Tampere University of Applied Sciences

The Importance of Audio in Immersive Media and Horror

Lukas Ekberg

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ABSTRACT

Tampereen ammattikorkeakoulu
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LUKAS EKBERG:
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Music and sound are an essential part of media, be it movies, TV shows or video games. As computers have become more powerful and new technologies have been developed, the worlds created with sound have become ever more immersive. This immersion is vital in creating a believable and captivating world, especially when it comes to video games in the horror genre. There are many aspects to be aware of when it comes to creating experiences with sound, whether it be the story setting, the sub-genre, or simply limitations of the format.

The purpose of this thesis was to analyse the human fear reaction and how sound is used to create the feelings of anxiety and unease in horror video games. Having used evolutionary science, psychology and learning from professionals in the field, this thesis was a study into what makes a sound scary and to discover if there is a formula that can be used in the creation of these sounds.

This thesis serves as a starting point for those interested in making sounds for horror games. It covers the general importance of sound in media, as well as the why and how sounds are used to create fear. It also goes through in-depth technical information about video game sound and looks at examples of some of the most popular video games and their sound design. Also covered in the thesis is the author's own practical project relating to the creation and implementation of sounds into a video game with Audiokinetic Wwise middleware.

In conclusion, there are many matters that have to be considered when creating sounds for a horror game. There is no one formula or processing technique that can be used for every sound. The best thing one can do is to become familiar with the basic concepts and learn what has and has not worked in the past.

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Key words: video game sound, horror games, audio design

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GLOSSARY

Wwise	audio middleware made by Audiokinetic
Asset pack	a package of ready-made 3d models
Random container	a container that plays back audio objects in a random order
Switch container	a container that plays back audio objects depending on which switch is active in the game
Blend container	a container that plays back audio objects simultaneously
RTCP	real-time parameter controls are used to control specific properties of various audio objects in real time (volume, effects etc.) based parameter changes occurring within the game

1 INTRODUCTION

I have always been a big fan of the horror genre. Even when I was I child, I was sneaking into the living room to watch horror movies at night, and whenever I heard someone about to tell a scary story I was instantly captivated. I have later learned that this is because of the emotional component in horror, fear. I rarely relate to fictional characters, but when I do it is in horror genre. Being able to feel the fear relayed through the medium of immersive media is something truly fascinating to me. Most of all this phenomenon is present in horror video games.

Being in control of the character, where their successes are your successes, and their failures your failures. Being caught by a monster as a direct result of your own actions is where the feeling of fear is most evident. This interest has led me to learn more about video game development and sound design, as well as the main question of this thesis "Is there a way to make a scary?" I wanted to find out if there is a formula that can be added to a sound to make it fit a scary scene.

Another purpose of this thesis was to create something of a checklist of different sound elements found in horror games. This list was to act as a guide for me and anyone else interested in the topic. Finding the most essential sounds for the creation of immersion was something I was after. I decided to approach the subject by learning the basic elements of sound in media as well as the way that we as humans react to different sounds.

2   THE TASK AND ROLE OF SOUND IN MEDIA

The significance of sound in the telling of stories is often understated. Even before the creation of the phonogram in 1894, sound has been an important part of storytelling. The earliest example of this is stories passed down by word of mouth. Before the creation of written language, stories and legends were passed down throughout generations, simply with the act of speaking. "The comprehension of language, an attribute so specialized in humans that no satisfactory animal model exists." (Hudspeth, A.J., 1997).

In the vast amount of media being produced be it films, television, video games or even virtual experiences, sound plays a large role that is as crucial as the visual side, and in some cases even more so. Sound and sound design is not only added flavour to the visual narrative but also a form art that often drives audience engagement.

Sound in media covers many different components including environmental sounds also known as foley, sound effects, music and dialogue. Each of these categories of sound exists to enhance the narrative, provide contextual clues and all in all create a complete experience.

2.1   TV and Movies

The importance of complex communication is very apparent when it comes to media such as movies and television. Even in the earliest examples of cinema, the silent film, the sound was being emulated on screen with the use of intertitles, also known as captions. Without the ability to produce sound matching what was shown on screen, filmmakers had to somehow convey emotions, dialogue and even sound effects, as can be seen in Picture 1.
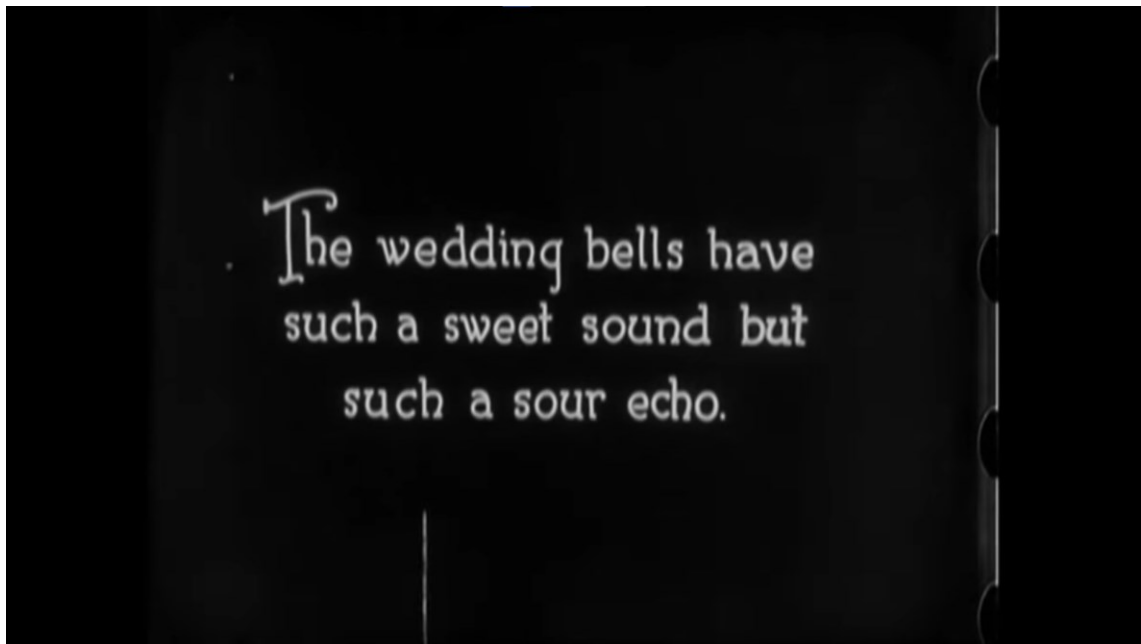
Picture 1. An intertitle from the silent movie One Week (Keaton, B. 1920)

