intensity like some do music, people would be reckless walking through the neighborhood

Interviewer: Okay. Did it at any point feel like the music was trying to communicate something?

Respondent: Did you put some hidden message in there? But no.

# **Interview 5:**

Interviewer: Let's start this interview with some basic questions. How much experience do you have with video games?

Respondent: A lot. A lot.

Interviewer: So what types of games do you play?

Respondent: I play puzzle games like at the moment, mostly puzzle games. I play a lot of FPS as well. Just depends on story games. Interviewer: Okay. Because you're a B tester, the next thing I want to do is quickly show you the A version of the game.

Respondent: Now I have different sounds coming from there. Bit higher tempo. Still going to go with my search. But it's like I would if it weren't for me playing this earlier.

My instincts are to go through towards it because it's like here's a new thing. So yeah.

Interviewer: Would you say that like now that you saw the other version? How much would your navigation differ had that been your first?

Respondent: So I would be like a moth to flame like this hyper child like, oh new sound.

It just works. New sound there? Yeah.

Interviewer: The final question that I want to ask you is do you have any other questions, remarks or anything like that?

Respondent: Right. As far as I understand, it's about navigation.

Interviewer: It is.

Respondent: And how music influences decision making.

Interviewer: Wow. Well you figured it out.

Interviewer: Yeah, OK. So wide ranges. All right, cool. So now about the game. Could you just describe what you went through?

Respondent: Just, you know, the game was like a castle thingy and I was walking around the castle. Sightseeing for me. So yeah, a little bit of a maze. Bit of a maze.

Interviewer: So could you describe how you decided which paths to take in the maze?

Respondent: Looks cool. That one's narrow. That's dark and donkey at some

point in the second level, I think I figured out that that sound was leading me towards the exit.

Interviewer: Yes. So to the sound a little bit, can you describe the music that you heard when playing the game?

Respondent: Very mellow background music. But then like, yeah. Got a little more intense?

Interviewer: Yes, so at any point, did the music influence your decisions? If so, how?

Respondent: I mean like I got to the circular castle thing and I was like the music stopped, but I kind of want to see this.

Interviewer: Yeah.

Respondent: So I'm like, okay. I'll do this and then I'll follow the music.

Interviewer: Fair enough. So were there any moments where the music made you more curious to explore certain areas or avoid others?

Respondent: More curious.

Interviewer: Okay, so in terms of immersion, did the music make you feel more immersed in the game or rather took you out?

# **Interview 6:**

Interviewer: All right. So let's start with just a little short interview. So first just for basic questions, how much experience do you have with video games?

Respondent: Quite some. Quite a lot. A few thousand hours? I'd say so. Quite a bit, yeah.

Interviewer: So what kind of games do you play?

Respondent: I used to play a lot of first person shooters. And I still play a lot of simulation games. Tycoon games as well. And map games. Yes,

Interviewer: Paradox games?

Respondent: Yeah, more immersive, more immersive,

Interviewer: Okay, if so, could you explain how it made you feel so?

Respondent: I mean, in general music, like, it adds to the ambience of the game, it's to offer a full experience.

Interviewer: Yeah. Fair

Respondent: To also close off that part of your census and bring you into the hearing.

Interviewer: Yeah. So did it feel like it was trying to communicate with you? Or like, when did you realize that it was trying to communicate with you?

Respondent: Like halfway through the second maze? Yeah, it was just like, oh, wait, it's stopping when I go in a certain direction and it starts again when I go in this direction. I didn't notice this. But now I do.

Interviewer: Yeah, fair enough. And then the last question, do you have any further questions, comments? Anything like that?

Respondent: No, no.

Interviewer: Yeah, that's fair. In that case, that's it.

Respondent: Those yes. Yeah, yeah. So those usually. Some Total War like games as well.

Interviewer: Yeah, quite varied, fair. So now a little bit about the game. Can you describe what you just went through?

Respondent: A maze. In my eyes, a weird one. But it didn't seem like it made sense.

Interviewer: Yeah, I see. So can you describe how you decided which paths to take in the maze?

Respondent: Just stick them off, just randomly. Usually actually the shortest to the shortest corner.

Interviewer: Yeah. OK.

Respondent: So if you see a long hallway, I'm like, OK. Let's first try the other one.

Interviewer: Yeah, yeah, fair enough. That makes sense.

Respondent: And just a choice because I don't know whatever is behind them.

Interviewer: Yeah. OK. So also now a little bit just about like the ambience of the game. Can you describe the music that you heard? Just in your own words.

Respondent: Well, it was just very few notes. Kind of.

Interviewer: Yeah. OK. At any point did the music influence your decisions?

Respondent: Not that I can answer.

Interviewer: That's fair. Yeah, that makes sense. Going off a little bit from that, even though it didn't influence your decisions, were there moments when the music made you more curious to explore certain areas or others? Or avoid others.

Respondent: This kind of music, I think it's a bit too neutral, too neutral, too, plateaued basically, yeah. Not enough going on.

Interviewer: Yeah. i

Respondent: If you had like 2 soundtracks next to each other and they were, like, completely different, right then, yes. One of them. One of them beat.

Interviewer: Yeah, that makes sense.

Respondent: I mean, compared to no music maybe.

Interviewer: Yeah, that could be. So in terms of just the music, did it make you feel more immersed in the experience, or would you say rather took you out?

Respondent: Well, definitely did not take me out.

Interviewer: OK.

Respondent: Yes, more immersed. And yeah, it was just like the maze itself was not very immersive.

Interviewer: Yeah. No, that's fair.

Respondent: Like you could make it immersive. It's like I'd say, it's a good base, right?

Yeah, but I would say it's not much of a logical one. And that keeps at least me out of immersion.

Interviewer: That makes sense. Yeah. So a little bit from that, did it at any point at all feel like the music was trying to communicate something to you or not at all?

Respondent: No, it was just 4 tones for me exactly.

Interviewer: That makes sense. So this is because you were a B tester, so I would now like for you to play a little section of the first level through a different version of the game. And then I wanna ask you a question.

Respondent: Oh, what's that? Oh, that's not nice. OK, hmm. Very disorienting.

Interviewer: OK, that's just what I meant. So it's first of all, so I assume you now heard some kind of difference.

Respondent: Yes.

Interviewer: OK. Did you now hear a difference? If you had this when you were first playing, do you think this music would have made you not curious to explore certain areas or compel you to explore others? How would you have navigated differently?

