

The Application of Interactive Music within a Video Game Score  
An Analysis of the Development and Use of Interactive Music in Video Games

by

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## **Abstract**

Video games have had a short but exciting history. Throughout the years, the musical contribution to video games has progressively improved and become an essential part of the video game experience. Music changed quickly to compensate for hardware limitations and to avoid repetition. With the interactivity in video game music being a new concept, many people disagree about what terms to use when defining video game music and the different techniques. Composers also had to learn to employ a variety of techniques and strategies to achieve interactivity in games and to further immerse the player and create a more believable world. Because of the complexity of interactive music, composers also need to work with game designers to implement an intelligent music system. Overall, the further player immersion into the video game world shows the importance of the integration of interactive music.

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## Introduction

Interactive music has become a staple feature in video games within the past decade as a means to further immerse the player; however, this strategy for music composition took many years to refine and to cement its place in video game culture. The earliest games, such as *Pong* (1972) and *Asteroids* (1979), didn't have a traditional soundtrack as seen in films at the time. As the processing power of the video game machines increased drastically, the music that accompanied the games became much more powerful as well.<sup>1</sup> As the possibilities for games expanded, the musical contribution to video games had to also expand. Players were thrust into a world of endless opportunities and the music had to somehow respond to each of the player's decisions to inform the player of their surroundings as well as nearby threats and events. Since game developers wished to communicate nonverbally with the player to inform the player about their environment, interactive music in video games became essential to further the story, create a more immersive environment for the player, and give subtle hints about the player's surroundings. Throughout the paper, the importance of interactive music in video games will be analyzed by discussing the adaptation of music throughout video game history, the differences in terms in video games, the use of interactivity in video game music, and the implementation of interactive music.

## History of Game Music

Video games began to emerge as a popular form of entertainment in the 1970s. However, game music in the 70s was held back by the limitations of the hardware. Video game music didn't start out as the symphonic and moving scores that are used in today's industry. These

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<sup>1</sup> Vass, Lachlan. "The Role of Music in Video Games." <http://the-artifice.com>, p. 2; Phillips, Nathaniel. "Film and Video Game Parallels." <http://filmsound.org>, p. 1; "The Evolution of Video Game Music." NPR, <http://www.npr.org>, p. 3; Cerrati, Michael. "Video Game Music: Where it Came from, how it is being used Today, and Where it is Heading Tomorrow." *Vanderbilt Journal of Entertainment and Technology Law* 9 (2), p. 2.

games were generally silent with only the occasional noise to represent an action in the game. Games like *Pong* (1972), *Space Invaders* (1978), and *Asteroids* (1979) would rely on these beeps as the primary source of music.<sup>2</sup> Due to hardware limitations, there was no way to record these sounds and then synchronize them to the gameplay.<sup>3</sup> Therefore, these games required a physical synthesizer that would receive instructions from the game to make certain kinds of sound. The games used special programs like 8-bit, Chiptunes, and Chip Music to produce this sound.<sup>4</sup>

Music in video games quickly shifted directions with the introduction of home consoles in the mid-70s. Consoles started the 8-bit era of video games that would last until the 1980s. The consoles introduced games that were stored on cartridges. These cartridges had more memory so that games could be played at home. People could now have their own collections of games. Since people had their own libraries of games, the purpose of video game music shifted to accommodate at-home video game use. The arcade machines' music was essentially a collection of alarms aiming to attract the player's attention to their machine over the other consoles in the arcade. Now that the players owned the game and did not need to be persuaded to play the game, the music for video games focused more on music that fit what was happening in the game. Due to the limitations of using video game cartridges, however, the music was unable to achieve high-quality sounds.<sup>5</sup>

This changed with the introduction of the CD-ROM in the early 1980s. As mentioned earlier, with the limitations of using synthetic chips, components that were designed to create music from digital signals, and the limited memory capacity of video game cartridges, it was

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<sup>2</sup> Vass, p. 2.

<sup>3</sup> Phillips, Nathaniel, p. 1.

<sup>4</sup> Vass, p. 2; "The Evolution of Video Game Music." NPR, p. 3; Young, David. Adaptive Game Music: The Evolution and Future of Dynamic Music Systems in Video Games," p. 7-8, 20.