Throughout the years new technologies emerged, able to produce more and more complex forms of sound. From the early examples of inventions such as Thomas Edison's phonograph in 1877 to the first use of surround sound in 1940 in Disney's Fantasia. This was until the spotlight was overtaken in 1966 with the release and standardization of Dolby's A-type noise reduction technology. All this invention for one thing, immersion. A movie that used sound to its advantage was the 2010 film "Monsters". Made by Gareth Edwards on only a small budget of 500 000 dollars, he could not afford fancy visuals, so sound was used to create the effect of threat, letting imagination fill in the gaps. His sound department's excellent use of atmospheric creature sounds that are vital to a mostly unseen foe. (Blackford, S., 2023.)

2.2 Horror media

Be it character writing in a book or the sounds made for film, it all comes back to how it helps immerse us. One genre that heavily relies on the consumer being immersed in is horror (Clasen, M., 2021). If the immersion is ruined, this almost always results in a negative outlook on the end product.

When it comes to horror it is often difficult to write something that is serious instead of unintentionally funny. There exists a fine line between these two that is

often crossed, if the filmmaker is not experienced enough to work in the genre. One thing that is often overlooked is sound. A recent example of filmmaking that uses sound design to its advantage is the 2023 film "Evil Dead Rise", made by writer and director Lee Cronin. From the film's use of ever so subtle distorted reverbs overlayed with the actor's performances to the sound effects used to re-inforce the evil actions of the villain, all while not becoming annoying or obnoxious is what makes the film so great.

2.3   Video games

The video game industry over the years has gotten larger than ever. In 2021 the estimated revenue of the games industry was 192 billion dollars, compared to the film industry, usually thought of as the largest entertainment industry was esti-mated at 99 billion dollars (Richter, F., 2022). This is why video games often have some of the most refined and immersive sound design.

An example of sublime sound design can be in the game "Alien: Isolation" re-leased in 2014. In the game, you play as a survivor on a spaceship, that has been overtaken by the famous Xenomorph, as seen in Picture 2 from the movie "Alien". The game is a tense ride as you try to complete objectives and solve puzzles to move the story forward as you hide from the Xenomorph. This experience is brought to life with the use of sound. Hearing the creaking of the metallic space-ship and the howls of the monster chasing you echoing in the hallways growing ever closer. The difference between these two games speaks to the importance and the life that sound can breathe into an interactive experience such as video games.
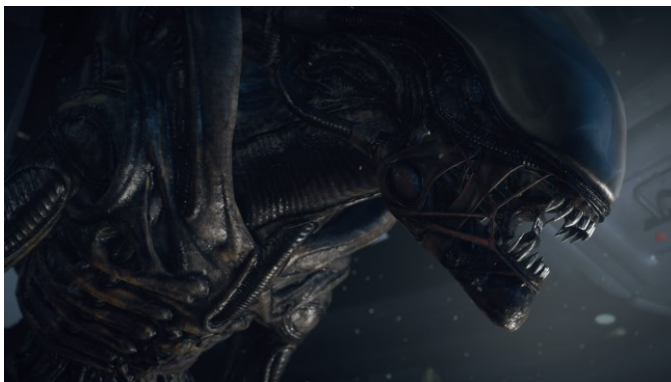
Picture 2. Xenomorph from Alien: Isolation (Sega, 2014)

3 FEAR CREATED WITH SOUND

Long before the human species had evolved into existence, sound had been an integral part of evolutionary survival. Most animals on land and in the air use sound to overcome the harsh reality of nature, be it for finding threats nearby, sensing the presence of a possible mate or looking for a source of food. (Lorimer, T., Gomez, F., Stoop, R., 2015.)

Most if not all horror is built on the principle of evoking fear as an involuntary reaction. This goes for sound in horror too. Common types of sounds that can be used to create fear are an instantly recognizable threat, something that the mind cannot discern the source of and sounds that are not naturally occurring. Examples of these could be a natural predator like a bear or a lion, the sound of a fictional monster which makes a sound like no other animal and the metallic creaking of an abandoned spaceship.