Respondent: I cannot tell.

Interviewer: Yeah, that's fair. But just curious about your thoughts in that case. Like, do you think something like that would influence you?

Respondent: I find personally very disorienting.

Interviewer: Yeah, yeah.

Respondent: So like it was not that they were in a specific direction. It was like a

swarm of like, like a swarm of bees going around.

Interviewer: Do you have any other further comments, questions, or remarks?

Respondent: Game is nice if it was actually like a sensical and mystery right then. Like I kinda like the artwork to be

### **Interview 7:**

Interviewer: Few questions just to start us off. How much experience do you have with video games?

Respondent: I wouldn't say I'm a real gamer, capital G gamer, no. But I mean like,

Every now and then I like to start playing Minecraft again, like two weeks of a Minecraft phase. Portal every now and then. No, but like I don't game much, like I maybe open a game like once in a few weeks, once a month.

Interviewer: You spoke a little bit about the games that you do play. So what types do you play then usually?

Respondent: So pretty much there are and actually only like 3 games. Stardew Valley, but I'm pretty new to it. I just bought it a few days ago. I think it's fun. Like, I think it's fun when games let you do your own thing. For instance in Minecraft, like, yeah, sandbox. They're like, here's what you can do in this game. Go mess around. Go have fun. Like, I like that about Minecraft. Also, it's more like you have to solve a puzzle, but you do have this one thing, and create portals, go mess around with it, go have fun. I like that about it a lot.

Interviewer: So now to the actual thing you just played through. Can you describe what you just went through?

Respondent: Okay so when I open it like what I actually did, I went through experience or like what I actually did in the game?

Interviewer: The game that you went through.

honest. Like it's it's quite nostalgic, I'd say like. And if you make it actually mystical and a bit like a mystery and such it could work as a game.

Interviewer: Yeah, anything else?

Respondent: No.

Interviewer: Well, thank you. Thanks a lot.

Respondent: I like it. I like the little story at the beginning 'cause like it gives a fun little "Oh, there are Wizards. You have to go to find the tower in the maze." I thought it looked very nice. The castles were very cool. Okay, I am not that great at mazes or anything, but I mean, I do know a method like if you just stuck your right hands to the right wall and just keep following it, you always find the ends, but it's kind of boring. So I just was like, okay I'm just going to run around, see like, keep my eyes open. Maybe try to find a pattern in the maze, like maybe it was some sort of symbol or whatever, but I couldn't. Really, I'm not that great at finding patterns.

Interviewer: Interesting, so can you describe the music you heard while playing it?

Respondent: It was kind of like, I couldn't really find a repeat, but it was kind of still in like a some sort of ambiance. I never thought it was really fun. It was kind of. It made some sort of, majestic is not really the right word. Some sort of it fits the rest of the game. It really fits the theme.

Interviewer: Okay, well, that's great. So at any moment when you were in the maze or one of the mazes, did the music influence your decisions on which path to take?

Respondent: Oh, that's a good one. I do think it added to the experience of it. So you had some sort of medieval theme with castles. They had to find the wizard's tower and stuff. So I did think it added to the theme of "Oh, I want to explore this world." So, like an attitude and total experience, because if there was no music, it would be like, oh, it's just a maze. I want to find it's end as fast as possible. But I do think that experiencing it made me want to explore it.

Interviewer: Okay, cool.

Respondent: So I didn't really mind. Like, oh, this takes longer. Oh, this is like a dead end.

Interviewer: Oh, Okay.

Respondent: Well, I'll just walk around more.

Interviewer: Would you say that there were moments when the music made you more curious to explore certain areas while avoiding others, if at all?

Respondent: Good. I was wondering if it was gonna be like that. So the maze was pretty consistent. The walls and the towers and everything still looks very cool as a castle. But there weren't any places you could go in that were like stuffed with dinosaurs or something. Because there was not really a difference between places to go to like choosing right or left, there wasn't really a preference based on what they looked like, and I don't think the music really added to like oh, I wanna discover this part because they were both kind of the same.So I mostly just went for go to the right.

Interviewer: Okay, so did the music make you more or less immersed in the game?

#### **Interview 8:**

Interviewer: So question one, how much experience do you have with games?

Respondent: A bit. A bit like more than the average person, less than the average gamer.

Interviewer: Fair. What types of games to play?

Respondent: Baldur's Gate 3.

Interviewer: Hell yeah.

Respondent: Also Minecraft.

Interviewer: Oh yeah. Anything else?

Respondent: Yes, more, absolutely.

Interviewer: And did it at any point feel like it was trying to communicate something with you?

Respondent: I liked how the music was quite medieval. Yeah, so that felt, but also it had some sort of magical but majestically, like, something in the theme of, like, about, like, finding a wizard's tower like magic wizardry stuff. I'm not sure if that answers the question.

Interviewer: No, it's fine. If it's like, did it make you choose certain paths over another for any particular reason, if at all?

Respondent: Not no.

Interviewer: That's fair. All right, cool. That's good to know. Do you have any other further questions? Comments. Whatever.

Respondent: I also really like the ending parts like where you get back to the garden and the trees and everything. I was like yes, I think stuff like making it look like your friends can also go inside places. There's like, I know horse stalls there like more themes of medieval parks. So, it's like you're in a castle that happens to be amazing .So it's a maze that looks like a castle.But I still think it was very nice.I really liked how it looked.

Interviewer: So yeah, that's it for the interview, of course. Thank you.

Respondent: I do like Spirit City type games where it's just low fun music vibe things. Pick a park. I don't know that the top of my head would have that. Like the more cozy side games.

Interviewer: Yeah so, about the thing, can you describe what you just went through? Just the game in general, just in your own words.

Respondent: It was like a maze, castle walls, stuff like that.

Interviewer: Yeah. So can you describe the music that you heard while playing the game?

Respondent: I wasn't actively aware of it, which is good.

Interviewer: No, that's fair.

Respondent: Like, I wasn't distracted by it. It was just mm hmm.

Interviewer: Nice.

Respondent: Yes.

Interviewer: So at any point while playing did the music affect your decisions or not?

Respondent: No, no.

Interviewer: That's very fair. Were there moments that well, because you already said no, but I still would like to ask that question, were there moments where it made you more curious to explore certain areas or avoid others, if at all?

Respondent: No.

Interviewer: Yeah, that's fair. That's all right. So did the music make you feel more immersed in the experience or less?