<sup>5</sup> Cerrati, p. 2.

somewhat difficult to create music that sounded good and that would make sense to the listener. The CD now had 600 megabytes of memory instead of the previous 32 megabytes of memory. This allowed for more storage space for music and higher quality sounds through music synthesis.<sup>6</sup> With the introduction of the CD, it also made music composition much easier through the use of different compositional programs. It was at this point that composers were now contracted on a regular basis to create music for video games. Even though there was more storage for music, there was still not enough storage space on the CD to have large amounts of music throughout the game. To remedy this, composers started writing music that could be looped. These pieces were then replayed for as long as was necessary.<sup>7</sup>

Two major developments towards music in video games came about in the 1980s. The first important development was the introduction of the Musical Instrument Digital Interface (MIDI). This now allowed for more realistic sounding soundtracks with synths that emulated symphonic instruments. Information was sent as abstract musical instructions which was then decoded and performed by the computer's synths to create music.<sup>8</sup> The second was the first utilizations of soundtracks that could change to fit the on-screen action in games like *R.B.I. Baseball* (1986) and *Super Mario Bros.* (1985). The music and sound design of these games, especially that of *Super Mario Bros.*, influenced the game industry. The soundtrack would constantly change to match the player's action in the game with different factors such as levels and time limit. These games also introduced concepts such as having "winning level" and "game over" music.<sup>9</sup>

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<sup>6</sup> Cerrati, p. 2; Christopher, John Farley. "In Fantasy's Loop." *Time*, May 28, p. 1; "The Evolution of Video Game Music." NPR, p. 3; Phillips, Nathaniel, p. 3-4.

<sup>7</sup> Young, p. 7-8; Phillips, Nathaniel, p. 3-4.

<sup>8</sup> Young, p. 21.

<sup>9</sup> Vass, p. 3; Summers, Tim. "Playing the Tune: Video Game Music, Gamers, and Genre." *Act: Zeitschrift für Musik & Performance*, 2 (2: Musik spielen), p. 3.



In 1987 composers started using music in a much more sophisticated manner for a video game. As a last-ditch effort to save their video game company in Japan from going bankrupt, *Square* worked to release their final game. This game would be later named *Final Fantasy* (1987) to reflect the fact that this would be *Square*'s last game. However, *Final Fantasy* became a success and would define the role-playing game genre (RPG) and create many further entries and spin-offs.<sup>10</sup>

One of the most notable aspects of *Final Fantasy* was the unique score that was created for the game. *Square* had hired Nobuo Uematsu to create the music for this game. Uematsu had aspired to become a film composer and realized that there weren't any jobs available, so he set his sights on video games. Essentially, Uematsu did the same thing for the video game industry that John Williams did for the film industry. Uematsu brought many of these concepts used in films to the soundtrack for the game. Uematsu created memorable themes and leitmotifs, or music that is associated with different areas and characters. Fans quickly fell in love with the soundtrack.<sup>11</sup>

With the introduction of this new type of video game music, composers in the late 1980s would have to do their best in order to catch up.<sup>12</sup> This became easier for composers with the introduction of the 16-bit era in 1989-1992. These games could now process twice as much data with an additional of an 8-bit processor being allocated solely for sound. The results of these games were a clearer sound, as well as allowing for more detailed games.<sup>13</sup>

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<sup>10</sup> Karmali, Luke "Nobuo Uematsu Remembers 20 Years of Final Fantasy Soundtracks." IGN., <http://www.ign.com>, p. 1-8.

<sup>11</sup> Karmali, p. 1-8; Christopher, p. 1.

<sup>12</sup> Karmali, p. 1-8.

<sup>13</sup> Cerrati, p. 3.

With the end of the 16-bit era and the advent of the 32-bit era, computers became much more powerful in the 1990s. At this time, sound cards became a major component in computers. Video game companies also began to gradually stop using video game cartridges. With the use of CDs as their main component, games could now use film and video clips with higher definition music.<sup>14</sup>

Computers could now handle more music tracks than ever before and music started to become more of a feature in games. One such game is *Myst* (1993), a mystery game, where the player found themselves on an island and would have to solve riddles and puzzles in order to unravel the mysteries of the island. *Myst* began to use techniques that are used commonly in the music scores for video games today. These techniques used music as a function to give you clues to find where you needed to go and what you needed to do.<sup>15</sup>

With the rapid development of technology from 1993-2000, the 32- and 64-bit eras began in video games. At this point, classifying computers by the number of bits was not as important anymore because factors such as processor clock speed, bandwidth, and memory size were found to have a much greater influence on computers.<sup>16</sup>