3.1 What Do We Fear, Learned or Innate?

Understanding the differences between the two types of fear can elevate a piece of horror media to the next level. A good writer or director can call upon the fear in us effectively, using the knowledge of universal fears.

Firstly, we have learned fears. These are dictated by our own experiences in life. For example, someone who does not know how to swim might develop a fear of water due to negative or lacking exposure to these situations. These fears can also be influenced by other people, like our parents and peers. A good example of this relating to horror is stories about ghosts and other monsters. These are not something we are exposed to naturally, as they are not something that exists, but we are taught to fear these through stories told us in books, movies, games and verbal retellings.

The other type of fears are innate fears, also known as evolutionary or prepared fears. These are things that have been coded into our genetic makeup through

generations. Some sources view innate and evolutionary fears as separate concepts. This viewpoint considers the two truly ingrained fears to be the fear of falling and the fear of loud noises, as evidenced by the "Visual Cliff" study (Gibson, E.J., & Walk, R.D., 1960) and the acoustic startle reflex a.k.a. ASR.

3.2   Non-linear Sounds

Non-linear sounds are a type of acoustic phenomenon known for unpredictable, abrupt changes in frequency and amplitude. These sounds often include elements such as noise, sudden frequency fluctuations, bi-phonation, and subharmonics. Non-linear sounds can be for example an animal's distress call, a baby's cry or an erratic change in the frequency of an acoustic instrument (Nevada Film Office 2018).

In studies of animal behaviour and human perception, non-linear sounds have been found to be uniquely effective in eliciting strong emotional and instinctual reactions (Blumstein, D., Récapet, C., 2009). A notable application of non-linear sounds in media is found in horror and drama genres, where these sounds enhance the emotional impact of scenes.

3.3   The Sound of Silence

Silence is one of the most underutilized mechanics in media. It is a powerful narrative tool that, when used skilfully, can elevate a mediocre scene into something unforgettable. The use of silence plays a crucial role in building suspense and creating tension. It is rare to experience true silence in life, but when it does happen it is haunting.

In media it also helps to bring the viewer's engagement back to what is happening, as the negative space created by the lack of sound can be very impactful, creating a moment of uncertainty in what is to come. The lack of auditory information can mimic feelings of isolation and provoke a visceral reaction as one is left to fill the silence with their own fears. Multiple Oscar-winning sound designer Walter Murch states the following:

> The ultimate metaphoric sound is silence. If you can get the film to a place with no sound where there should be sound, the audience will crowd that silence with sounds and feelings of their own making, and they will, individually, answer the question of, "Why is it quiet?" If the slope to silence is at the right angle, you will get audience to a strange and wonderful place where the film becomes their own creation in a way that is deeper than any other. (Murch, W., 2005.)

Though a powerful tool in a creative's toolbox, silence can also be abused if not used mindfully. In the past decade, a cliche has risen from the horror genre, known as the "jumpscare", a moment of silence followed by contrasting loud noise (Martin, G., 2019). This by itself is not a bad thing, but the overuse of it has gotten to be too much.

4 HORROR GAMES AND SOUND

To me, video games are the best medium for delivering a scary experience. Being in control, and existing in the world of the game creates the perfect storm of immersion. The creak of a wooden floorboard, or the echo of an abandoned metal vessel, as you take a step forward, the world reacting to you in it, makes it something special.

One of the first video games to be considered part of the horror genre is "3D Monster Maze" released in 1981 on the home computer system Sinclair ZX81. In the game, the player is tasked to escape a labyrinth where a T. Rex lies in wait. As soon as the player starts to move, the dinosaur goes on a hunt for the player. As the game lacks sound, the general state and anxiety levels caused by the dinosaur are communicated through subtitles, like; *HE IS HUNTING FOR YOU, FOOTSTEPS APPROACHING, REX HAS SEEN YOU* and ***RUN*** *HE IS BESIDE YOU* or ***RUN*** *HE IS BEHIND YOU.*

For the next 10 years, horror games kept following the same formula of 2D graphics until 1992 with the release of "Alone in the Dark". It was the first horror game with 3D animations, with the creator of the game Frederick Raynal having built his own 3D animation engine. On top of this sound designer Philippe Vachey used a combination of music made on the AdLib Music Synthesiser Card and sound samples running on the Creative Technologies Sound Blaster sound card. This allowed Vachey to integrate real-world samples for the first time on the PC, "that was something very important for the game," says Vachey. (Alexander, L., 2012.)

Technology keeps advancing at a pace never seen before, which allows game developers to do more year after year. Longer games with better graphics are easy to differentiate from older games, as the changes are visibly obvious. Audio then again is different, even if you can tell that something is changed, it is not as obvious, since you cannot see the systems producing it. For example, one of the most popular consoles of all time, the Nintendo Entertainment System or NES,

supported a total of five audio channels for music and sound effects. These consisted of two pulse wave channels mainly used for melodies, one triangle wave channel without volume control, one white noise channel used for percussive elements and one PCM channel for sound effects. This often led to necessary compromises, like in the 1987 title "Castlevania", where a music channel had to be used simultaneously with sound effects, leading to the music dropping out from the said channel. In comparison, modern consoles and computers are able to playback up to 256 voices at any one time, in some cases even more, while also processing the sound through plug-ins, like reverberations and delays. Having the capability to use this many sounds at one time can allow sound designers to make the experience of playing a game ever more immersive.