Respondent: More.

Interviewer: OK, cool. And at any point, did you feel like it was trying to communicate something with you?

Respondent: No. Not that I know.

Interviewer: So that's because here's the thing, you're a B tester.

Respondent: OK, I was. I was just sitting here feeling so bad.

# **Interview 9:**

Interviewer: Alright, so let's get started.I first have a few questions just to get us started. How much experience do you have with video games?

Respondent: I have a lot of experience. I wouldn't say I'm very good at them.

Interviewer: That's okay. No judgments here, you know. So that's fair. So what do you actually play?

Interviewer: No, no, no.

Respondent: Did I miss everything?

Interviewer: No. So I'm gonna now let you just play a snippet of the A version and then ask you one question about it. So just go to the first level, just the first turn there.

Respondent: OK.

Interviewer: You can just speed run the tutorial.

Respondent: Oh yeah, uh, the ominous things.

Interviewer: Yeah. Yeah. OK. So I can also show you how it all works later.

Respondent: So the question for you is how much would you have navigated in the maze differently had that been there from the beginning?

Respondent: I think fifty-fifty, because depending on if there's a sound, I either go directly at it just to see what's there and then it wouldn't matter in the long run. But then, like if there's a consequence to going there, then it would have mattered a lot more.

Interviewer: Yeah, that's a fairpoint. That was actually the final question. Do you have any other further questions? Comments or remarks what not.

Respondent: I was lost.

Interviewer: That's alright. Thank you for the testing!

Respondent: Oh I like open World games, Skyrim and the like.

Interviewer: Yeah.

Respondent: I enjoy being immersed in the game, so I usually play games that have either a nice art style or good graphics.

Interviewer: Fair. So can you describe what you just went through again?

Respondent: I went through a short walking-sim, basically. About a medieval castle. And reaching the lookout towers at the end of the level in order to move on to the next stage.

Interviewer: And can you describe how you decided which paths to take?

Respondent: At first I was just like usually when I play games, I want to do all the side content first and then the main content. So at first I was going everywhere and then went to the main one. Then at some point, after three times when I went, I took a side path and there was nothing. And then I noticed there was some sound playing and paths that did seem to be important. So then I just ended up following the sounds.

Interviewer: Yeah, so that brings me to the second question. Can you describe the music you heard while playing today with your own words?

Respondent: Distant. Ethereal. Not very many notes. Very pleasant, not very noticeable. I'd also say a little unengaging.

Interviewer: Yeah, fair. So in terms of that, did it at any point influence your decisions on which path to take the actual music?

Respondent: No. Obviously the sound effects, yeah. Did the actual music, no, not really. No.

Interviewer: So were there moments where both the background music and the actual sounds that you heard made you more curious to explore others or avoid some other?

Respondent: The first time it's very much a thing of, hey, there's something here. I try to look where the music is coming from.So the first time, yes. And then after going through it and seeing how the music keeps leading to the right path, I just assume the music guides my way. So then it's more like where there is music. I go there, whether it's not, I assume there's not. Interviewer: Yeah I noticed you like test like, oh, the sound is there. There's none, Yeah So did it feel like it was trying to communicate with you at some point?

Respondent: Yeah, it is. It does feel almost like a guiding hand. Like someone beckoning you to come in a certain direction.

Interviewer: Yeah, yeah. No fair. Do you have any other further questions, comments from marks?

Respondent: I think the very first time I heard the music, I was a bit confused because it's coming from one direction. And you can very clearly localize it in space, but there's nothing there. And then at some point you walk around enough, you start to hear the other one. I mean, it's not diegetic at all. It's. Yeah, it's entirely separate from the world, but it's also somehow guiding you. Yeah, so it's confusing.

Interviewer: Yeah, that's fair. That's fairpoint.

Respondent: Not so much confusing because you do, of course, realize you're playing a game. So it's understandable like, oh, this is where I go. But it I wouldn't say it felt like it. It felt like a ghost at most, and other than that, it didn't really feel like part of the world.

Interviewer: So question about that is that did it make you feel rather more immersed or less immersed just in general?

Respondent: I have to say more immersed. Any sort of sound is more immersive.

Interviewer: Fair enough.

Respondent: I can't remember if there were footsteps or not. I think there were. I did really like that. Yeah, I do like that sort of emotion.

Interviewer: Oh, well, then, that's it for the interview. All right, thank you.

# **Interview 10:**

Interviewer: All right, so first question, let's go. How much experience do you have with games?

Respondent: One to ten?

Interviewer: Just in general.

Respondent: I'll just say I'm a really experienced gamer.

Interviewer: Yeah. What types of games do you play?

Respondent: Yeah, RPGs, racing games, simulators, all sorts.

Interviewer: Yeah. So can you describe what you just went through? The game.

Respondent: Yeah, it was like orientation. You have to find I would say, the most optimal path to the end point, yes. I think there were some clues on the ground. I'm not sure that you have to follow to get to the correct path.

Interviewer: So, OK, could you describe the music that you heard about playing the game?

Respondent: It was really quiet, but it was really. How should I explain it? It was really wizarding. Like, really like it was simple but effective because it gave you this mystical feel about the game, like the ambiance, the ambiance.

Interviewer: So following that, at any point did the music influence any of your decisions, or did it not?

Respondent: No, because it was too quiet. Yeah.

Interviewer: That's OK.

Respondent: I should have had the volume a bit higher. Maybe then it would have been. But the way it was, I didn't know.

Interviewer: That's very fair. So were there moments where the music made you more curious to explore some areas or avoid any others? Or was it just neutral?

Respondent: Well, OK that way. It was neutral, but it was more so to make you

more immersed with that which it achieved.

Interviewer: Yeah, 'cause that was going to be my next question, if it made you feel more immersed?

Respondent: Yeah, yeah, yeah, it achieved that. Because yeah, as I said before and it was like it had this Mystic style to it.

Interviewer: So did it at any point feel like it was trying to communicate something to you or not?

Respondent: Again, it was too quiet. I didn't.

Interviewer: Yeah. So this is because you were a B tester. So now I'm going to quickly show you a version of the game, and then I want to ask you a question after that.

Respondent: Can I increase the audio?

Interviewer: Yeah, yeah.

Respondent: It reminds me so much of the game that I cannot remember which one. I see the difference, yeah.

Interviewer: Oh, that's good. So, how do you think your navigation of the maze would be different if you had played this version?

