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Jarno Salo

STORYTELLING THROUGH GAME AUDIO

– case Juuret

TURKU AMK
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Game audio is an integral part of the game development process. It helps greatly in creating immersion and building believable game worlds. Still it is often overlooked or just an afterthought. Badly made game audio can ruin even a good game.

The purpose of this thesis was to design and create all the audio for a 3D adventure game called Juuret. It is the first game from a startup game company called FoxFail Creations. The audio was designed based on the research of music and game suggestions given by the commissioner. The design was then further improved after conducting literature research into types of game audio and their roles in creating immersion. After this the music and the ambience were carefully crafted using a Digital Audio Workstation and a MIDI keyboard. The sound effects were then recorded by using a microphone and a USB audio interface.

The theoretical section of the thesis examines the evolution of game audio and related technology and how that has affected the ways game audio is created. The thesis also examines what types of game audio exist and the different roles they fill, how music becomes the soundtrack for the player's actions, how ambience fills the game world with details and how sound effects give feedback to the player about what is happening. Finally the thesis examines what type of workflow to expect when working in an audio role in the game industry.

The practical section of the thesis studies in detail the design and creation stages of the process, how the instrumentation choices were made, how an unfamiliar music style was adapted to work in the context of the game, how the melodies for the music came to be and how obstacles in creating the sound effects were overcome. Lastly, the work process and the end result are analyzed very thoroughly.

A full soundtrack, ambience and a full set of sound effects were produced for the game. Once the audio was finalized, it was then given to be accepted and evaluated by FoxFail Creations. After the work was accepted by the commissioner, the audio was evaluated by them to be a perfect continuation to their game development process. Finally the audio was delivered as ready-to-be-implemented files.

KEYWORDS:

audio, video game, composing, game industry, audio design

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TARINANKERRONTA PELIAUDION KEINOIN

- case Juuret

Peliaudio on tärkeä osa pelikehitystä. Oikein käytettynä se auttaa pelimaailmaan uppoutumisessa ja uskottavien pelimaailmojen rakentamisessa. Silti se jätetään usein pienelle huomiolle ja huono peliaudio voi pilata hyvänkin pelin.

Tämän opinnäytetyön tavoitteena oli suunnitella ja toteuttaa kaikki audio 3D-seikkailupeliin nimeltään Juuret. Se on ensimmäinen peli FoxFail Creations -nimiseltä startup-yritykseltä. Audio suunniteltiin toimeksiantajan musiikki- ja pelisuosituksiin pohjautuen. Tämän jälkeen audiosuunnittelua vielä parannettiin tutkimalla peliaudion liittyvää kirjallisuutta. Lopuksi audio toteutettiin huolellisesti FoxFail Creationsin asettaman laatutason mukaan.

Opinnäytetyön teoreettisessa osiossa perehdyttiin peliaudion historiaan ja sen kehitykseen läpi vuosien. Tämän lisäksi perehdyttiin erilaisiin peliaudion rooleihin ja tavoitteisiin. Lopuksi opinnäytetyössä luotiin katsaus siihen millainen on tyypillinen työprosessi audiosuunnittelijan näkökulmasta.

Käytännön osiossa tarkasteltiin audion suunnittelu- ja toteutusvaiheita, sekä peliaudion erinäisiä rooleja ja merkityksiä. Tämän lisäksi perehdyttiin toimeksiantajan tarjoamiin musiikki- ja pelisuosituksiin, jonka jälkeen kaiken tämän pohjalta toteutettiin toimeksiantajan tilaama audio. Tämän jälkeen työprosessi ja lopputulos analysoitiin tarkasti.

Opinnäytetyön aikana toteutettiin täysimittainen soundtrack, luotiin ambienssi ja peliä varten toimitettiin myös täysi paketti ääniefektejä. Kun audio oli viimeistelty, toimitettiin se hyväksyttäväksi ja tarkastettavaksi FoxFail Creationsin toimesta. Toimeksiantaja arvioi työn olleen juuri sitä mitä haettiin, jonka jälkeen se todettiin täydelliseksi jatkeeksi heidän pelinkehitysprosessiaan. Audio toimitettiin toimeksiantajalle äänitiedostoina, jotka ovat valmiina implementoitaviksi.

ASIASANAT:

audio, videopeli, säveltäminen, peliala

CONTENTS

GLOSSARY

Art Nouveau	International art style most popular between 1890-1910
BD	Blu-ray Disc
C64	Commodore 64
CD	Compact Disc
Crescendo	A gradual increase of loudness in music
DAW	Digital Audio Workstation
DVD	Digital Video Disc
FM	Frequency Modulation
Foley	Reproduction of everyday sounds
Gibberish	Speech that is or appears to be nonsense
Hook	A short musical idea used to catch the attention of the listener
Leitmotif	Short recurring musical phrase associated with a person, place or an idea
MIDI	Musical Instrument Digital Interface
NES	Nintendo Entertainment System
PC	Personal Computer
PSG	Programmable Sound Generator
RPG	Role-Playing Game
SID	Sound Interface Device
SNES	Super Nintendo Entertainment System
UMD	Universal Media Disc
USB	Universal Serial Bus

1 INTRODUCTION

Game audio is an integral part of game development. If used correctly, it helps greatly in creating immersion and building believable worlds. Still it is often overlooked or just an afterthought. Badly made game audio can ruin even a good game.

