Dynamic music systems in video games over time?

Introduction

This Essay sets out to compile a timeline of music within video games and catalogue interesting developments, I have selected this topic as creation of music being a big hobby of mine as well as me being a drummer and guitarist. Another reason is that I would like to chart the changes of music within video games as both are mediums that I enjoy deeply. I also have a large interest in video game music and how the technologies used have changed and improved over time. My favourite type of music in video games are dynamic music systems, also known as adaptive music, and how the game can react to the gameplay to return sounds more fitting to the current situation with it in turn creating a unique listening experience alongside each playthrough of a game. Whilst my essay will aim to cover as music of the history and developments as possible, I will have a strong focus on dynamic music systems as I would like to share the progression that type of music has had and to share these developments from my research in one singular paper for ease of finding information. But most importantly I want to answer the simple question of, how has music changed in video games over time?

Collecting information

To begin my research, I looked for pre-existing timelines of video game music and I soon noticed that there is too much history for me to cover in such a word count, where I initially wanted to look further in depth of the growth of technologies alongside the techniques that are used to create music in game with a soft focus on dynamic music systems as they are what I am most interested in. but at before that decision was made I searched for the progression of how the sound was made, at first having the speakers directly controlled by the CPU and then the developments of multi-channel sound chips [1].

After eliminating that side of the research, I turned to the original inspiration for my essay and what introduced me to dynamic music systems, a video created by youtuber with the pseudonym "Scruffy" with an MFA in music composition [2] and their video about *"Pikmin 3"*'s dynamic boss music [3].

Soon after rewatching that video I took a break. And played some *"Guitar Hero 3"* (2007), it is here that I did some unintentional research as I noticed that the "Guitar Hero" series uses dynamic music.

Past there I began to look at articles covering various games that used dynamic music systems, this is where I found an article by Toni Kähkönen which catalogue various games that use dynamic music [4] which is where I discovered that *"Frogger"* (1981) uses dynamic music. This made it the earliest example of a dynamic music system in a video game regardless of how simple it may be, making it a key piece of history in the development of dynamic music systems, whilst reading this article I discover that he too had commented on the *"Guitar Hero"* series and my previous realisation was in fact correct.

I found that dynamic music was also appeared commonly within the *"Mario"* series of games as well as the "Mario Kart" spin off series, most importantly *"Mario Kart 8"* (2014) [6] as I have selected that will be the game I look more into and present how the games music is dynamic.

"Portal 2" (2011) is a popular example of dynamic music which is also diegetic. This is quite different from most of the other games that I will cover where most have non-diegetic music or if the music is diegetic then they use traditional instruments such as *"Guitar Hero 3"* (2007) whereas portal does

not use traditional instruments within its soundtrack, however I will cover this more when I present my findings [7].

Establishing Problems with research

One clear problem is that there is a lot of information to search through and far too much to cover within my word count, so to comeback this I decided to target into exclusively dynamic music systems and how games have used this over the years and the varying techniques that they have used to further immerse players into the game using.

Even though I now have a much smaller topic, I still will not be able to cover every game that uses dynamic music systems as far too many games use it in one way or another. Instead, I will try to cover important games that use dynamic music systems such as *"Frogger"* (1981) and on top of that I will also mention games that I believe uses them in a particularly effective way such as *"Pikmin 3"* (2013).

It was also quite challenging to determine what exactly could count towards a game containing dynamic music systems compared to musical sound effects or a game changing to a completely different music track such as in *"Animal Crossing: New Horizons"* (2020) where the music changes to a new loop each hour of the day [5].

I found too that my research was not an original project and had been done by people before me such as Toni Kähkönen [4] who I have mentioned in my collect information section, despite this I stuck to my theme as I wanted to search a little more in depth on fewer games with some nice variation such as *"Frogger"* (1981) as an old game, *"Pikmin 3"* (2013) my personal favourite game with dynamic music as well as something like *"Ape Out"* (2019) which I had first heard of whilst doing my research for this essay. By including a game, I didn't know about I thought it would be a good way to improve my knowledge on dynamic music as I knew absolutely nothing about the game before researching it and how its music is presented to the player. Although this did cause a minor issues as I had to be very decisive one what games I wanted to talk about in depth and what games I would give a brief mention to or not mention at all.