This era was dominated by consoles such as the *Sega Genesis* (1989), the *Super Nintendo Entertainment System* or *SNES* (1990), *Sony PlayStation* or *PS1* (1995), and the *Nintendo 64* (1996). The *Sega Genesis*, the *SNES*, and the *PS1* all allowed for large upgrades in audio capabilities and they used CD quality, pre-recorded soundtracks. However, the *Nintendo 64* went back to the use of game cartridges for their console. On the *Nintendo 64*, full CD-quality audio wasn't possible because of their decision to use the game cartridge instead of a CD so the

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<sup>14</sup> Cerrati, p. 3.

<sup>15</sup> "The Evolution of Video Game Music." NPR, p. 4; Cerrati, p. 3.

<sup>16</sup> Cerrati, p. 3.

console used MP3s to compress the audio files.<sup>17</sup> Even though the audio was compressed, the *Nintendo 64* heavily used music in their games. This can be seen, especially, in the *Legend of Zelda: Ocarina of Time* (1998). This was one of the first games to have music making the core element of the gameplay. Not only would the music change dynamically to the environment, but players were given control of an Ocarina that they could use to affect gameplay. The player would have to play different patterns of notes to influence things like the weather, time, and travel as well as solving puzzles and summoning the main character's horse to ride.<sup>18</sup>

The 2000s brought about the 128-bit era with consoles such as the *PS2* (2000), *Nintendo Gamecube* (2001), and *Xbox* (2001) rising in popularity. These console's processors were now similar to personal computers and had more storage space and better sound chips. *Nintendo* returned to the disc and now all consoles could play digital CD-based music. However, in the early 2000s, game music was not quite up to par with film music yet due to technological limitations and memory capacity.<sup>19</sup>

This quickly changed in the mid to late 2000s with the introduction of the *PS3* (2005), *Xbox 360* (2005), and the *Nintendo Wii* (2006). As with any upgrade of consoles, they all received an upgrade in processing power and memory space allocated towards music alone. These consoles also saw more implementation and integration of interactive music. One of the standout titles that used more fully interactive music techniques was the *Uncharted* series. Both *Uncharted 1* and *2* broke boundaries with their cinematic interpretation of storytelling as well as the implementation of different film angles, advanced graphic styles, and interactive music. The

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<sup>17</sup> Cerrati, p. 3-4; Young, p. 23.

<sup>18</sup> Cerrati, p. 3-4; Young, p. 21.

<sup>19</sup> Young, p. 23; Cerrati, p. 3; Mirapaul, Matthew. "In a Nod to Lush Film Scores, Game Music Gains Texture." *The New York Times*, p. 1.

complexity of music in titles like these increased drastically and music became much more cinematic and almost indistinguishable from concert hall music.<sup>20</sup>

In the 2010s, along with the new iteration of consoles: the *Xbox One* (2013), *PS4* (2013), *Nintendo Wii U* (2012), and eventually the *Nintendo Switch* (2017); all came with more upgrades to Digital Signal Processing (DSP) effects, increased audio channels, and more storage.<sup>21</sup> The music in video games began to take shape in this time period as even more of a prominent feature. Players started noticing the quality of a video game's soundtrack more and it became an expected feature for a game to have a stellar soundtrack. Background music evolved and became even more interactive in titles such as *Skyrim* (2013), *Uncharted 3* (2011) and *4* (2016), *Trine 2* (2011), *Abzû* (2016), *Star Wars Battlefront* (2015), *Bloodborne* (2015), and many more. Music took on less of an accompanying factor and started accentuating player's actions and cuing them in more into their world around them. The game that started to challenge the modern preconceptions of music and gameplay in a video game was *Journey* (2012) by *Thatgamecompany*. The music for *Journey* was composed by Austin Wintory. Wintory decided to have the music be at the forefront of the game. *Journey* was recognized on an international level and became the first video game ever to be nominated for a Grammy for the best soundtrack.<sup>22</sup>

### Important Terminology

Due to video game music becoming more complex in recent years, many composers argue about what the defining term for video game music should be called. The following paragraphs analyze the purpose of interactive music, the different terms used for video game

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<sup>20</sup> "The Evolution of Video Game Music." NPR, p. 4.

<sup>21</sup> Young, p. 24.