The purpose of this thesis is to create the music, sound effects and ambience for a Turku-based game company called FoxFail Creations, to be used in their first game Juuret which is a 3D adventure game, and to make the game audio feel and sound immersive. This thesis also introduces some of the basics of game audio and audio design.

In the theoretical section we take a look into game audio and some of its concepts, how it is used, how game audio has evolved throughout the decades and how the tools and technology have evolved. We also take a look into what music, ambience, sound effects and dialogue means in the context of video games, what it means to create an atmosphere or to activate the player. Lastly we study storytelling through game audio by going through some industry examples with great audio design.

In the practical section we first discuss the game itself and how the stylistic choices for the audio came to be. Then we thoroughly examine how the audio was planned, what the thought process behind the audio design was and how the audio was created.

After that we analyze all the work that went into creating the audio for Juuret. Lastly in the Conclusions chapter we reflect on how well the project succeeded and what obstacles were encountered during the process.

2 EVOLUTION OF GAME AUDIO AND AUDIO TECHNOLOGY

Game music and sound effects started as series of bleeps and bloops. Nowadays it is possible for games to have full orchestral soundtracks and complex sound effects. The main goal of game audio is to improve the experience and to provide realistic and immersive experiences.

Throughout its history technology has placed constraints on the production of video game audio. Some of the choices made by game music composers may have been predetermined by the technology of the time. Nevertheless there have also been creative composers that have found smart ways to work around those limitations or perhaps even use them as an aesthetic. [1]

It could be argued that Pong [2] had one of the first soundtracks. The gameplay makes a kind of minimalist accompaniment utilizing three different notes; one for a paddle hitting the ball, one for the ball hitting a wall and one for either player scoring [3]. This video by Andy's Arcade [4] demonstrates the sounds in action.

The arcade game Gun Fight [5] could be considered the first game to have music. It had sound effects and a short melody. The melody was taken from the 1840 piano sonata "Funeral March" composed by Frédéric Chopin. In 1977 Atari released the Atari VCS (Atari Video Computer System, later known as Atari 2600) and it was the first system that offered dedicated sound hardware. It had one pulse channel and one noise channel. This gave game developers new ways to experiment with how to engage the player. For example Combat [6] used the pulse channel to create bullet sounds and the noise channel for the sound of a rumbling tank engine. [7] Two videos by Old Classic Retro Gaming demonstrate these games in action, first video about Gun Fight [8] and the second video about Combat. [9]

The earliest example of interactive game audio can be found in Space Invaders [10]. As the player defeats more enemies, the gameplay and the music becomes faster. The first game with continuous background music was Rally-X [11]. Frogger [12] was released one year later. It had different background music for different levels. The same year Vanguard [13] was released. It was one of the first games to utilize digital voice and licensed music. [14] The interactive audio of Space Invaders can be heard in action in

this video by Game Archive. [7] In addition these videos by Old Classic Retro Gaming the soundtracks of Rally-X [15] and Frogger [16] can be heard in action, and the digitized voice in Vanguard. [17]

Two new and revolutionary soundchips were released around the same time. The first one was the AY-3-8910, released by General Instrument in 1979. It was a Programmable Sound Senerator (PSG) and could be found everywhere; Intellivision, Atari ST, Sega Master System, MSX, pinballs and arcades. The chip had three square wave channels with different sounds and a noise channel. It was a strong option for the game developers of the time period due to its cheap price and versatility. The second soundchip was the Sound Interface Device (SID) integrated in the Commodore 64 (C64), which was a home computer released in 1982. The chip was in essence a full synthesizer with three channels, programmable analog filters, multiple wave forms and pulse width modulation. [7]

Both the AY-3-8910 and SID soundchips are still used to create music today. A sample from any time period demonstrates their capabilities well. This video by spacehen [18] demonstrates modern usage of the AY-3-8910 soundchip and in this video by Peyser Commodore [19] the SID soundchip is being utilized in a sort of “loading screen music”. The music was composed by Jonathan Dunn and was used in the C64 games published by Ocean Software.

The next great step forward in video game audio was the Nintendo Entertainment System (NES, released 1983 in Japan and in 1985 in the USA). Its sound hardware was modest but it had more channels than the earlier systems. Two pulse wave channels typically used for melodies, a triangle wave channel typically used for bass, a noise channel typically used for sound effects or percussion and a sample channel that could be used to record small samples to be used in the game. Super Mario Bros. [20] was one of the early examples to utilize the full potential of the hardware. It set the bar and changed the way people perceive game audio. [7] In this video by Longplay Archive [21] the music and sound effects from the game can be heard in action.