Presenting finding

Dynamic music systems first appeared in the 1981 game by Konami, *"Frogger"*. This game had exceedingly simple music since it from an old arcade game and music and sound systems in games had not got a powerful as we now have today [8]. However, the dynamics within this game can be seen when a player makes it to a safe space, the music will abruptly change to a different, calmer song. This reassures the player that they are playing well through audio without having to layer many sound effects on top of music, which in turn will clearly save processing for the sound chip within the arcade cabinet.

As for *"Guitar Hero 3"* (2007), music is an integral part of the gameplay, with players playing along to songs of their choice, the dynamic within this game takes place when a player either misses or messes up a note on the fretboard this is a clearly way of having the music reflect how well you are playing and further immerses the player, making them feel as though they are the one playing the guitar. *"Guitar Hero 3"*'s use of diegetic music lends itself very well to having dynamic music systems and appears throughout the entire series [9]. On top of this the game will also play a short musical stinger when a player has a long enough combo [9] which can be argued as either being a sound effect or a part of the dynamic music which is why I am giving it this brief mention.

"Portal 2" (2011) uses dynamic music throughout however the most common example given is within "Test Chamber 20" in which the player must redirect lasers using reflective cubes at three panels to open a door and progress further. Each laser withing this level will play a synth like drone when the player is stood by and when the player is beside all three once they have solved the puzzle then they will hear the full piece. The three separate tracks can be played in any combination which is a clear and simple example of the game's dynamic music for people unfamiliar with the concept [7]. In an interview with GamesRader, Mike Morasky (composer of *"Portal 2"*) spoke about the dynamic systems within the game stating that the "interactive musical experience tends to become one of exploration, as if the music is emanating from the facility and devices of Aperture Science itself" [11]. The system created gives the player full control over what music they will hear whilst the music is entirely diegetic and emanating from various objects around the player depending on the state that they player has put them in.

"Pikmin 3" (2013) uses dynamic within its boss fights which can help immerse the player deeper into the fight as well as give the player audio signals for when the boss performs certain actions alongside the visual signals that a boss will give such as jumping forward. These boss themes are built up of separate bars with each set of bars corresponding to what the boss is doing. When a boss in inactive or not performing an action that has its own corresponding music then a default loop is played [10]. When a boss then performs an action the new bars of music will be added once the current bars are complete. The boss's music wont only change to what the boss is doing but also directly to how well the player is doing within the fight, for example, if the boss kills a Pikmin of yours during an attack the next bar will reflect that however if your Pikmin all survive then a slightly cheerful bar will play that implies a major key instead of the bosses minor key. The way the music is built whilst the boss is being thought can be considered a to be a flowchart as it follows basic rules such as, boss is inactive, attacking forward and killed Pikmin or shakes Pikmin off boss [3]. The way *"Pikmin 3"* presents its music provide players with completely new music experience each time they replay the game, as they will likely have different events occur such as a Pikmin dies in a fight or survives. Unlike *"Portal 2"*'s layered musical channels being audible based on what the player is doing [11], *"Pikmin 3"* has its bars prerecord using real instruments which the next bar of music to com being a small audio file, this differs from previous Pikmin games too as *"Pikmin 2"* (2004) used midi instruments to create its dynamic soundtrack [3]. This is an interesting progression of the uses of dynamic music as we now have live orchestrated tracks that can be played and rearranged based on what is a flowchart of the bosses' actions.

