

Krystian Marcin Krupinski

Student number: 2012813

MA Commercial Music Producer 2020/2021 (Development)

Insight into Game and Sound Design in Unity and FMOD

Introduction

Arguably over the years, the gaming world has become one of the most lucrative markets in the world of entertainment, *Forbes* says: “ ***The video game industry is growing so fast that some believe it will reach over \$300 billion by 2025. With billions of dollars in profit and over 2.5 billion gamers around the world, we can expect video game platforms to continue developing in 2020.***”,(Koksal, I., 2021, Forbes).

The fact exists and shows that nothing seems to stop this industry from further growing, whatsoever is fantastic news for any aspiring sound designers out there. Moreover, R.Moss points out that in his article by saying: ”Sound is crucial, then, to any experience that tries to convey a story or trigger particular emotions and actions. And while musical compositions are a key part of that, there's only so much they can do on their own...”, (Moss, R., 2021).

In the first part of an assignment, I have decided to design my own game, challenged myself to create a game build inspired by the Fortnite game and the Call Of Duty. I started researching information about the Unity software and found many great reviews and tutorials on the internet. The majority were lacking detailed information. Moreover, another issue was to find valuable tutorials strictly related to Unity and FMOD. For the sound design, I have picked FMOD as its easily accessible and free of charge. Being said, I continued my research at looked at the available options

eventually decided to head over to the Ciarán Robinson book called: “Game Audio with FMOD and Unity”.

The goal was to create an immersive world with elements of nature moreover build the ambience effects combined with the battle royal style of game. Although it became quite challenging to create the whole game from scratch its become easier thanks to the ready presets/scripts and game objects (Prefabs, Materials, Textures). Furthermore, create own models/objects could have been time-consuming although, these self-created elements will pay off in the gameplay. Arguably, the majority of designers uses Blender software. Thanks to the research and C. Robinson book, I have learned the basics of sound design in FMOD. Moreover, the books taught me some more advanced techniques like using markers also, how to manipulate the audio recording by using parameters. Futuristic Battle was created on readymade codes, provided with the C. Robinson book. Therefore I could spend more time on sound designing and sound recording,” *The game editing tools and presets in Unity are amazingly powerful and easy to use. It’s possible to quickly put together a playable game scene, without writing or editing a single line of computer code...* “, (p.4, Robinson, C., n.d., 2019).

There are enough reasons why to use ready engines game objects, for example, the budget consideration. Nonetheless, creating graphics and codes from scratch gives more creative control. However, it may be expensive to pay for license charges, engine creators, etc.

Further down, I have started looking through available assets offered by the community of Unity. The goal was to find some of the elements of nature, trees, grass elements. Eventually, I went for “Forest Fantasy”, likewise additional terrain packs and “Standard Assets” all were available for free. Standard Assets were quite crucial for my game build as the C. Robinson book also uses them. Nonetheless, I tried to modify elements in the game also experimented with the textures on different game objects, rescaling them, adding some materials so the Drones could look more metallic-like.

Moreover, other assets were the Town Elements, which allowed me to create the land and the town scene, invaded by enemies drones. Moreover, for

my sound design, I have chosen FMOD as it seemed the most intuitive if compared to Elias or Wise.

The overview of the principles behind instrument works.

The story begins by landing on the tropical island, which previously been invaded by futuristic drones. The player wakes right before the battleground (at the Battleground Scene) accompanied by his fellow soldiers. The main goal of the game (Futuristic Battle) is to get rid of all enemies but also gather all the pickups (red and yellow points, 5 in total however, there are also bonus pickups).

The battleground is full of the enemies drones, which are deadly dangers for our main character (FPS). Many elements are triggered once the player enters them or leaves like grass sound or sphere collider (which connected to the FMOD lunches waves crashing audio).

The amount of pickups affects the main music, which creates dynamic and tension. For instance, if the player picked up two elements, the code tells FMOD to skip into the second marker on the audio track. That way, the instrumental has additional sound elements (like extra synths, kick).