<sup>22</sup> Vass, p. 2.

music and the differences between them, different types of immersive music, and different cues that the player can give the music and vice versa.

When somebody plays a video game, each person's experience of the video game will be slightly different due to all the possible paths that a player may take. Therefore, one of the purposes of implementing interactive music is to cue players to the world around them and to also change to fit every possible outcome and decision a player could make.<sup>23</sup> This can be challenging because the composer must adapt his or her compositional style and process to best suit the needs of the game and to prepare for the unpredictability of the player. The composer also needs to keep the music interesting without getting repetitive. To avoid this, composers needed to find a new way of writing music that did not continually loop or was completely pre-composed to fit every outcome. Therefore, music gravitated to a method of changing with the different game conditions. To accomplish this, composers began to work with game designers to create an intelligent music system that would change with the different parameters set by the game.<sup>24</sup>

When discussing video game music, many sources disagree about what the defining term for video game music should be. There are several terms that are used in different sources and these terms are fairly similar to one another. The terms used are: interactive, adaptive, dynamic, and non-linear music. Each of the terms, except for non-linear, due to how broad the term is, is defined by the video game's interaction with the soundtrack whether this interaction be environmental, parameter based, or based on player input.

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<sup>23</sup> Angel, Amanda and Lazyan, Merrin. "Music Jumps from Console to Concert Hall." <http://www.wqxr.org>, p. 3; Mirapaul, p. 1; Cote, Alexandre. "The Basics of Game Music Interactivity." <http://alexander-cote.com>, p. 1.

<sup>24</sup> Young, p. 8-9; Phillips, Winifred. "Interactive Music for the Video Game Composer." <https://winifredphillips.wordpress.com>, p. 1.

### Interactive Music

This music is composed to respond to events and player input. Therefore, the soundtrack will adapt to the player and varying game states to alter the mood or action in the game. Due to this, interactive music's purpose is "to underscore, emphasize and occasionally influence gameplay."<sup>25</sup>

### Adaptive Music

Adaptive music is composed to interact with the soundtrack by corresponding with the game's environment and parameters. For example, this type of music could have different music states for different variances in weather or in cases where the time is running out to meet a goal within the game.<sup>26</sup>

### Dynamic Music

The defining factor of this type of music is that the music will change based on a set of different parameters or conditions. These parameters relate primarily to the player's ability or inability to complete a task. The music will then change based on whether or not the conditions for success or failure are met. dynamic music can be interactive and/or adaptive.<sup>27</sup>

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<sup>25</sup> West, Latta. "A Primer on Creating Interactive Music for Games." <https://music.tutsplus.com>, p.4; Tyler-Jones, Matthew. "Non-Linear Sound in Video Games." <https://memetechnology.org>, p. 1; Young, p. 8-9.

<sup>26</sup> Tyler-Jones, p. 1; Hayes, Lance. "A Composers Perspective on Game Audio – Adaptive Audio Concepts and Work Flow." <http://www.keyboardmag.com>, p. 7; Young, p. 8-9.

<sup>27</sup> Tyler-Jones, p. 1; Hayes, p. 7; Phillips, Winifred, p. 1.

## Non-Linear Music

As opposed to linear music, which plays without interruption and has a definite start and stop point, non-linear music is more unpredictable. In this type of music, sounds are triggered and combined in relatively unpredictable sequences by parameters, player actions, or by the environment. This creates an almost limitless amount of possible variations of the soundtrack.<sup>28</sup>

Some sources argue that dynamic is the best term due to the fact that it is audio that can be interactive and/or adaptive.<sup>29</sup> Other sources claim that adaptive fits best because adaptive aligns with the fact that the music adapts to the game's environment. These sources also say that this term closely outlines the process that takes place when the music is changing during gameplay.<sup>30</sup> Additional sources prefer the term interactive considering interactivity refers to how the soundtrack interacts with player input and game states.<sup>31</sup>

My personal belief on the “correct” term to use is a little more specific than what is listed above. I do believe that all of the terms can apply to video game music; however, it is a question of when to specify and when to use each term. I have broken down my thoughts into different sections about each term and decided to create categories that contain these terms.

## On The Subject of Non-Linear as a Descriptive Factor

I feel that naming all of video game music of this type of non-linear music is too broad. Video game music can (and should) be a subset of non-linear music. However, non-linear music is not confined to just video games. Many different types of music now feature non-linearity.