In *"Mario Kart 8"* (2014) also uses record music instead of midi instruments [13] and has numerous aspects making this games music dynamic. The most obvious example is the items that are within the game, the first being the Starman powerup, this shifts the music entirely to a different track which emphasises the players invincibility. The next is the lighting item which shrinks the player, to reflect this, the current song that is playing will be pitched up and have a vibrato wobble effect until the player has grown back to normal size this helps make the player feel small just like their character, creating a greater sense of immersion. Every track also has two variations, one for when the player is not in first place and one for when they ae in first, the difference being the drums are played faster creating a greater sense of excitement for the player. There is another variation of each tracks theme which is a sped up version (1.25 speed) that begins at the start of the final lap which emphasises the final lap and creates a strong urge to drive as fast as they can. Because the player will now be used to the normal version having this sudden shift into a faster version, they may feel more tense which can also aid the feeling of needing to speed up as they will want to mimic the speed of the music [6]. One track in particular named "Melody Motorway" or "Music Park" depending on region uses dynamic music in a interesting way. Throughout the track is a giant piano,

xylophone, and a vibraphone, as the player drives over the top of the instrument's keyboard an ascending then descending scale will be played by that instrument. On top of this if the player hops on these instruments then a random note will be played instead of the scale. Scattered around the track there are also various snare drums that the player can bounce off, and when they do so a drum snare sound will be played. These additions are excellent and can make the player feel as though they are playing the instruments that they are driving over creating the strong sense of immersion once more. A final example from "Melody Motorway" is near the end of each lap, the player will drive past bouncing music notes that will shake the ground and although the player to trick, gaining them some extra speed. However, once they enter this section the player will be able to hear some drumsticks clicking together, counting in the bouncing, giving the player a subtle way of timing their trick.

"Ape Out" (2019) uses procedurally generated music to reflect the current intensity of the gameplay the player is taking part in. The game uses a large bank of drum pattern samples which it will take from then playing it back at different volumes and intensity depending on how violent the current gameplay is [12]. The player also can knock enemies into walls, playing a crash cymbal when they do so. However, he crashes sample being played is determined by the distance from the player and then referring that to a real drum kit with many different cymbals. This procedurally generated music fits this game very well as the labyrinth the player navigates through is also procedurally generate, meaning every playthrough is completely unique, visually and with audio. The game using drums as the main instrument with the game featuring little melody can help create a bombastic feeling and is a simple way of creating excitant without needing a bands worth of instruments.

Conclusion

To conclude, dynamic music systems have existed for a long time in video games dating back as early as *"Frogger"* (1981) with it becoming a more popular technique over time. Dynamic music primarily exists to greater immerse the player in whatever game they are player, since by design it reflects the current status of the game from being safe or invincible, having a boss lunge forward and attack the player, the proximity they have to an object and what they object is pointing at, helping them solve puzzles or simply highlighting good play or a mistake made by the player.

I have adored dynamic music systems ever since discovering them, and now knowing it appears far more games that I had previously thought has grown my appreciation for the games the include it. Knowing that it is far more common than I had known now means that I will be actively looking out for it whenever I play new games.

It is also a feature that I would love to play with in future games I make, as I would be interesting in a greater sense of immersion and how I can apply it in my own projects. I would love to incorporate it within boss music just like *"Pikmin 3"* as I think that music choreographing the enemies' attacks is a unique way of having the music reflect what is happening around the player.

One of my favourite examples of dynamic music that I covered would have to be "Melody Motorway" in *"Mario Kart 8"* (2014) and how the player drives across instruments, adding that instrument to the racetracks mix.

My research whilst small can be seen as a contribution to knowledge as I have compiled some good examples of games that use dynamic music systems and brought them to the attention of any read from the earliest example in *"Frogger"* (1981) to a rhythm and musical based game series with *"Guitar Hero 3"* (2007). Also giving one of the most popular games including dynamic music, that being *"Mario Kart 8"* (2014) and then to an indie game that I had not previously heard of, that being

"Ape Out" (2019) and of course just my personal favourite example being the boss music within *"Pikmin 3"* (2013).