Frequency Modulation (FM) synthesis was the next technology to revolutionize game audio. It had been available since the 70s but became mainstream in the 80s. It was cheap and versatile like the PSG. The first game to utilize this was Marble Madness [22]. Another notable one was OutRun [23] where the player could select the music they were driving to. [7] Two videos by World of Longplays demonstrate these games in action, the first video is about Marble Madness [24] and the second video is about Outrun. [25]

At the same time sampling was becoming commonplace. A good example was Commodore Amiga, released in 1985. It was essentially a powerful and flexible four channel sampler. A new type of music software called a tracker was introduced with the Amiga. Trackers eventually made composing more accessible and affordable. Each sample channel has its own instructions for what instrument to play and for how long. Since most of these sounds are just the same samples playing over and over, the music could be compact enough to fit into a diskette while maintaining a decent level of audio fidelity. [7] In this video compiled by off1k [26] Amiga music by the artist Jester can be heard. It also demonstrates a tracker software in action.

Super Nintendo Entertainment System (SNES) came a little later (1990 in Japan and 1991 in the USA). The SNES was another sample based system, equipped with eight sample channels. Many of its games had soundtracks that are still loved today. Final Fantasy VI [27] demonstrates a good selection of audio samples on the SNES. [7] In yet another video from World of Longplays [28] these audio samples can be heard in action.

This led to the situation in the late 80s where there were several different and competing ways to make game audio. The industry was looking into standardization of media. It brought us sound cards and Musical Instrument Digital Interface (MIDI). Like the trackers in Amiga, MIDI is essentially just a set of instructions. By the mid 90s most of PCs supported MIDI natively. The exact sound of the music was dependent on what soundcard or module was used. For example AdLib Music Synthesizer Card that was released by Ad Lib Inc. in 1987 or Roland MT-32 that was released by Roland Corporation in 1987. [7]

The arrival of Compact Disc (CD) technology revolutionized game audio once again. It brought much more storage space, which could be used for high quality music recordings. Notable example being Ys I: Ancient Ys Vanished [29] for the TurboGrafx-CD which was one of the earliest games to take advantage of the CD format in its audio. [7] In this video by Zeithri [30] the CD quality recordings of Ys I can be heard in action.

After this, the CD has been surpassed by formats like Digital Video Disc (DVD, released in 1996) and Blu-ray Disc (BD, released in 2006). With even larger disc space came the possibility to have even higher quality audio recordings and hours upon hours of voiceacted dialogue.

3 DIFFERENT TYPES OF GAME AUDIO

To understand game audio and its roles better this chapter dives into different types and categories of game audio; music, ambience, sound effects and dialogue. It also explores the basics of adaptive audio and the difference between diegetic and non-diegetic audio.

Music is the soundtrack of the game, a theme of sorts for the player and their actions and situations. Ambience is usually in the background building up the world by adding details and layers or filling the aural landscape when no action is happening. Sound effects are in essence just the game reacting to what the player is doing or what is happening in the world. Dialogue (and narration) is a way to convey information and the means through which the characters can have discussions. It is the voice of the player and other characters, or the voice of the narrator.

3.1 Music

A musical theme within the context of a video game is experienced in a different way than a theme in passive forms of entertainment like television or movies. In a video game the theme accompanies an activity that the player is performing. This in turn makes it a soundtrack for the personal adventures of the player. As a player it is typical to experience game music while doing something else than just listening. This links the music to significant personal actions. Hearing the music associated with these actions has a strong potential to bring back detailed memories. Game melodies can function as mnemonic ambassadors for the games from which the melodies come, reminding the player of all the fun they had while playing. [31]

From the amount of video game cover songs online on sites like YouTube it is very evident that game music is greatly appreciated. And judging from the amount of videos dissecting game music it is clear that it is also considered a serious art form.

3.2 Ambience

During moments of calm when the player is free to explore, engaging in safe activities and interacting with other characters the ambience sets the emotional atmosphere. It can be anything from the bard gently strumming in a medieval tavern to a sinister synthetic pulsing in a futuristic city. Ambience establishes a mood which adds layers of meaning to the game world. The need for ambience is dependent on the project. For example fighting games and beat ‘em ups may have no need for that. [32]

It is important that ambient sounds don’t rely on looping. The player will be very quick to pick up on repeating distinctive sounds [33]. Instead of playing at a specific point, multiple short samples can be created to play randomly throughout the game. This randomness plays an important part in breathing life into the game world and avoiding repetition. [34]

Ambience works in the background doing its magic. Well-made ambience blends perfectly with the game world, creating immersion. By comparing the amount of videos about game music versus the amount of videos about game ambience it is evident that outside of the context of a video game the ambience is not listened to in the same capacity as game music. This is most likely due to the typically unmelodic nature of ambience.

3.3 Sound effects

The most typical examples for game sound effects are ones directly linked to the movement and actions of the player character like footsteps or jumping and landing, and basic actions like opening a door, pushing a button or picking up and dropping an item. Also non-player sounds like clicking of UI/menu items.

The audience is a passive “receiver” of sound in consumption of more traditional media. Meanwhile in video games the player plays an active role in triggering of various sounds in the game like dialogue and sound effects [35]. It is important to communicate to the player whether the sounds are generated by their actions or by the game world itself [36].