Respondent: Yeah, I would have been able to do that way, way quicker. Because that way I can distinguish which path is right and not, like to go through and not deviate from the quickest path.

Interviewer: Yeah. That's fair do you have any other further questions, comments, remarks?

Respondent: No. Were there runes that looked like runes on the ground or just side effects?

Interviewer: So visually, there was nothing guiding you.

Respondent: Maybe, maybe that would be something like mm hmm like these, like unique marks, just to know that. OK, maybe this is a good path maybe. Interviewer: Anything else?

Respondent: Not really.

Interviewer: Well, thank you for the testing.

# **Appendix B - Interview With Sound Expert**

#### Expert: Yes.

Interviewer: All right, let me check. Yeah, it works. OK, cool.

Expert: Yeah. OK.

Interviewer: Yeah, so my project.

#### Expert:

'Cause. Yeah, you were working on something interesting for your graduation project.

#### Interviewer:

Yeah. So basically what I'm trying to do is I have like a maze like game and I'm trying to have the music essentially learn them to take one. Passover another so I have like 2. Like levels, if you could say which are basically one is like a just a maze. There's no clear obvious main path to take. And the other one is more of like there's a golden path slash like a main path. And like a very obvious kind of main path. And then like some.

Side roads that STEM branch from it.

#### Expert:

Right, yeah. So it's it's there's one solution. If it were like it, it is.

The players are supposed to take one path. There's no multiple.

Interviewer: Yeah. Wait, I can actually, like show you. I think 'cause I.

Expert: Endings, if it were.

Interviewer: Let me see if I can record this screen. Hold on.

Expert: Oh yeah.

Interviewer: Yeah, so this is. I don't know if you can see my unit.

Expert: Fire.

#### Interviewer:

Yeah, so basically I have like 2 levels here where one of them. So the one on the left has like a very like kind of you know obvious main simple side like main Rd.

Expert: Yeah, yeah. Yeah.

Interviewer:

And then there's the side path that's done from there. And then one of them is like, yeah, there's no really clear main path to.

Expert:

No, there's just dead ends and yeah.

Interviewer:

The end.

Yeah, basically so. And then the goal 'cause I I have like one main background song and then well currently it's all like it's not the final music obviously, but basically I have AI have that and then I wanna essentially use the music to see if it influences the.

Player to to choose one path over another.

Yeah. And so like that's what I wanted to know is to like, what is it in music that can, like, entice someone or just like curiosity?

Expert:

Yeah.

Yeah, that's that's a good question.

I.

I actually have multiple questions about about your idea because.

Well, I think it's it's possible to to to to make.

Changes in music that.

Overall, do sound more positive and more negative or you know more, more, happier or more sad.

Interviewer: Yeah.

Expert:

Based on like cultural references that we that we all have. Grown accustomed to.

Interviewer: Yeah.

#### Expert:

So that part is well it it it depends on the entire atmosphere of the game and the the the sort of base music that you're using from which you can either go good or or bad or you know just to simplify things.

# Interviewer:

Yeah.

#### Expert:

But overall, I think that that part is. Doable by mostly well trying to mimic the the the, the, the the elements of of those cultural references that we know.

So probably a major scale indicates if your music changes.

To.

A major scale, it it generally tells us that that, well, it's sort of the happiness scale, right, whereas the minor scale is more like sadder and and less.

Interviewer: OK. Yeah, yeah.

#### Expert:

You know, so those are very simple things that that could be applied to to give an indication.

My first question, however, looking at your your plans is.

When does player have time to hear that? And interpret it.

Because of course music is linear product that takes time and you need time to to to ingest it and and process it and sort of if there is.

Interviewer: Yeah.

#### Expert:

Any meaning through it to to to.

To grasp up meaning within a certain time, and I don't know if it's if you can predict how long people are going to take on that, especially if it's not their main focus in playing the game.

Interviewer: Mm hmm.

#### Expert:

So the adaptive music that we usually design.

Interviewer: Mm hmm.

#### Expert:

And usually use within games to change the emotional atmosphere for the player. Is tends to be reactive to what you've got. Got yourself into and then the music response to that.

Interviewer: Yeah

#### Expert:

So it's it's very rarely, is it a predictive or or a sort of steering?

Element and that's what you're trying to do here, of course.

#### Interviewer:

Yeah, that's yeah, that's what. Like, I also saw through my research is that it's usually like like music adapts to your state. Like if you're in stealth or comet or such, it will adapt. But like basically for for my project, I'm trying to keep the like visual.

# Expert:

Mm hmm.

Interviewer:

Like visually, the game should be very simple, so there's not much that like for the player to differentiate other. Obviously in the main path, but like.

Visually, there shouldn't be like any like a light that would catch their attention to take this aside instead.

So if it's like all kind of like an equal playing field, if you could say?

So because the idea for me is that I have like this main music and I have these emitters that at the like entrance of each path kind of emit a different sound.

Expert: Mm hmm.

#### Interviewer:

And I I thought I could do that with, for example music stems or create like some kind of certain addition to the main track that's playing with, like I don't know a guitar that does like a certain motif or something. And so that was my idea. But I yeah, I don't know, like how.

Expert: Sure. But then you're if. If I. Yeah. Sorry. Do continue.

Interviewer: Like what? Like on the teeth? Yeah. Not like, yeah, it's just that I I would have known. Like, how? Like what kind of metaph would communicate?

Expert: Right, yeah.

Interviewer: Intrigue. Yeah.

#### Expert:

So is then, because then you're talking about sort of localising parts of the music within. The the game world.

So you're making the music diegetic, if it were.

Interviewer: Yeah.

Expert: Yeah, I mean, that's technically possible. It's not. It's not usually how we.

Interviewer: Mm hmm.

#### Expert:

Design music is usually music is a non diegetic element in the in. In games of course.

Interviewer: Yeah.

#### Expert:

So so I'm wondering how the music as a whole then would. React or maybe the sort of the base layer

of the music is non diegetic.

It's just on on your headphones, for example, as a player and you hear.

Interviewer: Mm hmm.

#### Expert:

A musical elements emanating from either of the paths that you could choose from and is sort of playing in the same.

Interviewer: Yeah.

#### Expert: Tempo scale.

Interviewer: Yeah, the tempo scale. Those have to match, of course.

#### Expert:

Yeah, yeah. But but that is a clearly localized source for for the player.

Interviewer: I.

Expert: So they can actively choose to walk, making the music grow.