Likewise, if the player remains low health, the breathing sound appears, so it suggests looking for health pickups (located on the entire map).

Once the health object picked up, the code creates the pickup sound causing the breathing audio to stop also adding the health points to the main character preventing from losing.

There are a variety of terrine spheres sounds relocated on the map. Each terrain has its sound design, few filtered in FMOD, so it appears closer to the actual sand sound (This could be heard in the main scene close to the shore, once the player enters the area).

The majority of the sounds has been recorder in my room, using picked leaves from the park mixed with some old receipts from Tesco. That allowed me to recreate the effect of stamping on the grass and create a sense of movement created by the equipment.

I have created the multitrack, loaded with the verity of audio files to prevent a sense of repetition also, audio is played accordingly to the stage percentage. Further down, applied randomisation and automation to the

audio tracks. The player can defeat the enemies using the rocket launcher (the sound trigger every time the key/mouse is pressed).

On the map are located crates and pizza boxes, once the player interacts with these objects the sound will be lunch. Moreover, there are empty objects with sphere collider to imitate environmental sounds throughout the FMOD. I have placed the fire camps prefabs to create a more realistic vibe, that illustrates the damaged (made by the drones). Moreover, some sound objects are affected by the FMOD EQ Multi-band plugin, to add a bit of crispness to the high and to increase the presence.

Additionally, I have implemented dialogue also the soldiers that are imitating the radio sounds as if they wait for the orders. The dialogue part has been recorded with the condenser mic at home, I also placed some blankets to reduce the room sound: "Towels, rags, foam, and sound blankets can all be used as dampeners to reduce vibrations in the props you are working with. They can also be used to separate the props from the surfaces that you work on. Putting a towel inside a prop to deaden the resonance works on the same principle as placing a towel inside a kick drum", (p.118, Viers, R., 2011).

These several dialogues have a set percentage, if the player stays long enough, he might be able to get some extra information about the specific character. Moreover, I added some extra elements like a food truck, or Ethans modified prefabs to support the overall mood. Furthermore, we can bump into a fired-up car projecting the alarm sound (by FMOD emitter). I decided to keep the vast majority of the scripts from the C. Robinson book and replace them with my recordings. Additionally, I have recorded my own Jump/Land/Grass/Sand/Stone/Wood sounds and added them into Player impacts in FMOD.

Details of the encountered issues while creating the instrument

There were many issues that I had to encounter, although for many, I could find solutions. During the process, I have noticed that using the same sound samples over again for sand land might be a bit boring and repetitive. Being said, that applies to the rest of the events on the map, like the gas leak sound that repeats a bit frequently and might become quite unpleasant for

the player. To solve the issue, I created multiple instruments track and added a variety of audio files to mimic the wanted effect. To make it even more unexpected and exciting, I have set the percentage stage for each of the audio files so while it runs becomes less predictable. Moreover, adding automation or pitch variation could help the overall sound design.

“One of the core tenets of game sound is “repetition destroys immersion.” If you hear the same sound again and again, then it distracts the player, and detracts from the game”, (p.14 Robinson, C., n.d., 2019).

The Drones were tricky to set up, as the laser sound was bugging halfway through exploded before launching for that issue. I have tried several times to recreate the model, unfortunately, unsuccessfully. Eventually, I have replaced the laser object with the rocket so the game would be playable (no errors occur since then). Moreover, I have moved the rocket a bit further from the model body, which works perfectly. Additionally, had to adjust some prefabs or create the original ones. Although using code provided by C. Robinson book is very helpful after a while, it might be challenging to modify them. Nonetheless, C. Robinson explains the function and describes the potential of coding. The Futuristic Battle build is attached to every script in the package, any missing element might destroy the game or cause some errors. In the long run, coding became more intuitive, which allowed me to modify some scripts like adding extra landscapes sound effects.