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<sup>28</sup> Tyler-Jones, p. 1; Hayes, p. 7.

<sup>29</sup> Tyler-Jones, p. 1.

<sup>30</sup> Hayes, p. 7; Young, p. 8-9.

<sup>31</sup> Cote, p. 1; West, p. 3-4.

These pieces, such as some electronic music and experimental music, can change from performance to performance and can change based on a different set of parameters such as changes in the world around them. Also, by using non-linear, the term doesn't allow for other interactions that are not non-linear. Many games include cut scenes, or small clips that are scripted, to move the story along. These clips will be the same every single time the game is played and the music will not change. After the scenes, the music will revert back to a non-linear form, but because of all of the points mentioned above, I feel that non-linear would not be the best defining factor for this type of music.

#### On The Subject of Dynamic Music as a Descriptive Factor

As mentioned above, dynamic music can be interactive and/or adaptive, the term dynamic has the possibility to be a subset of both interactive and adaptive, but it cannot be a superset of either due to its reliance on success and failure conditions. Dynamic music is defined as changing based on different parameters. While both adaptive and interactive music do this, what makes dynamic music different from the interactive and adaptive categories is the fact that these parameters are created based on different game state conditions such as success or failure. When these parameters are met or not, the computer will determine how the music will fade in and out as well as how the music is best presented to the listener. Dynamic music cannot be used solely by itself and therefore, it is not the best indicator of this type of music.

#### On The Subject of Adaptive vs. Interactive Music as a Descriptive Factor

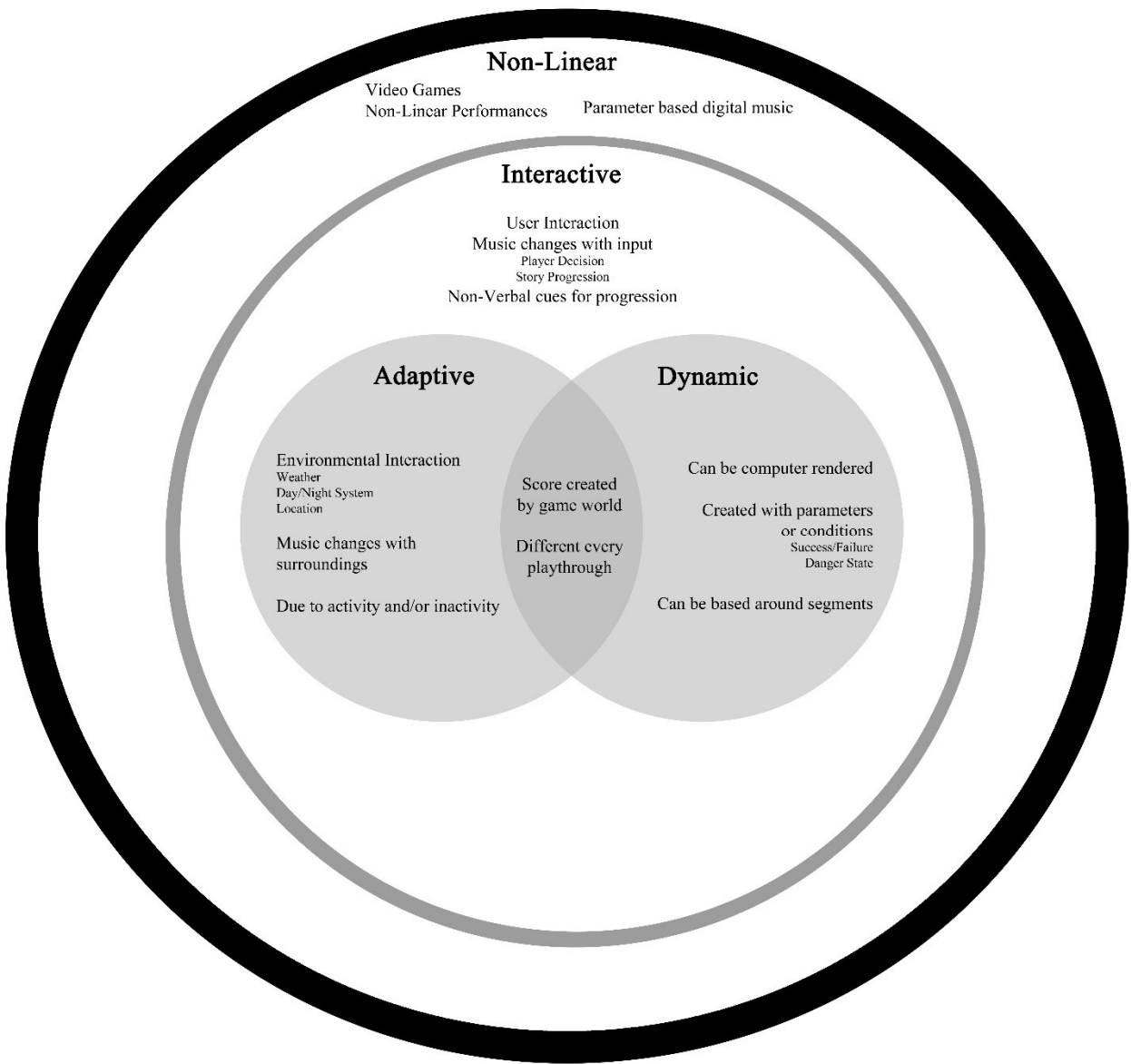
When you break down the differences in definitions for adaptive and interactive music, there is not much of a difference. However, I find that this subtle difference is why I have to lean