With that sound or or that sound right, that's I'm understanding correctly your.

Interviewer:

Sort of, yeah.

So my idea for using those emitters mainly came from the stereo audio, because I figured that if I if they could hear like something from the right, the music wise, maybe that could further convey that.

Oh, you might want to go, right?

#### Expert:

Right. So it doesn't even need to be in the game world per southeast. It just needs to be. It needs to have a directionality, yeah.

#### Interviewer:

Yeah, basically that's that's the reason I put the emitter stair like for the directionality.

#### Expert:

Right. Yeah, 'cause. Then you don't. Yeah, I understand now. So I I initially was thinking about like it's an object or it's a it has a place in the gaming world.

Interviewer: Oh yeah, yeah.

#### Expert:

You're working. You can work towards it and then sort of pick it up and add it to the music, but this way you can also make the emitters sort of float around the head of the of the listener, placing them in specific places or whatever they.

Interviewer: Yeah.

#### Expert:

Well, yeah. Whenever they turn their head, they can still hear that the the sounds are coming from either the general direction of that part or the general direction of that part.

Yeah, yeah, I understand.

Interviewer: Yeah.

#### Expert:

That's. Yeah, that's definitely.

Technically possible, and I think yeah, it's the, the the. Yeah, I think that's a smart idea in, in, in, in presenting the choice to to the player.

Interviewer: Yeah. OK.

#### Expert:

While keeping the source of the music quite close to the to the, to the listener themselves.

Interviewer: Mm hmm.

#### Expert:

Then and and I do think that. Well, look, yeah, if you're going to change scales, for example, the example that I used before, then it's going to be a little bit more difficult maybe.

Interviewer: Yeah, for sure.

#### Expert:

Well, it depends on you how you do it. If your bass music is just rhythm for example.

Interviewer: OK.

Expert:

Then you can make the players choose the scale because you don't have a scale in your skeleton music.

Interviewer: Yeah.

#### Expert:

I think unless that music with a certain tonality. Disappears again before the next choice. You can only make that choice once though.

Interviewer: Yeah, fair.

Expert: Or you'd have to change scales mid, mid song. That usually doesn't produce the best.

Interviewer: Yeah, that doesn't sound good.

Expert: No. Well it's it's. I mean it's it's worth a try. Anything, anything is possible if you design it right.

Interviewer: Yeah.

#### Expert:

But that was one of the mistakes I personally made when I started developing adaptive music for the first time, which is probably around 20 years ago.

Interviewer: OK.

#### Expert:

Where I chose to do exactly this to give sort of emotional state.

Connect them to musical scales.

But then you'd have to switch between scales within a a sort of continuing piece of music. And that often. Yeah, it there's very little chance of of that becoming like a beautiful piece of music to listen to actually. So.

Interviewer:

Yeah.

Yeah, but.

What if, like like one potentially idea that I had was that I could maybe use, let's say

I have the background song, it's very simple.

And it's in a certain key and tempo. And then I would let's say add a instrument to it in one of the choices that would then obviously play in the same key and tempo and whatnot, but.

#### Expert: Mm hmm.

#### Interviewer:

Would that also be something that would be?

Possible, or would you say yeah?

#### Expert:

Yeah, it it. It goes in the realm of what I was going to suggest next.

So have a sort of, yeah. Again, a sort of bass music sort of skeleton of a music that you can add stuff onto.

I think if you're talking about choosing between instrument A and instrument B, then that's gonna be very subjective to each player and and it's just what brought instrument to you as a as a listener prefer. I don't think instruments by themselves have this this cultural connotation that.

Interviewer: Yeah. Yeah, yeah. Mm hmm.

#### Expert:

Oh, a violin is positive and and you know, a vibraphone is negative. That's but.

Interviewer: Yeah. Yeah.

#### Expert:

You can try to include little cues like an upwards melody is usually something positive.

Also in pick up sound effects or in power up sound effects. Usually whenever something positive happens we need to communicate this in a short time which is also one of your issues I think.

Interviewer: Yeah, it is.

#### Expert:

Because you, unless you want to. Sorry, I'm switching back to Dev. I will get back to this, but unless you present the player with, are you going to go there?

Interviewer: OK.

Expert: Are you going to go there? You have X amount of seconds to choose.

Interviewer: Yeah.

Expert:

It will need to happen fairly quickly that the player has to decide. I get a positive feeling from that side and I get a negative feeling from that side. So in that sense. Your queues should be. Super clear and rather quick too. To decipher basically.

Interviewer: Yeah.

Expert:

But what I was going to say is if we are using the simple tools of notification sounds for example we can have an upward melody meaning positive downward melody.

Interviewer: Yeah.

Expert:

Presenting the negative option and then it would be I think fairly easy for people to.

Interviewer: Yeah.

#### Expert:

Sort of make that connection and you can do that with multiple instruments that get added onto the music.

And it doesn't even mean that.

When the choice is presented, 1 Melody goes up, 1 Melody goes down.

But as soon as you've made a choice, then the melodies with that instrument gets added to the music, doesn't need to be constantly playing upward melodies for example.

It can then just be attached to the music and do whatever it wants.

And but it does allow you to to add multiple instruments to that music.

#### Whenever you have a choice.

You pick the instruments based on what sounds best in your ears as a player, and then the instruments get added and each time you have this this.

Interviewer: Yeah.

#### Expert:

Choice that you're making the player choose from, presented in in a way like like upward melody versus that. downward melody. I think that would be the the simplest and most simple to understand.

Queue for a lot of people, yeah.

#### Interviewer:

Yeah. Yeah. I didn't think about the upward and downward mentality because she had notifications and stuff. Really do use to use those because that that that's an interesting point. Think about it.

#### Expert:

They they also use things like amber, like, usually smooth Timbers are are considered more friendly and you know when you when you say.

Interviewer: Mm hmm.

#### Expert:

An incorrect answer on a on a quiz for example, that is a very, very gritty texture.

Interviewer: Yeah.

#### Expert:

So that's another element, but that's I think a little bit more subtle.

So if you want to make the choice more difficult, then you could choose to use tamper only for example.

Interviewer: Yeah.

#### Expert:

But if you want to make it easy for for the players to to pick positive versus negative, then I would go with some kind of. Well veah the the notification cues like upward melody or downward melody.

Interviewer:

#### Mm hmm.

OK.

But would it be like if there's so that would be like if there's like a wrong and a correct choice?