Furthermore, the audio looping might be tricky as the transition must happen smoothly, so it's not causing any distraction to the player from the game. To solve this issue, I had to make sure that some of the end parts, are with the same BPM or to experiment with attack settings in FMOD.

Moreover, I had to edit some of the samples by adding fades or making sure that they are trimmed good enough (so there are no pops or any unwanted picks). Moreover, the noise reduction process is crucial, as it affects the entire experience for the player.

R. Moss says: *“These games use things like crossfades and loudness prioritization to clean up the mix at any one moment, so that distant and quiet sounds almost disappear under nearer and louder sounds, while nearby explosions can lead to a tinnitus effect and the dynamics of the mixes, in general, tend to offer great dimensionality.”*, (Moss, R., 2021).

Some of the sound effects were too short to the rest of the audio files, in that instance, I have tried to solve the issue by using Asynchronous Instruments. Being said additional file is triggered while the main audio also remains. Furthermore, the audio from the FMOD emitter was getting too loud and unrealistic for the player. Nonetheless, the FMOD offers Spatializer Controls, which allowed me to create the accurate distance (from the value one to twenty where at twenty, the gamer barely will hear any ambience). Implementation of the audio recordings (sand, grass etc.) was a bit tricky, as the Future Battle game is based on the readymade script. Nonetheless, placing invisible mesh became more difficult specifically, on the uneven terrain, which caused an invisible obstacle.

The ideal solution could have been to modify the script and change the command “hit”. Nonetheless, I have decided to place mesh more precisely, so it's not affecting the player.

I also had some issues when regarding recording the material.

I have had to make sure that the condenser mic captures the entire environment without excessive picks or unwanted distortion. Being said, I went outside to capture the sound of the city.

Moreover, I added some effects like reverb to the “Land” and “Jump” audio files. Additionally, I have implemented some reverb effects. The same applies to character dialogue. I also worked with the 3D parameters to improve the positioning of the dialogue.

” Sound effects are an integral part of storytelling. It goes beyond film, television, and radio productions. I have a friend who cannot tell a story without mouthing sound effects to illustrate the events of his tales.”, (p.23, Viers, R., 2011 The Sound Effects Bible: How to Create and Record Hollywood Style Sound Effects).

Reflection upon the results of the Futuristic Battle game

Although the game is playable, it still needs improvements due to lack of time, I wasn't able to implement the final music at the defeat scene “GameOver”.

That is due to some issue with the coding on my end. Some additional tropical sounds come from the forest area. Likewise, the dialogues are mimicked by the soldier's characters. Furthermore, different landscapes or sea sound and additional ambience areas immerse with the gameplay. The gameplay would benefit thanks to menu implementation, likewise advanced dialogue sections, interactive ones that could improve the gameplay. Due to capacity requirements, I kept the terrain a bit smaller although, there could have been additional areas likewise availability to enter the buildings that could potentially have their FMOD events once the player enters them.

The game would have benefited from the variety of enemies operating different guns and sound effects.

Moreover, the game would profit from a more advanced equipment system or ability to pick up the items from the map, which can be achieved by adding another script to the first person character and specific objects (ammunition system with relocated pickup objects points).

The shore area could benefit from additional physics to the object and sound design like swimming etc. Moreover, adding additional events, thinking of 2D sounds to the first person controller (Breaths when running happens or being tired), likewise, unexpected events like the weather system (Rain sound, wind sounds).

Another way would be expanding the multiple instrument tracks, walking or dropping the bullet shells and pan them out.

Additionally, the audio tracks could be improved so that music would change accordingly to the player's progress in the game.

Another improvement can be made when regarding the real-time effects, which are using lots of power. The solution could be using samples with prior made editing (Like cutting the low ends or busting the high frequency in the DAW, reverb).

However, printed audio files have their downfalls: "Printed effects obviously can't be controlled by real-time parameters, so they won't be suitable all of the time. Also, if you need sections of the game to have the sound with the effect and other sections without, then you will need twice as many audio files." (p.156 C.Robinson.). Nonetheless, usage of pre-

rendered files could have a significant effect on the performance of the game.