The player's main objective being to keep their character alive, they must detect all hazards that might negatively affect them. In these cases, gamers have to be able to recognize the sounds they hear and extract the necessary information to keep themselves alive. (Grimshaw, M., 2011, 208.) This is where modern technology is very useful, sound designers have all the necessary tools to effectively inform the player of dangers, while not having to compromise on the rest of the soundscape.

According to Principal Audio Designer Ville Sorsa (2023), there are many things that make a horror game whole sound-wise. These include diegetic sounds, the character's emotion-based reactions to the game's events such as breathing, the building of the character's personality, the flow of build-up and relief of suspense, the abstraction of sounds and the creation of scary images with sound, synchronisation of the audio and the visuals, tactile sounds of the player's physicality in a simulation, the character being in a three-dimensional space, occlusion and obstruction of sound, the use of silence and the sounds technical presentation in the final product.

5 CASE STUDIES

The following case studies are success stories in the horror game genre from different time periods and systems. The case studies give a brief overview of the game, and its systems as a whole and then lead into what kinds of sounds have been used in the game. I also wanted to look at how certain specific sections had been constructed and why the sound works in those sections. All the analysis parts focus on monster encounter sequences in the games, as this is when most sound is happening at the same time.

5.1 Silent Hill 2

Silent Hill 2 is a game where the player controls James Sunderland through the foggy and dark town of Silent Hill in search of his dead wife. Released in 2001 by Konami on the PlayStation 2 and the Xbox the game has become a classic in the horror genre, some calling it the best horror game ever made. (Konami, 2001; Metacritic.com.) The game's atmosphere is created with a combination of visuals, sound and gameplay. The look of the town can be best described as decaying or decomposing, with walls covered in what looks like organic material. The game is very dark, and the player is forced to use a flashlight to find their way through the game. The game is also known for its iconic fog-filled streets, making seeing nearly impossible. This is also reinforced by gameplay elements such as the player being forced to equip a flashlight for reading maps or clues for solving puzzles.

5.1.1 Sound Incorporation

The sound design in Silent Hill 2 works great with the rest of the game, enhancing the creepy and uncertain atmosphere. Created by Akira Yamaoka alongside the game's music, he manages to capture the player's attention. Having created all of the game's fifty sound effects, not counting sound variations, he wanted to catch the player by surprise and create a physical reaction. He also uses silence as an effective tool, knowing that a sound designer's job isn't only to make sound, but also to know when to leave it out. (Yamaoka, A., 2001.)

One of the most notable uses of sound is radio static coming from a walkie-talkie, informing the player that a dangerous monster is nearby. Since almost all of the game that takes place outside is covered in fog and the indoor spaces being poorly lit, this is an effective way to inform the player and player of what is happening, and by making it a diegetic sound creates a connection between the character and player, enhancing immersion.

5.1.2 The Wood Side Apartments

The sequence used for this analysis is a 10 or so-minute-long section at the start of the game. This part is right after being introduced to the walkie talkie mechanic and encountering the first monster. After defeating the monster, the player must find their way to an alleyway where the key to the Wood Side Apartments lies. The streets lined with fog and filled with the sounds of guttural moans of monsters that weren't there previously.

After a few minutes of the walkie-talkie's constant crackling, the player reaches the apartment complex. As the metallic doors open and close everything goes quiet. The only sound that remains is the footsteps of James Sunderland as the game hands the player a save point and a health potion. These act as reinforcement to what the silence already told us; something is going to happen. The room the player enters can be seen in Picture 3.

Picture 3. The first room of the Wood Side Apartments (Konami, 2001)

As the player ascends the stairs deeper into the building, they reach another door. The door opens, the game loads and the door closes, right after which the walkie-talkie starts once again emitting static. Wondering the dark halls with the only information being the loudness of the radio static. Three monster encounters later the player will find a set of metal bars with a key on the other side. As only grunts of James remain while reaching for the key, the walkie-talkie is quiet signalling safety to the player, as something kicks the key without warning, after which the silence is broken with what feels like a slow pulsing low-frequency breathing.

This whole sequence works because of the different elements of sound being added and taken away. The introduction of the unsettling static mixed with what sounds like voices of the walkie-talkie slowly increasing in volume as the previously safe streets are suddenly turned hostile. After the player possibly starts to get used to the constant noise it all gets taken away as the player is left to wonder about the possible dangers. This leads to again the introduction of the familiar static in the dark and cramped halls, leaving it up to the player the decipher behind which corner the monster could be lurking and after having the walkie-talkie's purpose of sensing danger be reinforced multiple times, that feeling of knowing and safety gets taken away.

5.2 Amnesia: The Dark Descent

Released in 2010 by Frictional Games, Amnesia: The Dark Descent takes place in the year 1839 in the Kingdom of Prussia (Frictional Games, 2010). The player plays as Daniel, a character that wakes up in the lifeless halls of Brennenburg castle, remembering nothing. All he knows is that someone or something is hunting him and that he must find his way to the inner sanctum of the castle to find and kill its baron, Alexander. The game makes great use of its sanity mechanic, where the player is forced to find different light sources and stay out of the dark in order to stay as sane as possible. The game has some puzzles to solve and no combat, but despite that it is one the most beloved horror games ever made, due to the atmosphere it is able to create.