But what if they I don't want them to know if there's like a wrong choice necessarily?

I just want them to make the choice based on the music kind of so.

Expert: Yeah. Right.

Interviewer:

If I were to go like that way, would it be that let's say, like you, you're going down a path and you see a side path.

Then you would hear that kind of upward short melody from the right side, let's say of the matches with the music.

### Expert:

Mm hmm.

Interviewer:

So would you say that like, that's something that would then possibly entice someone to take it? Or would it be like, I mean I I guess it's always subjective, but.

#### Expert:

Yeah. And I think whatever you choose, it is going to present the player with a choice. Like if they actively can recognize.

I see a path appearing and I'm hearing a piece of music that also comes from that general direction.

Then, whatever that sound is is going to present like an opportunity to to the player like.

Interviewer: Yeah.

#### Expert:

It is going to present as as as a choice. Probably, as do I take that path or or not?

Interviewer: Yeah.

#### Expert:

My my instinct would be to say that if if a sound is also connected to it, it makes it extra inviting to go in there and see what is in there.

Interviewer: Yeah.

#### Expert:

If, if you're completely blind to the overall concept of the game, of course.

But just speaking from from that moment, I would say that that's, yeah, you're setting up an an intriguing little.

Moment there, yeah.

If you don't want players to do to directly hear that positive or negative connotation to the music, then.

Well, either you make it more subtle, like I just said, like you play around with Tambor instead of those very clear.

Positive versus negative choices or you can play around with.

Interviewer: Yeah.

#### Expert:

Just general atmosphere. I would, I would say like.

If the music is fairly neutral and and one path offers me, you know, a somewhat more heroic melody on top of that versus the other.

Sounds a little bit more mysterious.

You'd have to.

As a musician, you'd have to look if that's both. If both of those options are possible to to to grab and stick onto the base melody that's already there, of course, but.

Interviewer: Yeah.

Expert:

In that way you could sort of. If that's possible, then you could make a choice between sort of culturally recognisable general atmospheres that don't necessarily convey like positive versus negative or negative, but do.

Communicate different.

Emotions, different feelings, different atmospheres that you're you're presenting? Yeah.

Yeah.

Interviewer:

But do you know if, like any? I mean I have like an electric guitar that I can make a bunch of sounds and music with. But like, if you have any like recommendations on what to focus on or make?

Expert: Mm hmm mm. Sure. Yeah, I I would say if you go with like the stems route.

Interviewer: Mm hmm.

#### Expert:

Then I would make the bass music as as as as neutral as possible maybe.

Not even start out with with Melody in it, but just a basic rhythm on which you can add stuff.

Interviewer:

Yeah.

#### Expert:

I I do think for what you're doing and for what you're trying, it would help so much. If there was someone there that could make the music for you.

Interviewer: Yeah.

Expert:

Like just just just an amateur that that can cause you need.

In order to do these experiments, you do need a lot of different music that is able to connect together and just by searching stems you're still left with a fairly limited pool of of options I I think so.

#### Interviewer:

Biggest issue is that they have to fit my game right?

#### Expert:

They they have to fit your game, but they also have to fit each other and and usually if you take stems from, from from a pre made song you end up with like the individual instruments.

Interviewer: Yeah.

Expert:

But they are all playing the same song, so they don't really differ in in emotional range.

Interviewer: Yeah.

Expert:

They don't all have like their happy and mysterious and heroic and sad. And you know.

Interviewer: Yeah.

#### Expert:

I, unless it's like, Bohemian Rhapsody, you really stuck with the music that you have. So I would say.

Interviewer: Yeah.

#### Expert:

It would benefit you and the research and the speed with which you're able to do this a lot. If you can find someone that, even as an amateur, is able to put these things together. Like a separate drum tech and and

make a major scale melody. Make a minor scale melody.

Stuff like that.

That that should be fairly simple for anyone who is into making. Music, preferably electronically.

On a very low level, I would say so.

#### Interviewer:

I mean fair drums I have no experience with, but I do have plenty of experience with guitars and stuff.

#### Expert:

Of course, yeah, yeah.

#### Interviewer:

So that way I can probably make something with that.

#### Expert:

Yeah, and and and I mean, the tools that you use don't have to be super, super. Elaborate or professional as well. You can use something like like beatbox or or or. You know simple simple tool. If if you're not into. Producing music with a with a doll.

Yet I don't know how far your your experience with that goes.

#### Interviewer:

I mean, I have a recorded things with my guitar directly into my like laptop using Reaper and processed it there.

I learned a lot of Reaper some time ago just because I wanted to record my own music, so.

Expert: Sure. Yeah.

Interviewer:

That that definitely helped. But if you know any other tools then feel free to let me know.

Expert: Yeah. Yeah, sure. No, I I I I mean Reaper can do it all and and that's why I introduced it to all of you, of course.

Interviewer<sup>.</sup> Yeah

Expert:

But if you're just looking for something simple to generate drums, a bass and maybe a couple of instruments on top of each other, I would rather go towards. Let's see if I can find something that's. More simple to use. Um. Let me I can't remember what the name of the One moment. Music. Lilv. Umm. Have like just. Shoot me one more, but then yeah. The the music to von Terry Kavanaugh. Yeah. If we do the. What's Garcia? Oh yeah, those guys kill. Yeah, it's ears are so cool. Yeah. All right, cool. Thanks. Yeah. Interviewer: OK. Expert:

Q.

These are very simple tools, but archived. Oh new. It's very cool. These are. I'll give you the links.

Interviewer: Thank you.

Expert:

So these are just online music tools that are very simple for for essentially not even

non musicians can can start trying out stuff.

Interviewer: That's cool.

Expert: Here it does all sound fairly you know. Bleepy and bloopy. This. Somewhat more reminiscent of the retro. Gaming era, but that might also be, you know, appropriate for the for the for the sort of basic look of your game, I don't

Interviewer: Yeah. Yeah, fair. No, fair enough.

#### Expert:

know.

Yeah. This is the new book tool which I haven't checked even out. So, but it does allow you to just set up a basic rhythm, I think. Both tools I'd have to check. They don't even include scales like mixolydian or, but they just say, oh, this is happy or or.

Interviewer: Hmm.

#### Expert:

This is an island tune for in beatbox. Say.

Interviewer: So no aiod in scale there.

Expert: Exactly. It's it's more what, what it exudes emotionally or.

Interviewer: Yeah.