I have chosen two majors, Fortnite and Call of Duty, to compare and discuss the contrast in relation to the Futuristic Battle. In both of the products, the sound design plays a huge role, as the distance accuracy affects the entire experience as follows, the player can assess if they decide to take on the fight. The Fortnite has three types of sound gun effects (close, mid, far), triggered based on the distance. Moreover, the player can assist if the gun has fired inside or outside the property. Furthermore, each weapon possesses its sound effect moreover, the effects react to the distance value from the source. The feature can be achieved by adding extra parameters. The additional advantage of the Fortnite over the Futuristic Battle is the availability of the multiplayer.

The Fortnite's sound design is crucial, as it also allows players to assess the distance from the enemies navigating the sounds of their footsteps, likewise helps to figure out if the intruders are on the same level or below, whatsoever effects the tactics.

Recognition of the footsteps sounds of different landscapes might be a crucial advantage for the players. That could have been applied by adding new enemies prefabs, also setting up the waypoints code, and attaching the accurate targeting system, moreover adding 3D event FMOD emitter to the object and adjust the distance parameters. Besides, adding some EQ filters and reverb effects to the specified areas could improve the gameplay also designing the buss for it so it takes up less processing power.

Also, there could have been additional explosion/damage sound effects, once the wooden objects like walls or floors are being hit/destroyed the FMOD would launch relevant audio file like wooden fragments hitting the ground.

Following, there could have been some additional sound events attached to the doors being open/closed, which are the basic major features in such a game as Call of Duty or Fortnite.

The recording can be executed, by recording moving objects in the forest, by throwing sticks and rocks. R. Viers book states; "Source material is priceless in the hands of a good sound designer. Ruin becomes riches, garbage becomes gold. Save your extra takes and use them as source material. Multiple takes of a door slam might give you a couple of leftover

takes that can create beefy wood impacts or become the base for a solid bullet impact into the wood. (R. Viers, 2011).

These techniques have been used throughout the sound recording process for Call of Duty. For instance, designers used fireworks to mimic the sound of the explosion. Moreover, they have manipulated the recording by adding some time-stretch effects and pitch shifting manipulation to achieve the wanted result. The great result has been shown in the video, (11.10.2019, Geloboy).

All combined sound recordings, breaking branches and fireworks result in an impressive explosion sound design. Besides, one of the techniques used in Call of Duty was the recordings of the garbage truck picking up the metal trash cans. That shows that sound designers can find their source anywhere without spending a penny. For instance, the designers had to create a futuristic sound design which some of it was the recordings of garbage truck arms picking up the trash. Moreover, the audio recording made out of the beard trimmer became the audio for the drones in Call of Duty, (5.2014, Game Informer).

Whatsoever, this is also the case for my sound design process. I have recorded the trimmer, to mimic the sound of the futuristic drones. Also used the electronic toothbrush, which can be heard occasionally if stand long enough next to the drones. Due to the low budget project, I had to improvise the rocket firing sound by recording two heavy 5 litres of water bottles hitting each other. It was inspiring to hear that the majority of the sound was recorded without a prior plan. The designers claim that the vast majority of preplanned recording sessions were not fully accurate to the ideal object. Moreover, most of the recording was made in the vicinity of locations, forests or abandon buildings to achieve realistic reverb sounds, (01.2020, SLEDGEHAMMER GAMES).