towards interactive music as the defining title for this type of music. Adaptive music means that the music changes due to differences in the environment whereas interactive music changes with player input. These environmental changes to the soundtrack as seen in adaptive music, however, cannot exist without player input. The player alone has the choice on where to go or where not to go and what to do or what not to do. Therefore, the environment cannot change without the player taking the initiative to explore new environments. One could argue that perhaps a thunderstorm or some other elemental affect could change the soundtrack without player choice. However, it is because the player chose not to move locations that the soundtrack changed. Therefore, I would call adaptive music a subset of interactive music. Since interactive music encompasses video game music, interactive music must be a subset of non-linear music that encompasses video game music as well as other genres. But even though interactive music is a subset of non-linear music, we are solely looking at video game music. Therefore, the term “interactive” will suffice perfectly for the purposes of this paper.

To summarize the above points, the chart as shown below demonstrates the different categories for video game music classification.

Figure 1: The Hierarchy of Video Game Music Terms



Besides the classification of interactive video game music, there are a few other terms that need to be defined to better understand the implementation of interactive music. These terms deal with immersive music, different types of player-music interaction, events that influence music interaction, and cues that can be given to players.

## Immersive Music

Immersive music in videogames is music or sounds that are experienced by the player during gameplay. The first type of immersive music is digetic music. This type of music is experienced directly by the in-game character. This music comes from the video game world. Examples of digetic music could be a radio station in the game or performers on the street.<sup>32</sup> Non-dietic music, on the other hand, is music that does not come from the game world. This would be the symphonic underscoring that is commonly heard in games as well as film.<sup>33</sup> Trans-dietic music is music that acts to both underscore and function as all-knowing and will bridge the gap of underscoring to notify the player of something that is about to or could happen.<sup>34</sup> The last type of immersive music is interactive ground music. This is a game that puts music making as either a feature of the game or a primary objective of the game. The sounds and rhythms can be mapped in this type of music directly to the keyboard or controller. Examples of this are: Final Fantasy VII, where players can play on Aerith's piano, and Guitar Hero, where players have a guitar shaped controller and match the buttons and rhythms to what is shown on the screen.<sup>35</sup>

## Types of Player-Music Interaction

Listed below are the different types of interactions that the player can have with the soundtrack or vice-versa. Filtered-preferential is when a video game allows a player to have direct control over the soundtrack. This form of interaction could allow music to personalize their experience by choosing their own music or even choosing to turn off the music. Cinematic-

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<sup>32</sup> Vass, p. 4; Kamp, Michael. "Musical Ecologies in Video Games." *Philosophy & Technology* 27 (2), p. 5.

<sup>33</sup> Vass, p. 4; Kamp, p. 5.

<sup>34</sup> Kamp, p. 5.