5.2.1 Sound Incorporation

Creating an atmosphere alongside the barely lit hallways is sound. The game utilizes very minimalistic music and instead heavily relies on environmental sounds and cues. Every footstep and creaking door are a lot scarier with the lack of music to distract the player. The importance of sound is understood by Thomas Grip, the co-founder of the development studio behind Amnesia, who states, "Visuals don't generate sound in your head, but you can listen to something and get a visual impression – – play a sound that sounds like a monster, and the player's anticipation builds up." (Grip, T., 2018). This can be felt in the lack of monster encounters in the game, of which there are 30 in total. One of the monsters can be seen in Picture 4. This means that throughout the 8–10-hour long game, players must walk around for an average of 20 minutes in between every encounter. This allows for the encounters that do happen to feel much more impactful while keeping the player on edge with the guttural sounds that can be heard every now and then even when there are no monsters present.

Picture 4. The servant grunt enemy from Amnesia (Frictional Games, 2010)

The impact of sound can also be heard in the game's sanity mechanic. As the player's sanity keeps lowering, the game will start to scare the player with visual

and auditory hallucinations, making it even more difficult for the player to distinguish between real and fake dangers. This keeps the player looking behind every corner for possible dangers.

5.2.2 Cellar Archives

45 minutes into the game the player enters the "Cellar Archives". At this point of the game, the player has seen glimpses of the monster and heard its groans echo in the halls of the mansion. After countless doors opening by themselves and lights going out without repercussion, the player has been conditioned into thinking that the scares that happen are harmless.

Just as the feeling of possible safety has been planted into the player, the screen turns dark, and the player is transported into a place with water up to the knees, as a terrifying cacophony of screams starts. After taking their first steps in the water, the player can hear something start chasing them. The player cannot see the monster, but only hear it splashing and hissing as it rushes toward the player. As the player steps out of the water onto a wooden box, an eerie choral piece starts playing, accompanied by the sounds of the monster looking for the player.

The next section is the player trying to stay out of the water, stepping onto whatever is possible. This segment works very well due to the player every now and then having to step into the water to proceed. Not being able to see the monster adds a level of tension. Every time the player is forced out of safety, they are forced to gauge the distance of the monster only with sound. Also, this monster suddenly being introduced breaks the conceptions that the player might have built up to this point.

5.3 Outlast

The player plays as Mike Upshur, a freelance investigative journalist who receives an anonymous e-mail about inhuman experiments going on at Mount Massive Asylum, owned by the famously unethical Murkoff Corporation. After this, the player arrives at the asylum to find it in complete disarray, as an officer of

Murkoff's private militia informs the player and Upshur that the hospital's deranged inmates have escaped and the player needs to find a way out.

Outlast was released in 2013 by Red Barrels to high praise (Red Barrels, 2013; Metacritic). The game focuses on creating a terrifying environment with the design of the asylum, littered with corpses of employees, bloody hospital equipment and completely dark sections. The game also introduces a very common mechanic in a fun and innovative way, seeing. The player character being a journalist has a camcorder camera with a night vision mode, that the player is forced to use to find their way through the dark while making sure the camera battery does not run out.

5.3.1 Sound Incorporation

Many horror games tend to use a combination of realistic and unnatural sounds, but this isn't quite the case with Outlast. Lead sound designer Jonathan Wachoru focused on making the sounds for Outlast feel as real as possible. This can be felt throughout the game, with the ambient sounds of a broken-down hospital, mixed with screams and pleas of the employees and patients, making the place feel alive. The game is mostly made up of diegetic sounds, making immersion and the connection between the player and character strong.

5.3.2 Where the Real Game Begins

Shortly after starting the game, the player finds themselves entering the Mount Massive Asylum. The game aside from the sounds of Mike Upshur and the surrounding nature is completely quiet. The building and the area around it seem to be good condition, but missing people. As the player starts finding their way inside the building, singular short violin notes start playing.

After the player finds their way inside the strings pick up and quickly stop, leaving only the sounds of the abandoned building, sounds like the flicker of the tube lighting the humming of computers that have been left on. This continues for a while until the player finds a set of bloody footprints that lead into a bathroom, and as the player approaches the door it closes softly.

Finding themselves with only one way to go the player enters a room with a ven-
tilation shaft, Picture 5, through which some activity can finally be heard. As the
player enters the shaft the string section from earlier starts creeping back, while
for the first time spotting another person. After making it to the other side of the
vent the strings stop again, leaving the player with nothing but the shaky breath-
ing of Mike. Closing in on the door it suddenly opens, as a bunch of strings and
horns start playing and Mike screams.

Picture 5. The ventilation shaft the player enters (Red Barrels, 2013)

This sequence has been constructed masterfully. The player has heard almost
nothing but the sounds of their own actions, alongside the slow and rare single,
string instrument. This leads to a somewhat obvious and predictable scare, that
still works really well. The contrast between the negative soundscape and slow
build-up compared to the sudden release with familiar instruments as we can
hear the player character's voice for the first time.

6   PRACTICAL PROJECT

The purpose of this thesis' practical project was to take everything I had learned while researching the subject, make a short horror game and see what was possible for me to do. Given the timeframe and technical limitations, I decided that I should focus more on sound rather than making a complete experience, so the graphics are low polygon and the game mechanics lacking, but the base for a game exists. For sound implementation, I decided to use Wwise, one of the industry standard software for sound implementation for video games. As I wanted full control of the game, especially how the sounds would be applied, I decided to make it by myself from scratch. Altogether the project took about 500 hours, over 2000 lines of code and over 130 different sounds to finish.