The feedback and beta testing of Futuristic Battle

I have handed the build to one of my close friends (game lover) to get some feedback. As expected, the game needed more development on the gameplay side. The feedback stated that extra elements are necessary, like, the availability to talk to game characters. Moreover, to install the points/scoring system, as its a bit unpredictable at the moment. Additionally, the person noted that the terrain could have been a bit larger so she could explore more areas. Likewise, the enemies could have been more aggressive as they seemed not very active or make any sense of danger. In order to solve the issue, I have fixed the code settings. Besides, I increased spin and laser speed moreover, added more enemy objects. Furthermore, I added new elements and experimented with different textures on the objects, so they looked more appealing to the player. There were some issues with the mesh colliders as they were getting in the way, and eventually occasionally cause stuck the player. For that reason, I rescale and replaced some colliders. The additional solution would be adding sphere colliders and ticking "Is triggered", so when the players with rigid body enter the area, the FMOD responds accordingly to the type of land. Besides, I adjusted some of the sound events, are balanced and are not overly loud and do not distract the player (Firing sounds, music instrumental).

Conclusion

The whole process of designing the sound and the game taught me many lessons and gave me a great insight into the gaming industry. After a few weeks of creating, I have become more comfortable with FMOD and today, I would have done things a bit differently. Nonetheless, that showed several elements and how huge is the potential of that gaming industry. Besides that, from recording my footsteps to catching the sound of the city, just in front of my flat, It was a valuable journey, and it proves that designing the audio for a game not always happens only in fancy soundproof recording studios. But, in the woods, or the random locations, the only principle is to think outside of the box. Whatsoever has been proved by the vast majority of the sound designers from the Call Of Duty. Besides that, thanks to Unity and FMOD, newbie designers have access to professional tools, totally free of charge. Moreover, thanks to ready prefabs and textures we are (beginner designers) able to create a playable game with a little

amount of knowledge about coding. Also, many scripts are available ready to use or are available in the Unity asset store. Arguably the challenge occurs at the editing stage, where the designers have to use any available tools to clean up the samples (Logic Pro X in my case). Likewise, to get the most of the material and get the record possibly accurate to the requirements (created world, theme). Moreover, the effects, making sure that the fired bullet sounds realistically enough despite being outside or inside the property, R. Moss says:” ***If you ignore or downplay the importance of sound design, you do so at your peril. Great soundscapes and soundtracks stay with players for years, and for the vision-impaired portion of your audience they can literally mean the difference between playable and unplayable.***” (Moss, R., 2021).

All these sound design elements have an enormous impact and could improve the game. These elements are the main key points and are crucial for the players. Cause the well-executed atmosphere and assets leave special memories to a player who could immerse with the game world.

Bibliography

Koksal, I., 2021. *Video Gaming Industry & Its Revenue Shift*. [online] Forbes. Available at: <https://www.forbes.com/sites/ilkerkoksal/2019/11/08/video-gaming-industry--its-revenue-shift/> [Accessed 22 March 2021].

Moss, R., 2021. *7 games worth studying for their excellent sound design*. [online] Gamasutra.com. Available at: https://www.gamasutra.com/view/news/318157/7_games_worth_studying_for_their_excellent_sound_design.php [Accessed 24 March 2021].

Robinson, C., n.d., 2019, *Game audio with FMOD and Unity*. Available at: <https://www.routledge.com/Game-Audio-with-FMOD-and-Unity/Robinson/p/book/9781138315976> [Accessed 24 March 2021].

Viers, R., 2011, *The sound effects bible*, Michael Wiese Productions. Available at: <https://postproduciendoenlaeav.files.wordpress.com/2017/09/the-sound-effects-bible-ric-viers.pdf> [Accessed 24 March 2021].

Geloboy, 11/10/2019, Available at :https://www.youtube.com/watch?v=FUuwZJnT4fA&ab_channel=Geloboy [Accessed 24 March 2021].

5.2014, Game Informer, Behind Call of Duty: Advanced Warfare's Audio, Available at:https://www.youtube.com/watch?v=ri1B2AQQAv4&ab_channel=GameInformer [Accessed 24 March 2021].

29.01.2020, SLEDGEHAMMER GAMES, AUDIOLAND: Creating Unforgettable Sounds for Call of Duty®, Available at: https://www.youtube.com/watch?v=FoXGlqW2nyo&ab_channel=SLEDGEHAMMERGAMES

Krystian Marcin Krupinski for Tileyard Education.