Attracting the player’s attention is one of the main uses for sound effects. For example when the player picks up a new weapon it might be accompanied by a sound effect like the cocking of a gun. This gives the player feedback; they have acquired a new item.

Another common use is to evoke emotional response like the feeling of success or failure. In the game Metal Gear Solid [37] a sound is played when the player is killed; a high-pitched screeching sound accompanied by the supporting character screaming the main characters name, evoking a strong sense of failure. [38] In a video compilation by Game Over Continue [39] this “death scene” can be heard multiple times with different supporting characters.

3.4 Dialogue

Merriam-Webster’s dictionary [40] defines dialogue as “a written composition in which two or more characters are represented as conversing”. In game context this can mean voiceacted dialogue or narration, like for example in Max Payne 3 [41] and Bugsnax [42]. Even if the game has characters with voiceacting the player character might be silent. This is the case in games like Half-Life [43]. In this cutscene compilation video by Gamer’s Little Playground the dialogue from Max Payne 3 can be heard in action. [44]

Different video game genres have different types of recording needs, for example a simple puzzle game is not going to require any audible dialogue [45]. Some games that don’t have any voice acting might still have an audible dialogue of sorts through sound effects that imitate speech like for example in Banjo-Kazooie [46], Undertale [47] and Celeste [48]. A cutscene compilation video by Gamer’s Little Playground [49] shows how this imitation dialogue works in Undertale.

3.5 Adaptive audio

Unlike film, television and other traditional linear audio, video game music can response to gameplay in varying degree. From the simple loops that remain constant throughout the levels to a more complex adaptive relation between the music and the player. Adaptive audio responds to the gameplay and the game environment. As an example the music might change as the in-game timer reaches a certain point. [50] Adaptability is reflected in the game's ability to react to the gameplay. It is usually done by sending events or triggers from the game engine to the music engine. There the latter decides when to response. In theory this could occur at any point in the music but the usual response occurs immediately at the next beat or the next bar. Even a marker can be used if the system offers the possibility for creating markers in the music. [51]

A very basic example of adaptive music can be found in Spyro Reignited Trilogy [52] where a rhythmic percussion track starts playing on top of the music when you start running.

3.6 Diegetic and non-diegetic audio

Diegetic audio is audio that originates from a source that exists within the world. It is something that the characters would be able to hear. Non-diegetic (or extradiegetic) audio has no actual source within the world. [53]

Sounds like bird sounds, wolf howl and crickets chirp are diegetic. Also the sound a sword makes while cutting or the sound of footsteps. The most basic form of non-diegetic audio are the non-dynamic linear sounds and music found frequently in introductory movies and cinematics. [54]

It is important that the player can differentiate between these two types of audio so that they can make good and informed decisions during gameplay. If it is not clear enough, the player might received mixed signals on what they should do. This can lead to frustration.

4 STORYTELLING THROUGH GAME AUDIO

Game audio is an important tool in storytelling. Playing any modern game muted will cause the player to miss out on lots of key information and feedback. They will also miss out on the general feel of the building or the area they are in. Just like in the real world; if a person cannot hear anything, they won't have any idea what's lurking behind them unless they turn around. Game audio has two major roles, creating the atmosphere and activating the player.

4.1 Creation of an atmosphere

Video game audio can be categorized to three different purposes. To inform, to entertain and to immerse. By giving the player audio cues they are informed about what is near them or what might be coming. Game audio can also be made to entertain the player, to keep their attention and to make them feel like they are having a fun time. It can also be used to create immersion, to make the player feel like they are not just an outside observer but actually a part of the game world. [55]

Immersion essentially means that the player is pulled into the world of the game. Total photo- and audiorealism is not needed for the game world to produce a sense of immersion and this is something that most scholars agree with. [56]

4.2 Activation of the player

What is meant by interaction with sound? There's a simple semantic distinction; listening to, and interacting with. When someone is interacting with, they are taking part in action. When someone is listening to, they are external from the action that is taking place, just an observer. How sound is perceived is affected by how it is listened to. Players are constantly gathering information based on the sounds that they hear in game; where the sound is located in the environment, what type of item or object has caused that sound and so on. Listening affects how the player will experience the game, and in some cases even how they play the game. As an example New Super Mario Bros. [57] expects the player to pay attention to the music to time their attacks since the enemies jump in time to the beat. [58]

Every now and then the goals in a game might become unclear. The player might feel directionless or lost when this happens. Developers have tried many tricks to keep these moments to a minimum. These tricks range from small text prompts to glowing paths. Music can provide two subtle and effective methods of leading the player in the right direction. The first one is the absence of music. When music suddenly stops or fades away, the player will notice the absence of it. This in turn creates the impression that there is nothing more to do or to see there. The second way in which music can guide the player into the right direction is through musical hinting. When the player enters a new area within the game, the music can suddenly introduce a new element, hinting that a critical part of the environment is now in view. This lets the player know that this section is important and needs to be explored. [59]

4.3 Industry examples of storytelling through game audio

Narrative-driven or “story rich” games come in many genres like adventure, horror, point and click, RPGs, walking simulators. Even combinations of these and more. They rely heavily on worldbuilding and storytelling through game audio. There is usually a lot of voiceacted dialogue and/or narration and many layers of ambience. Voiceacted dialogue and narrative are not a requirement though, a game can tell a story and have an amazing atmosphere just through ambience, music and sound effects.