6.1   Creation Process of the Game

In October 2023 I was thinking of what to make my thesis about and I decided what it should be; something to do with horror. For the practical portion, I wanted to do something with video games since I had been making simple games for a couple of years, so I decided to challenge myself. The goal was to make a minimum 10-minute demo, that would have a start, an end, working and meaningful gameplay systems, and most importantly working implementation of a somewhat complex sound system.

The process started with planning and looking for suitable systems to build the game with. I decided to use the Unity game engine since I was already familiar with it, as well as using premade 3D assets to save on time. I found an asset pack from Synty Studios called POLYGON – Apocalypse, that can be seen in Picture 6. This led me to an idea for the gameplay, as I wanted the game to focus on sound. I decided on an invisible monster, that the player would have to listen out for.

Picture 6. Screenshot of the polygon apocalypse pack (Synty Studios, 2019)

I then started by programming the base of the game. This included the player's movement, the camera controls and the player's physical interaction with the environment. This was all still fairly simple and could be done in a couple of separate files with around 350 lines of code. I then moved on to making the map and planning a route for the player to traverse.

After finishing the crude plan for the map, I decided it was time to tackle what I knew would be the biggest issue of the creation process, the enemy. I had to figure out a way to have it track the player based only on sound when usually the making of an enemy for a game includes a visual component and often is completely based on seeing the character of the game. I experimented with different tactics of awareness and ended up with the player character projecting a different-sized sphere trigger collider based on the player's actions.

The size is determined by whether the player is standing, walking, slow walking, running or holding their breath. If the enemy is within the sphere of the noise created by these actions, a counter would start counting upward, which then determines if the enemy is going to start chasing the player. With this implementation, I was able to create the most realistic feeling of interaction with the rest of the game. This part of the project took the longest and included over 500 lines of code. The player in the second half of the game can also throw rocks to distract the enemy. This is so that regardless of the enemy's current action, it will chase

the rock as soon as it hits the ground, while also resetting the enemy's awareness of the player's current position.

I then moved on to making 4 different event zones for the first half of the game. This would give me a chance to have the player become familiar with the breath-holding mechanic as well as give me a chance to make sound design for pre-planned actions. The event zones consist of a box trigger collider that activates when the player steps inside of it. This sets off an animation of the enemy moving along a predesigned path. The player then must stand still and wait for the enemy to leave. As the enemy is not visible to the player, I got to use sound to communicate how the enemy moves and acts.

6.2   Player Sounds

One of the most important parts of any game is the player's connection to the character. Sound helps establish this connection, as it gives auditory feedback about the player's actions. These sounds would also give the impression that the enemy is basing its actions on the player-made sounds, rather than being based on the inner workings of the game systems.

6.2.1   Footsteps

I started with one of the most important pieces in video game audio; footsteps. Having auditory feedback for walking which is the most used and natural action in most, if not all games. Since the game contains multiple surfaces for the player to walk on, I made different corresponding trigger zones where the sound changes to the appropriate material, like concrete, grass and mud. The footstep audio files are placed in random containers, which in turn are placed in switch containers. The switch containers decide which random containers are being played which take all the sound files fed to them and randomly play them with the given parameters. The sound of the steps also changes based on whether the player is walking slowly, at normal speeds or running, where the sound becomes softer and more muffled the slower the player moves, and louder and more impactful when running. These changes were made with game states.

The implementation for the footsteps was done by creating a timer in the movement code of the game, that based on the speed of the player would change the time that it takes between footsteps, so the slower the player walks, the more time the footstep sound takes to play, and vice versa. The footstep also isn't being emitted from 3D space, since the distance and direction of foot to ear doesn't change in the context of the game. Spatialization was instead done in the processing of the footsteps with a reverberation that changes depending on the space.

6.2.2 Breathing

One of the most prominent connecting sounds between the player and the character is their breathing. This helps the player understand how the character is feeling at the moment. For me, breathing sounds were essential as one of the mechanics of the game is the character being able to hold their breath. This meant that I would have to add sounds for normal breathing, taking a deep breath to hold it in and an exhale once the hold has been broken. The breath sounds were placed inside a switch container.

6.2.3 Heartbeat

Another sound included in the game is the character's heartbeat, which serves as a keeper of suspense as well as an indicator of how close the enemy is. The sound of the heartbeat only includes low frequencies giving the illusion that the player rather than hearing it, is feeling it. The sound is also dynamic, meaning that the volume is dictated by the distance to the enemy and in certain situations it starts beating faster, communicating to the player that danger is close by. This was done using the RTCP functions which calculates the distance to the enemy and changes the sound's volume accordingly. The heartbeat includes two different switch containers, one of which is playing before the free-roaming enemy actives and the other after activation.

6.3   Enemy Sounds

The enemy's sound design was far more complicated than the player's sound, since the enemy, in addition to being a free-roaming entity, has also pre-set animated paths. In addition, I had to make sure that the sounds of the enemy is placed in a way that the player is able to accurately enough determine the position and distance of the enemy.

6.3.1   Event Zones

The first half of the monster is not a free-roaming enemy, but instead features designated event zones that the player must react to. When the player reaches the zones seen in Picture 7 as grey boxes, the enemy starts moving on a pre-planned path and a collection of sound design starts playing with it. The sound design was done completely based on the animations. All sounds for the animations were placed in blend containers.