#### Expert:

Yeah, associations you have with it. But I I would.

I think I would set it up like like this like this simple because it it does allow you to fairly quickly just generate and then you can start trying it out right. I think in cases like this it's it's always best to to start out super simple like.

Interviewer:

OK. Yeah.

Expert:

You have with with the design of the of the level and the game itself.

And then just being able to just like out different experiments and start trying them out.

I think that the most value is in in that.

Interviewer: Mm hmm.

Expert:

And like I said I would set up the sort of base melody with either just rhythm or rhythm and just a bass with 2-3 maybe at most 4 notes just to keep it super simple.

Interviewer: Yeah.

Expert: And you can sort of. Stick any. Meaning or any emotional atmosphere on top of that. Yeah, but that, that. Yeah, I don't know. That would be my. Those would be my tips to to to start out with and start developing.

Interviewer: Thanks, that definitely helps a lot. Get it something to work right.

Expert: Yeah. Cool.

Interviewer: Yeah. No, but thanks.

Expert: Yeah. Yeah. You're welcome. I mean, I I'm always find this super interesting myself and this is how I started. With what eventually turned into my job. So.

Interviewer: FedEx.

Expert:

I highly applaud this this this type of research.

I'm I'm super curious on on how you develop this further.

Is there anything I can help you with at this moment?

Because I do want to suggest that we talk in the future.

Again on on how it's going and.

Interviewer:

Yeah.

At the moment.

I mean, I guess you could because I'm suggest to me like just in some maybe tips about like how to go about this in Unity and FMOD stuff, because for me, like the FMOD was quite actually the F mod was easy the the unity part about setting it.

Up was a bit difficult, but I wanted to ask if it's like.

'Cause. Yeah, I'm doing it with emitters currently.

And if like so, I wanted to ask for like a idea of like they take the path and then the issue is that you hear it in the emitter area, the radius, but it's not very like it's too, I don't know like when you go take the path.

Expert: Yeah.

Interviewer:

Through the place.

It sounds a bit weird when you then walk through the emitter because at some point you walk really close to it and then really far from it.

Expert: Yeah, yeah, it's I. I think I understand like the unity part. It's not my expertise either, so I can.

Interviewer: Not fair.

Expert:

It's a very limited knowledge on on that, but I do.

I think I understand what your issue is here.

I think that.

First of all, I wouldn't place it as an emitter as a sound source in in the space itself like we discussed earlier, I would make because your your normal music listener is basically on the head of the of the player, right?

Interviewer:

Mm hmm. Yeah. Yeah.

Expert:

Or somewhere between like camera and and head but.

Interviewer:

Yeah, it's the. It's the players, the audio listener.

Expert:

Yeah. So I would make the emitters be very close to to the listening position.

Just basically imagine a circle around the head and place emitters on there so that they first of all.

Don't change in distance necessarily, so you don't have that.

The physical effect of coming closer to a sound source in a 3D World, but rather being able to.

Set the directionality and then keep it there.

I mean, depending on where the person is looking, the source just stays there around their own head.

Interviewer: Yeah.

Expert:

And.

And I would even say as soon as they've made the choice, they've entered a path. Yeah, ideally.

Lose that placement altogether.

Just add it onto the music onto the make it part of the non diegetic music if it were.

Interviewer:

But would it be like because they have to make multiple decisions between multiple paths so.

Should it be like that?

I added on because otherwise it might be like so would I.

Maybe it would just disappear at some point like.

Expert: Yeah, or it would be added.

Interviewer: Sure.

Expert:

In a more subtle way, like we could differentiate between the the hinting music.

And what actually gets added to the score? 'Cause. Then you keep it simple and then maybe.

Interviewer: Yeah.

Expert: A.

A.

A mysterious sounding cello melody that I used to base my choice on then becomes a cello part in the music that maybe plays.

One every four bars or or just short bits, but does.

Thematically like.

Mean something in that you've made a choice. You've added this to to your music.

It's now part of the the sort of overall arsenal of of what the music can do.

But not it doesn't have to play like full time all the time, or do very expressive or or noticeable things.

It just gets added as an element to the music as a sa whole.

#### Interviewer:

It would say, then that it that it should still be added to the like background master track.

#### Expert:

I would say that's well, it doesn't have to be for, for, for the purposes of your research, but I think in.

When playing the game, I would.

Yeah, I would add value to that moment of choice that I have because I'm next to sort of.

Interviewer: Yeah.

#### Expert:

Navigating the the the level and and making choices that I either want or or that the game asked me to to make.

It also feels like my choices have an impact on on how the game is played, and I feel like I'm sort of building my own soundtrack based on the choices that I've made. So in that sense I would say it adds a lot of value there, but for.

The purposes of of your research.

Say that it doesn't need to be added but.

In in the gameplay wise I would like it if you understand what I'm saying, yeah.

Interviewer:

Yeah, that's something I've struggled with a lot.

Is that like on one hand I wanted to add like things for the gameplay reason, like I wanted to make the game look like an actual proper game with trees and everything, but then.

Expert: Right.

Interviewer:

That interferes with my results and.

Expert:

Yeah, but I do.

I do get your question because if you end up with a level in which you need to make 20 choices, then 20 instruments need to be added to the music.

Interviewer: Yeah, yeah.

Expert:

So either you then sort of disperse them over or place them over a longer period of time within the music so that they each occur, but they don't all play on top of each other.

Or you could develop a system in which, like the last three musical instruments that you've picked up are part of your.

So you do.

It's part of the music now, but secretly or even non secretly.

For the player, I mean you start also removing the instruments made that that got added from choices like 5 choices ago.

Interviewer: Yeah.

#### Expert:

So you do have a sort of current state of music that represents your latest choices, but not all of choices get stacked on top of each other.

Interviewer: Yeah. OK.

Expert: That's.
Just a design choice for not making things overly chaotic and complex.

Interviewer:

Software.

Yeah, 'cause like for research like I was. I thought that I would need to then like. Like get presented with the sound that gets added, but then at some point I would need to remove it to go back to that base because like if they need to make another choice, I want them to. Kind of. I don't want that to influence the next choice. As well.

### Expert:

Right. Yeah, that's a fairpoint. Yeah, that's that's going to be the difficulty in this.

Interviewer: Yeah.

#### Expert:

As a whole, yeah, I would say if that's your your your experimenting with.

Interviewer: Yeah.