There are many excellent examples of perfectly crafted game audio. The author of this thesis recommends the following games to gain a deeper understanding and appreciation of the many ways game audio has been used to craft unique narratives and worlds.

For great examples in the art of dialogue and narration the recommendations are Bastion [60], L.A. Noire [61], Portal 2 [62], Thomas Was Alone [63], Never Alone: Kisima Inŋitchuŋa [64], Valiant Hearts: The Great War [65], Tacoma [66] and What Remains of Edith Finch [67].

Masterfully crafted horror ambience and horror audio design can be found in games like Dead Space [68], Outlast [69], Alien: Isolation [70] and SOMA [71].

Lastly the author would like to mention more lighthearted games. These are great examples of how game audio can also be used to craft some of the most colourful, vibrant and fun worlds that don't take themselves too seriously. Games like Day of The Tentacle [72], LocoRoco [73], Botanicula [74], Wuppo [75], Horace [76] and Pikuniku [77] are a great example of this. Some of these examples have voiceacted dialogue and some have written dialogue only, but the examples LocoRoco and Botanicula have neither and yet they still manage to tell a story through visuals and audio.

5 WORK PROCESS IN GAME AUDIO

It is very typical that a composer joins the game development team quite late in the process, unless we are talking about an in-house composer. For that reason they need to be briefed on the game and its style(s) and genre(s). Coming into an agreement about the style of the music and audio in general should always be the first task. This includes things like instrumentation choices and genre influences. Another essential step is to request materials from the development team. The more material there is the easier it is to prepare for the work and to deliver audio that matches their vision. The materials to request include videos of gameplay, design documents, concept art, storyboards, game builds and audio asset list, even dialogue scripts and cinematics. Audio asset list is the most important item and should also be the easiest to obtain. The audio asset list is an educated estimate of the game's audio requirements, usually containing information about style, length and placement of the asset in the game. [78]

"Every composer will have a unique working process" [79]. With game music the author of this thesis has found it easiest to build the music incrementally, starting with perfecting the main hook of the song to the developer's liking and then building around it. With sound effects they would rather make "too many" at first than come back later to add versions. This is since there might be very minor but still noticeable differences in the digital or physical recording setup which in turn could lead to inconsistent sounds.

With ambience the author would add the major building blocks first and create a nice seamless loop. To this they can start adding small details bit by bit. Lastly with dialogue they would first start with holding auditions for the roles. The author is very careful with who they choose. If the character that is to be portrayed is a native speaker of a language, the voiceactor should preferably be a native speaker as well, or at least someone that for most is undistinguishable from one. Before they could start the recordings though the author would go through the lines very carefully. Everything has to flow naturally and if there are any hard words, there should be a pronounciation guide attached.

6 PLANNING

6.1 Background about the game Juuret

The audio was created for a PC game called Juuret. It is the first game from a Turku-based game startup FoxFail Creations. The game is a “walking simulator” -type of 3D adventure game. It is set in a singular building which the player explores from bottom to top. During the exploration the player will find out clues about what has happened. The game sets up the world and a further narrative that the company is building.

The request from the company was to imitate the feel of 1920s and art nouveau through the music. The game audio should strengthen the story that they are already telling through visuals and written narrative. Agreement was formed with the company about the importance of game audio, which is why the author felt like this project was the perfect way to further their career in game industry and in game audio.

6.2 Planning

The work started with a series of long talks with the commissioner FoxFail Creations. The conversations about the details of the game started in November 2020. Active work on the project started in January 2021. These conversations mainly focused on the atmosphere and feel that they were aiming for with their game. They provided a lot of excellent music and game suggestions to gain an even deeper insight into their mindset. The game suggestions provided were mostly in the same genre as Juuret, games like Gone Home [80] and Tacoma [66].

They also provided two documents. The first one was a presentation about their game Juuret. In the presentation they describe each level and what sort of atmosphere and setting the level has. Requests about how the audio should be in any particular level. The another one was a list of items and interactables they want sound effects for. This included general sound effects for the player character like footsteps. The importance of using a recognizable theme or a melody (a leitmotif) throughout the game was also brought up.

After these talks there were everything needed to start planning the work; how many songs are needed, how many different types of ambience is needed and what are the actions and items that require sound effects. A work schedule was created and the audio work on the project was started.

7 EXECUTION

7.1 Audio design and instrumentation choices

The work started with the music and the theme song was the first task. The game has a music box in the main menu screen. That was a good starting point. This meant that for the instruments a music box and some other similar bright-sounding tuned percussion were chosen, supported by a bass and a synth pad.

For most of the other songs some research was needed first. The company had requested that the music should imitate the feel of 1920s and art nouveau, so the research concentrated on what instruments existed in the art nouveau time period. This was then compared to what were the common jazz instruments in the 1920s. Brass instruments were quite common and so it was decided to build the melodies with them, supported most of the time by drums and a double bass and even some woodwind instruments every now and then. Also a lot of keyboards were added to the music, especially the Rhodes electric piano. Those were popularized much later than 1920s, but since this is a fictional world, the timeline doesn't have to be 100% exact. These instruments also add a sort of mysterious and ethereal layer to the music.