References

[1] Murray, D. and Ivy, R. (2015) *How early games made their sounds and music*, *SCHOOL OF GAME DESIGN*. SCHOOL OF GAME DESIGN. Available at: https://schoolofgamedesign.com/project/how-early-games-made-their-sounds-and-music/ (Accessed: December 16, 2022).

[2] Bradley, M. (no date) *About Scruffy*, *about scruffy*. Scruffy. Available at: https://scruffymusic.com/about.html (Accessed: December 16, 2022).

[3] Bradley, M. *et al.* (2020) *How Boss Music Works in Pikmin 3 Deluxe*, *YouTube*. YouTube. Available at: https://www.youtube.com/watch?v=GaBJ2C7Am6E&ab_channel=Scruffy (Accessed: December 16, 2022).

[4] Kähkönen, T. (2021) *Game development world championship 2022: GDWC*, *GDWC 2022 Game Development World Championship*. atWar. Available at: https://thegdwc.com/blog/blog.php?blog_id=134 (Accessed: December 17, 2022).

[5] Justin (2020) *Listen to all 24 hours of hourly music from Animal Crossing: New horizons*, *Animal Crossing World*. Animal Crossing World. Available at: https://animalcrossingworld.com/2020/03/listen-to-all-24-hours-of-hourly-music-from-animal-crossing-new-horizons/ (Accessed: December 17, 2022).

[6] *The INCREDIBLE dynamic music of Mario Kart 8 - Part 1: Intro, items and more!* (2022) *YouTube*. YouTube. Available at: https://www.youtube.com/watch?v=XitVGF2GNd4&ab_channel=TheRamblingMan (Accessed: December 18, 2022).

[7] *The Genius of Portal 2's Music* (2021) *YouTube*. YouTube. Available at: https://www.youtube.com/watch?v=M7oHbCs089M&ab_channel=JulianH (Accessed: December 18, 2022).

[8] Unknown (no date) *Frogger (Sound)*, *Frogger*. Available at: https://computerarcheology.com/Arcade/Frogger/ (Accessed: December 18, 2022).

[9] *THROUGH THE FIRE AND THE FAILS!!! | Guitar Hero 3 | PlayStation 3 Gameplay #4* (2020) *YouTube*. YouTube. Available at: https://www.youtube.com/watch?v=wwReDK6SSg8&ab_channel=DeadlyShadowRat (Accessed: December 18, 2022).

[10] Pikipedia (2023) *Music in pikmin 3*, *Pikipedia*. Pikipedia. Available at: https://www.pikminwiki.com/Music_in_Pikmin_3#Bosses (Accessed: December 18, 2022).

[11] Wilde, T. (2011) *Portal 2's Dynamic Music - an interview with composer Mike Morasky, and five tracks to listen to now!*, *gamesradar*. GamesRadar+. Available at:

https://www.gamesradar.com/portal-2s-dynamic-music-an-interview-with-composer-mike-morasky-and-five-tracks-to-listen-to-now/ (Accessed: December 18, 2022).

[12] Wright, S. (2019) *How 'ape out' creates a soundscape worthy of smashing*, *Variety*. Variety. Available at: https://variety.com/2019/gaming/columns/how-ape-out-creates-a-soundscape-worthy-of-smashing-1203150773/ (Accessed: December 19, 2022).

[13] *The Music of Mario Kart 8 - Big Blue (Wii U)* (2015) *YouTube*. YouTube. Available at: https://www.youtube.com/watch?v=16Zq8EMCdZ4&ab_channel=NintendoWiiUUK (Accessed: December 19, 2022).

[14] *The INCREDIBLE dynamic music of Mario Kart 8 - Part 7: Why Music Park makes me happy* (2022) *YouTube*. YouTube. Available at: https://www.youtube.com/watch?v=9wYDSif7sf0&ab_channel=TheRamblingMan (Accessed: December 19, 2022).