#### Expert:

These things, but it also adds to to what the music becomes and. And you know it's it's a precarious job trying to to balance all that.

So that that would be, yeah. But maybe I would not focus on making a beautiful, coherent soundtrack that you would listen to even after playing the game, but rather.

## Interviewer:

Yeah.

### Expert:

Trying to make a base model that that incorporates this at all like and then.

Then your conclusion might be well, one of the downsides is that we keep adding stuff to two things to the music, and then you need to find a way to either drop it all down or.

Interviewer: Yeah.

#### Expert:

But these are, yeah, probably things are going to happen. But. But I would say the the, the, the, the, the the core of of your research of the why you're doing this. I mean, that's just the moment where the choice is made.

This now we're actually already speaking beyond that and and how to incorporate corporate this in an actual game. But I would, I would I would fragment it or or make it into segments in in what I would try to achieve because if you try to do it all.

Interviewer: Yeah.

Expert:

At once, and I recognize this with myself because again, I did this for my.

Interviewer: Yeah.

Yeah.

Expert: Graduation project as well.

Interviewer: No fair.

Expert:

Yeah, try to do everything at once and make make one, yeah.

Interviewer:

That's like difficult in the beginning 'cause at the start, I wanted to do everything.

I wanna make it look like a game functional game soundtrack has to be really good, you know and.

#### Expert:

Yeah, very recognizable.

But I think if you focus on one thing at a time.

It should be doable and and and don't expect it to be like the best thing ever.

It is a research project after all and I'm very happy. I did my research.

Interviewer: Yeah.

#### Expert:

And and tried out experimenting with different scales like I told you before.

Interviewer: Mm hmm.

### Expert:

To find out that that doesn't really work and I never made that mistake again.

In my professional life, I mean, that's eventually.

Interviewer: Yeah.

Expert: A bonus point so I don't screw up any projects that I do get actually paid for.

Interviewer: Fair, fair enough then.

Expert: So.

There's there's upsides and bad downsides to to to all things.

Interviewer: Yeah, true.

#### Expert:

But yeah, it's it's a super interesting project and I I I would love to help you with wherever I can. Making this getting as far as as as you can but.

Interviewer: Thank you. Yeah, I guess I don't have a lot of time. 'cause. I'll. I'll. I'm planning on testing next week, end of next week. So I'm gonna like after this I'm gonna start making the music so.

Expert: Yeah. Yeah.

Interviewer: Yeah, that's the plan.

Expert: Yeah, again. Just as a tip, keep it keep when you start making the music, keep it.

Interviewer: Mm hmm.

Expert: Keep the loops short.

Interviewer: Yeah.

Expert:

Keep things simple, very basic. Yeah. Just consider it like a sketch. I would, I would say.

Interviewer: Yeah.

Expert: Then you will get the most actual results out of it I feel.

Interviewer: Yeah, fair. Thank you.

Expert: Yeah. You're welcome. If you have questions or if you want to have a next appointment to to to talk to me, just just let me know. I'm.

Interviewer: I'll let you know if I need anything then.

Expert: Yeah, very cool. Because again, it sounds super interesting. It's yeah. I.

Interviewer: I'm glad to hear that.

Expert: Yeah. No, I would love to have done this myself if I had the time and the youthful energy.

Interviewer: Yeah, yeah.

Expert: But no best of luck man. I again whenever you need me, just let me know and I'll make time for you.

Interviewer: Yeah. Thank you. All right, cool. Yeah.

Expert: Super cool. All right, speak to you later, Martin.

Interviewer: See ya.

Expert: See ya.

# **Appendix C - Briefing document**

## Briefing Document for Video Game Testing

Firstly, I would like to thank you for volunteering to participate in the research of my Bachelor's project! The goal of this session is for evaluating your navigation of a video game level, which is done by playing a 3D video game made in Unity by me. Headphones will be required for the game, you are free to use your own or the ones provided. The results of this research allow me to analyse important effectiveness for methods of immersion and guidance in video games.

The testing will go as follows: We start with a simple questionnaire about your experience with video games which is followed by an explanation of what kind of game you will be playing. You will then be given a brief explanation of the goal in the game and then asked to play through it. You are encouraged to play through it at your own pace, as if the observer was not present. After gameplay, an interview will be held focusing on your experience with the game as well as your feedback and thoughts on it. Following this, you will be debriefed about the exact goals of the observations. The session will conclude with how your feedback and provided data will be used for this research, as well as discussing any potential final remarks or questions regarding the project.

#### Confidentiality and Data Use

Your participation is entirely voluntary and you may withdraw from this project at any time. All data provided from this research will be kept confidential and anonymous and there will be no personal demographic information collected. The only part of this research that is audio recorded is the interview conducted after the game, which will be used for the purposes of transcription and will be deleted once the transcription is complete. Until deletion, the audio will be stored securely and privately where only the researcher has access to it. There will be no information that could be traced back to any of the participants and the findings will be presented at the bachelor thesis defense. All data provided will be stored securely such that only the researcher has access to it.

#### Contact information

In case any questions arise regarding any parts of this research, please feel free to contact either me or my supervisor:

Researcher: Supervisor:

# **Appendix D - Informed Consent Form**

Consent Form for Evaluating Research into Immersive Video Games YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM		
Please tick the appropriate boxes	Yes	No
Taking part in the study		
I have read and understood the study information dated [/], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.		
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.		
I understand that taking part in the study involves completing a survey questionnaire, participating in playing through a video game, and an interview following the gameplay session. The interview will be audio recorded and transcribed as text. Information will be made anonymous and the audio recording will be deleted after the transcription is complete.		
Use of the information in the study		
I understand that information I provide will be used for the evaluation of a Bachelor's thesis. The findings of this research will be presented during the Bachelor thesis defense and will be published on an online repository		
I understand that personal information collected about me that can identify me, such as [e.g. my name or where I live], will not be shared beyond the study team.		
I agree that my information can be quoted in research outputs		
I agree to be audio recorded		
Signatures		
Name of participant Signature Date		
I have accurately read out the information sheet to the potential participant and, to the best of		
my ability, ensured that the participant understands to what they are freely consenting.		

Researcher name

Signature

# UNIVERSITY OF TWENTE.

Date

Study contact details for further information or questions:



#### Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee Information & Computer Science: <a href="mailto:ethicscommittee-CIS@utwente.nl">ethicscommittee-CIS@utwente.nl</a>

# UNIVERSITY OF TWENTE.