Next up was making choices for the ambience. It needed different versions that were slightly changed based on where the player is in the building vertically. Because the deeper the player is in the building, the deeper they also are beneath the surface of the water. This is because the building is mostly underwater. The main building blocks for the ambience were various water sounds and creaking sounds, and in the highest level also some winds and waves. The idea was to create images and ideas about the outside world.

Lastly there was the choices for sound effect production. The author of this thesis usually mixes up their methods a lot more, but this time they wanted to do the sound effects mostly through Foley-methods. The goal was to avoid using any digitally created sounds. Everything would be recorded by the author themself , unless it is something they can't record or create with their home studio setup. In that case public domain sounds would be layered with some of the author's own samples. The reason for the choice of going full Foley on the sound effects was that this sort of game benefits greatly from realistic sounds effects.

7.2 Creation of the audio

The music style of the game (art nouveau, jazz, 1920s) was not the most familiar one for the author. Through extensive research into history of art nouveau and jazz and to the music suggestions given by the commissioner the music of the game was adapted to the style that they were looking for. The ambience and sound effects were similar to what the author had made earlier throughout their career, so these were much more easier to work on. The commissioner did not request any voiceacted dialogue or narration.

7.2.1 The tools

All of the music was created with Propellerhead Reason, a Digital Audio Workstation (DAW) that the author has been using for close to 15 years. It is a very versatile software with tons of different sounds and it can easily be adapted to make any genre of music. The ambience tracks were layered in Reason. Mixing and mastering of both the music and the ambience was done in Reason.

For sound effects a free software called Audacity was used. It has a very simple interface and it is perfect for recording sound effects quickly. It has useful tools like “noise reduction” which can be used to reduce background noise from recordings to some degree. To record these sound effects in Foley-style a Shure SM58 microphone plugged into a M-Audio M-Track 2X2M USB audio interface were used. All of the sound effects were edited and finalized in Audacity.

7.2.2 The music

The theme and the credits song were created by playing around with a music box sound. This was to imitate a lullaby-like tune that is common to these sort of music boxes. Both of the songs have exactly the same instrumentation but a different melody and structure, although the credits theme does utilize the game’s main theme in its outro. The same instrumentation for both the theme and the credits was chosen to sort of “wrap up” the game together. Now the game has a clear starting and ending point music-wise.

The music for the second last level and the last level of the game are both very orchestral pieces, especially the first one. As its name “Crescendo” implies, it is a song working its way to a high point in the music. It has a full violin section, both brass and woodwind instruments, bass, piano, choir and some orchestral percussion, creating a very epic orchestral feel. There’s also a quiet music box playing every now and then. The music box is there to indicate that the player is getting close to the end of the game. The song starts in the middle and ends quickly, and this is exactly as was requested by the commissioner.

The other song belongs to the last level and imitates “plant music”. There exists a device called Bamboo that is made by Music of The Plants. It turns living plants into music. This works by connecting the device to a plant and letting it interpret the data from the plant as music. The device in action was listened to for couple of hours and then something similar-sounding was created as closely as possible. There are almost twenty different instruments playing in this song and they were chosen by their audio frequencies. To achieve this full-sounding orchestral feel a lot of instruments were tested to find the ones that together could fill the aural landscape to its fullest. It is not as organic and unpredictable as this sort of device can make, but the end result is very close to it.

The rest of the music was made by jamming along different types of drum tracks, sometimes with various instrument samples like brass (trombone, trumpet) played through a MIDI keyboard, sometimes with an electric bass. Jamming was chosen as a composition technique here so a song played by a real band could be imitated better. It is very typical in jazz music that there’s a whole band playing. These songs play from radios in the game.

With most of the songs the work was started by creating a couple of great hooks, testing different ideas and melodies. These were quickly turned into full songs. But there is this one song called “Rehearsals” which has a very different story. The main melody has been playing in the author’s head for close to 15 years now. They always thought that it is not serious enough to be used in any music. But with the right instrumentation, which in this case were a contra bassoon and a trumpet, and some playing around with the rhythm, the poor idea turned into a great song.

Most of these “radio songs” are led by a strong bassline played by a double bass (also known as upright bass), but they also utilize all sorts of brass instruments heavily. Mainly the trumpet, trombone and tuba. There are also some woodwind instruments here and

there and a lot of keyboards/synths/electric pianos, mainly Rhodes and an organ-type of instrument. These keyboard-instruments were mostly used to play a solo-like sequence somewhere close to the middle of the songs. Drums are mostly drum loops that came with the software used (Propellerhead Reason), but they are mixed up a bit and there's additional percussion layers playing on top of them.