PICTURE 7. The event triggers as seen in the Unity Editor (Ekberg, L., 2024.)

The first three zones are the enemy approaching the player's position, forcing the player to stand still and hold their breath while waiting for the danger to pass. The sounds for these zones are the enemy moving and reacting to the environment while closing in on the player. If the player does not react appropriately, they die and must start over.

The first event starts as the player approaches the city's outer fence and opens a door. This causes the enemy to approach the player and play the sounds of running on grass and climbing over a metallic camper. The enemy then lingers for a couple of seconds, while playing breathing sounds after which it runs away. After this, the player is free to continue.

The second event is more audio-heavy. It starts with the enemy traversing through shallow water in a concrete canal and climbing a metal fence. The monster then lingers on for a few seconds, after which it lets out a scream. It then descends the fence and runs off into the distance. All the sounds had to be delayed in a way that would communicate movement at an accurate pace.

The third zone is meant for to add weight and physicality to the monster. It once again starts with moving over fencing. On the way to the player, the monster hits a refrigerator, which is supposed to let the player know of the possible size and strength of the monster in a natural way. The monster then ascends onto a school bus, yet again listening to the player, but quietly this time, as a check to see if the player knows how to monster acts at this point.

The fourth and last zone is the most complex series of animations and sound design. The event starts with the sound of a truck nearing the player. The truck then crashes through a broken-down school bus and a minivan, causing an impact sound to play as well as the metallic screeching of the bottom of the vehicles dragging on the concrete. The truck then hits a wooden fence that plays a wood cracking sound after which the engine of the truck sputters and stops. This was meant as a checkpoint, trapping the player in with the monster.

6.3.2 Footsteps

The monster's footsteps are an essential part of communicating its position to the player. The sound of the steps is a sharp claw-like clicks on the concrete, giving a mental image of what the monster could look like to the player. As can be seen in Figure 1 and Figure 2 the sound is dynamic meaning its volume and filters are based on how far the player is in relation to the monster. The sound is implemented with the same kind of timer as the player, where it counts down to the

next step based on the speed of the monster, as well as being playing from a random container. This is also an effective tool for communication as the footsteps start playing in a quicker succession if it starts chasing after the player or a rock thrown as a distraction, also letting the player know of the aggression of the monster.
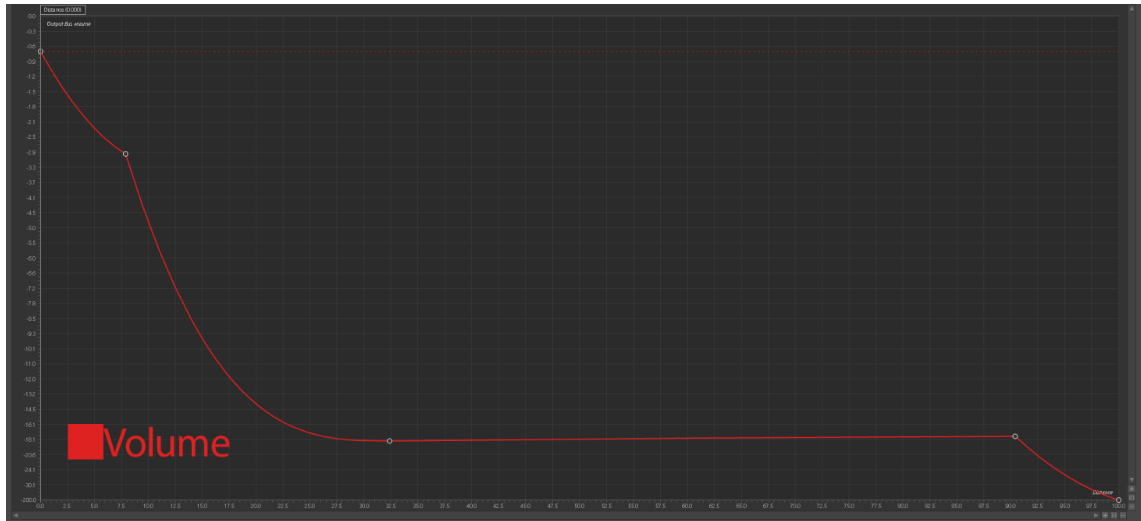

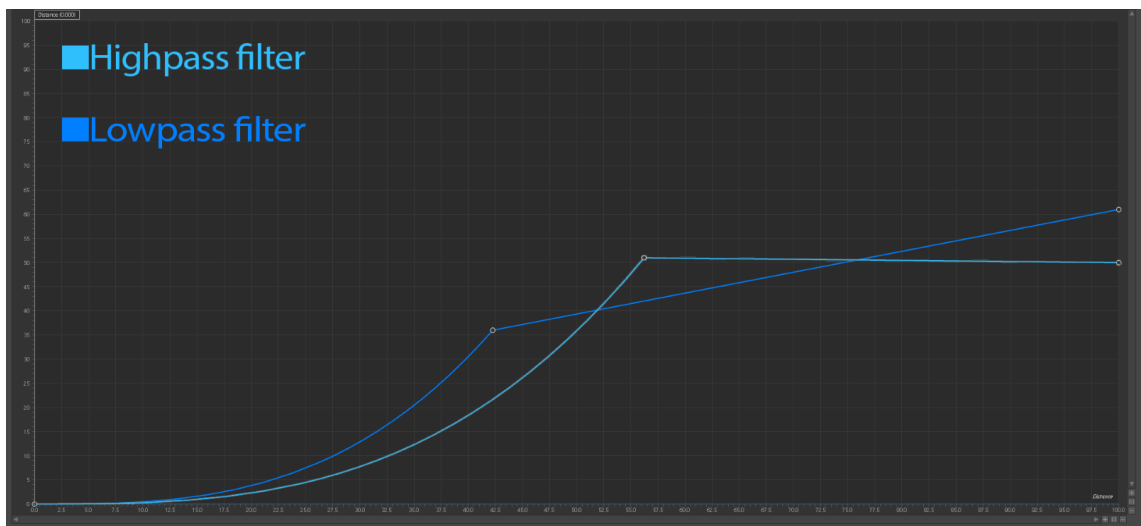FIGURE 1. The volume of the footsteps; vertical in correlation to the distance from the player; horizontal.