Originally there was an idea that some vocals should be added to these songs. The author would sing them themself, but the lyrics would be some sort of mixture between gibberish and French instead of any real words. The latter is because for some reason the music reminds the author of France. The gibberish would have been there to make sure that the player wouldn't pay too much attention to the lyrics and would instead concentrate on what's happening in the game world. It was decided not to add these vocals though due to a very busy schedule and lack of writing experience in gibberish. The latter sounds like a minor inconvenience but the author wouldn't want to add anything to the final product that they wouldn't be able to stand behind 100%.

7.2.3 The ambience

The ambience tracks were built by first making a simple seamless loop of water and creaking sounds. Then adding layers one by one to them until there was no more room for details. They were made as loops so adding details and balancing could be done more easily. Separated samples were also given to the commissioner so that if they wanted to improve the immersion, they could make the samples trigger randomly. The patterns would then repeat less often and thus would make it feel more like an actual living environment. Short instructions on how they could do this was also delivered to them.

The hardest part in creating the ambience were all the underwater sounds. Since there was no possibility to record anything underwater there was a need to partly rely on public domain water sounds. These samples were layered with bubbles and splashes that were recorded before this project. These samples were pitch-shifted a bit lower since the original recordings were about small bubbling sounds and light waves splashing. These would sound out of place deep underwater.

Last piece of ambience required was a loop of white noise. A noise that a radio or a record player would make if nothing was playing but if the device itself was still on. At first this was tested if it could be done by adding a radio filter to a recording of silence, but this method proved to be unreliable. For some reason the static-like noise would cut off eventually. This is probably due to some kind of build-in function to make sure that the static wouldn't play indefinitely, but unfortunately this was the exact opposite of what was the goal.

For the creation of the white noise loop a free audio editor called Audacity was used. With the software you can easily generate different noises, including white noise. After choosing the noise type, amplitude and duration the software generates the audio with those parameters. A white noise loop of one minute in length was created.

7.2.4 The sound effects

For the creation of sound effects three full working days were taken. Most of the sounds were very straightforward to record, like a key dropping since a set of real keys could just be used, dropping them and recording when they hit a surface. The keys were dropped in three different ways; to a table, to hands and to on top of each other. All of the key-related sounds can be heard in this video.

With footsteps it was also straightforward after the right setup was found. The hardest part was to set up all the different surfaces that the game required (shallow puddle, rug, stone, wet stone and wood) and to find a space that didn't echo too much. It took a lot of testing and changing the position of the microphone slightly, but in the end the perfect setup was found. Only wooden floors were available near the recording setup, so it took some improvising to get the stone floor steps right. In the end the sounds were created by tapping shoes to a stone wall instead of a stone floor. To create the wet stone floor footsteps the stone floor steps were layered with light splashing sounds that had been recorded before this project. All of the footsteps can be heard in here.

Other straightforward sounds were everyday interactables like light switches. The only preparation needed was to set up a microphone right next to one and press record and start pushing it repeatedly. There was very little editing to be done afterwards. Also things like chests and cabinets were easy to record since they could just be carried right next to the recording setup. Then they would just be opened and closed repeatedly until there

was at least a few good takes to work with. Each of these easier sounds took about 15 minutes per sound from start to finish; 5 minutes of recording, and then about 5 minutes of choosing the best takes and another 5 minutes for editing them. A compilation of these sounds can be listened to here.

The commissioner also listed various items made of different materials they wanted sounds for. The main thing was the material and the size of the items. For example they listed a variety of glass items like bottles, vials and syringes. Two sounds per category were created, a pickup sound and a drop sound.

Picking up an item doesn't necessarily make a sound, so a little improvisation was needed. The pickup sounds were most of the time made by lightly tapping the material in question. But dropping an item does make a sound. So the dropping of ceramic, glass, metal, paper and wooden items was recorded. The items were dropped to a piece of wood with a bit of cloth on top. This was done to make the sound a bit less sharp. In addition to this two sounds for books were also recorded. The commissioner did not request any sounds of items breaking from the fall. All of these pickup and drop sounds can be heard in this video.

For more "obscure" items that there weren't any access to, for example a music box spring, a variety of sounds were recorded and layered to create an illusion of a music box spring being wound. This was achieved with a retractable vacuum cleaner pipe, a leather strap and a tape measure. For opening and closing of the music box a similar-sized cardboard box was used. The music box sounds can be listened to in here.

One of the sound effects (a menu click) was from the author's earlier sound effect banks, and it was the only sound effect in the game that was taken from somewhere else and used without any editing. Layers for lever and button sounds were taken partly from their recordings and partly from public domain sources.

7.2.5 Finalizing the audio

In the end the music and ambience were mixed and mastered in their own single sessions that both took one full working day. Doing all the music and all the ambience in single sessions made sure that everything sounded like it belongs in the same project and world. Footsteps were also recorded in one session to make sure that they sound like they belong to the same game. Same with the pickup and drop sounds for items of various materials. Due to lots of trial and error, recording all the sound effects took approximately three full working days. The sound effects were cut, edited and mastered in one day. When all the audio had been finalized, it was delivered to the commissioner FoxFail Creations through a shared folder in Google Drive. They were accepted and confirmed ready for the game a day later.

8 DISCUSSION

The importance of game audio should always be taken seriously. Bad sound effects or unfitting music can instantly pull the player away from the fun and the immersion. And if the music is annoying, for example a loop that is too short and/or repetitive, the player will get annoyed very quickly. Ambience and sound effects are a vital part of creating a believable game world.

Another important note is that custom audio should always be created for a game if possible. Understandably there might be budget restraints and most of the time with sound effects it is possible to get away with using asset packs. But especially with music and sometimes with ambience it is usually very clear if the developer has used public domain or other “free” audio. It takes away from the uniqueness of the game and shows the lack of understanding of the bigger picture of game design and development. If all of the other assets are custom-made, the game audio should also be custom.

9 ANALYSIS

This thesis examined the history of game audio and the evolution of the related technology. Also a look into different types of game audio and how it is used was taken, how to create immersion and how to activate the player. The thesis also discussed different successful implementations of storytelling through game audio. The aim was to create the best possible audio for the game Juuret, based on this literary and game research and on the knowledge and skills the author has gained in 9 years of creating game audio.

During the work most of the tasks were a great success, but there were also struggles along the way and some tasks that were only a moderate success. This section will carefully go through all of them in the same order they have already been presented in during the execution chapter.

The game features a music box in the title screen so the main theme and the credits theme were both aimed to imitate a lullaby-like tune that is often associated with music boxes. Both themes succeeded in this imitation. Both of them are also quite short (2,5 minutes and 2 minutes respectively) as is also typical in the melodies a music box would play. Since there was no actual music box to record, the opening and closing sounds and also sound of the music box winding up had to be created through other means. They are a close enough approximations of those sounds to pass as real.

The more orchestral songs that are in the final parts of the game were a harder task. For the first one of them a full orchestral and epic sound was the goal. This kind of music was not the most familiar for the author. Reading related music theory was the first step, but as the author doesn't have any music theory experience or knowledge this was quickly dropped in favor of just listening to music and figuring it out from there.

The "plant music" was another challenging task. The reference material was a device that would "organically" create music from living plants once connected. Doing this sort of unpredictable music is not difficult per se, but emulating properly how the system works is. Trying to recreate this sort of process without proper knowledge of the inner workings of the device is near impossible. The unpredictable and random way the device creates the music was disregarded and the work then concentrated on how the music itself sounds. It was noted that long notes, pads, synths and orchestral instruments were

common. That is something concrete that can be used as a starting point for the music. Both of these songs manage to have a very orchestral and epic sound as was intended.

One of the greatest obstacles were to find the proper instrumentation for all of the music and figuring out how to best utilize these instruments in the composition process. In addition to this the usage of keyboards in a solo context was difficult.

The underwater ambience ended up being good. There is room for improvement, but many of the things that would have made it better would require a portable studio setup, preferably one that is capable of recording underwater. There are layers of public domain sounds, the author's own recordings and also some sounds from the DAW that was used. Nevertheless it succeeds in creating an immersive atmosphere for the game and it drops hints of what is happening in the game world, thus activating the player to explore.

Lots of trial and error was needed to achieve the suitable sound effects. For any given sound effect (or set of sound effects) the setup had to be changed a couple of times until it was proper for the recording. The effects sound very close to how they would sound like in real life (when applicable).

Sounds that do not really have a real-life counterpart also ended up sounding good, for example the sounds used for picking up different items. These sound cues tell the player that something was indeed picked up. Not everything that happens makes a sound in the real life. But still this aural feedback is an important detail in creating a great audio design for a game.

Finalizing everything, including all the mixing and mastering, was a great challenge. It is a skill that the author has not yet mastered. Up until recently they have used the help of a colleague for these final touches in music and audio. Reading the theory was again tried first, but trying to understand and internalize such an extensive topic considering the project's schedule it proved fruitless. Since this didn't help at all, the author went with what they know best; throwing the theory aside and trusting their gut feeling and ears. The end result speaks for itself. The soundtrack for the game can be listened to in the author's portfolio. It includes all of the music and ambience made for the project.

10 CONCLUSION

Both the author and the commissioner were happy with how all of the audio turned out. FoxFail Creations gave great feedback and the best score possible in their review of the work with the project. This will be a great addition to the author's professional portfolio. The story of Juuret is now much more immersive than what it would have been without the author's help and the game world ended up feeling more believable and more alive. In total there were around 100 sound effects made, close to 30 minutes of music and a bit over 12 minutes of ambience.

There were some obstacles along the way, like adapting to a completely new music style. Nevertheless with thorough research into the music suggestions given by the commissioner the right style for the game was found. Creating the sound effects through Foley-methods was also a great challenge. The author has some experience in that field, but usually it had been just a couple of sound effects here and there. Creating close to one hundred sound effects through these methods takes a lot of trial and error and experimenting, especially with sounds that had to be created from scratch.

During the project several things became clear to the author of this thesis. They fully understand what roles different types of game audio has and how to make comprehensive audio design for games. They are able to adapt quickly to a new style of music even if it is very unfamiliar at first. The author knows how to build atmospheric ambience with multiple layers and how to utilize both digital and Foley-techniques for creating audio, good example of the latter being creating the sound of a music box winding up with just regular everyday items.

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