FIGURE 2. A high- and lowpass filter that affects the footstep sounds based on the distance between the player and the monster.

6.3.3 Breaths and Screams

The breaths and screams of the monster serve as tension-building and communication. In the event zones they create a sense of anxiety but also to let the player know that the danger is still present. After the event zones the communication aspect is given less importance and the tension building and messaging of the form of the monster is highlighted.

6.4 Environmental Sounds

The sounds of the environment aren't as essential for the player's survival, but are mainly meant for building immersion. These sounds create the feeling of the player character existing in a real space rather than a simulation. There are also sounds that affect the gameplay, but in a way that makes the world feel more natural.

6.4.1 Ambience

The ambient sounds of the world, like the metallic creaks of the bunker that the player starts in and the howling of the wind, as they exit the bunker into the woods, are just as important for immersion as footsteps. They always exist all around us and there is no such thing as true silence. So, from the perspective of immersion, these sounds are vital.

The bunker starts with a creaking sound to catch the player's attention and then continues into looping metallic room tones and the buzzing of the fluorescent lights in the ceiling. I also had to position the sounds in specific places in the bunker to avoid a still and unnatural experience. The sound of the wind in the woods was done with a single sample, but playing it from multiple places at once, to make the sound feel large and all-encompassing while keeping it consistent.

6.4.2 The Rock

In the ladder half of the game, as the player character is trapped, and the monster has become free-roaming, the player is able to pick up a rock that they can then

throw to distract the monster. The rock works in a way that if the player is close enough, they can pick it up, and if holding one throw it. The actual implementation was done so that when the rock comes into contact with any surface after being thrown, it emits the same kind of sphere as the player forcing the monster to pay full attention to it. This was done so that when sound was implemented, it gave of the illusion that the monster once again was chasing after the sound of the rock, instead of a sphere trigger.

7 DISCUSSION

As with every other media, creating sounds for horror games is a multifaceted process in which everything depends on context. There does not exist a singular formula or trick to make a sound scary, but there are things that will help create an immersive whole. If one is going to start the process of creating audio for a horror game, one should make sure to follow these steps, as they are in my opinion the most necessary things to build upon.

For the best chance at immersion be sure to make the soundscape believable. Use sounds that are in keeping with the rest of the game, be it gameplay elements, the perspective of the game: 2D, 2.5D or 3D or style of the game; if the game's graphics consist of high-quality models don't use for example 8-bit sounds usually meant for a pixel art style. One should also make sure to keep the sounds consistent with each other to avoid mental dissonance, breaking the immersion. This means keeping the quality, the volume and the placement of the sounds as similar to each other as possible.

The connection between the player and the character is extremely important when creating a horror game. Make sure that the sounds the player hears are an accurate depiction of what the character would be hearing; having the sounds be precise in comparison to the source. Also, make sure that the character makes the appropriate sounds in comparison to their actions and reactions. The easiest way to approach this is with footsteps. Regardless of the space, having the accurate sounds of the character walking around will instantly create a more believable experience.

Other important things to remember are the sound reacting to the space accurately, which can be achieved with the proper reverbs and delays, synchronizing sound with the visual elements to avoid making the player feel like something is wrong with the game, as well as making sure that sounds are presented correctly when the source is obstructed since this will add a new layer of realism that will make the player more immersed.

Also, use silence to your advantage and make sure to build up scares properly. Silence is one of the easiest ways to create tension, especially when building toward a scare. When silence appears, using even small sounds will make them appear more threatening. This is also much easier than stacking sounds on top of each other trying to build upward constantly.

One more extremely important part is how the game is presented as a whole. Sounds will have a big impact on how a game is received, especially if the experience is made worse by the sound. Many games have received a negative image for sound issues, like bad mixing, sounds that are distorted or affected in an unwanted way, and sometimes even sound cutting out completely. And on the flip side games with good sound work will often get the recognition it deserves. For this reason, always make sure that there are as few bugs or issues with the sounds or the implementation.

Looking back at my own project I would've definitely focused more on the build-up since I think this would have made the scares much more impactful. If I had known what I do now, I would have also tried to create more defined mental images for the player. Also, would I have had more time I would have made a more variable selection of sounds to avoid excessive repetition, but as the game turned out quite short I believe the amount was still fine.

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APPENDICES

Appendix 1. Link to video of thesis' practical project

NOTE: Click the link to open it, do not copy&paste into browser it will not work.

https://drive.google.com/drive/folders/1HG-_n_DaWiyl-WiE7xFm6xBAKN1Y6e175?usp=sharing