<sup>35</sup> Kotzer, Zack. "Video Game Music: New Direction in Play." <https://www.musicworks.ca>, p. 3.

narrative is music that establishes the mood for the game. This type of music in video games is normally based on the player's location and may loop indefinitely until the player changes locations. Cinematic-situational, although similar to cinematic-narrative, relies more heavily on player choice. This type of music is what was defined earlier as interactive music. Rhythm-pattern requires players to make specific inputs based on in-game commands in rhythm to the music. Failure to do so either results in failing the level or a discontinuity in the soundtrack. Triggered-incidental creates the soundtrack based on player inputs and interactions. The player will create the soundtrack just by playing the game. Freeform-representational lets players essentially sequence and/or create music within the game. Lastly, Enqueued-incidental is an expansion on triggered-incidental interaction. It stores specific player inputs that can be later used to affect the game's music. The melody or rhythm would be generated over time after a delay. This type of interaction is not used commonly.<sup>36</sup>

### Events That Influence Music Interaction

These events are designed to move the game along and are based on two factors or a combination of the two. The first is player performance events. These events are directly tied to the mechanics of the game and are activated by player input. When the player makes the same input again, the same result will happen either indefinitely or a limited amount of times. This outcome can either be musical or nonmusical. Rule-based events affect the music based on the rules that determine how the player plays the game.<sup>37</sup>

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<sup>36</sup> Wroten, Alexander. "Developing Musical Video Games through Principles of Player-Music Interaction," p. 6-15.

<sup>37</sup> Wroten, p. 70.

## Cues Given to Players

As stated by “A Primer on Creating Interactive Music” (pg. 4), “The primary purpose of interactive music is to underscore and emphasize (and occasionally influence) the gameplay.” What it means to occasionally influence the gameplay is to give the player non-verbal cues to tell them about what is going on in their environment around them. Sometimes this could be a musical sting, or a sudden, short musical statement, to emphasize the change from one state of music to the next, or it could even be the changing footsteps to match the size of the room around them. These cues are used to directly influence and inform the player’s actions during the game.<sup>38</sup> The first type of cues that can be given are resonating spaces. This cue is implemented through player interaction and the sound effects of their environment. It is used specifically to tell the player about their location in the game world as well as the size or shape of their environment. The second type is paraspace. This effect lets the player determine their location in the world and time period through different cultural connotations. The third type is danger state music which simply lets the player know about the absence or presence of enemies within their environment. The last type that can be given to the player is preparatory. Like the name, the cue tells the player when a nearby event is starting through environmental sound or non-diegetic music.<sup>39</sup>

One of the interesting aspects of music in video games is the effect of music on the players. One of the benefits of using interactive music is the ability to nonverbally communicate with the player. As an example of this nonverbal communication, NPR found that the music in *Space Invaders* (1978) was composed to match the average human heart rate. As the aliens got

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<sup>38</sup> West, p. 4; Hayes, p. 7; Tyler-Jones, p. 1.

<sup>39</sup> Kamp, p. 7; Tyler-Jones, p. 1.

closer to the player, the sounds would get faster and faster. Players would then subconsciously begin to panic due to the nonverbal cues given to them by the game.<sup>40</sup>

Game Studies, on the other hand, wanted to find out what happens when the music from the game was removed. In their study, they had players play a game without music and then play the same game with their own music that they chose to play to. In the first study, players reported that playing the game felt more mechanical and that they felt disengaged from the action on the screen. Some players even found that it was difficult to use the controller because there were no audio cues for the player to match to each action. In the second study, players felt like they were less immersed in the game. Players found that when their own music was chosen that the gameplay was distracting and did not correlate with their game play. Some players even found certain scenarios comical when paired to their own chosen music while others started singing along with the lyrics rather than paying attention to the game. By eliminating the music, the players lost their ability to nonverbally communicate with the game and further understand the game's world as well as some of the basic mechanics of the game.<sup>41</sup>

#### Example: *Journey* (2012)

As mentioned earlier, the music for *Journey* (2012), composed by Austin Wintory, was the first video game soundtrack to be nominated for a Grammy for Best Original Soundtrack. *Journey* places the player immediately into the middle of a desert where a red-cloaked figure, the avatar that represents the player, stands up and climbs to the top of a dune. In the distance, the

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<sup>40</sup> "The Evolution of Video Game Music." NPR, p. 3.

<sup>41</sup> Wharton, Alexander and Karen Collins. "Subjective Measures of the Influence of Music Customization on the Video Game Play Experience: A Pilot Study." *Game Studies* 11 (2), p. 1-6.

player see a mountain with a single beam of white light emerging from the peak. Immediately, the player realizes that the goal of the game is to reach the top of the mountain.<sup>42</sup>

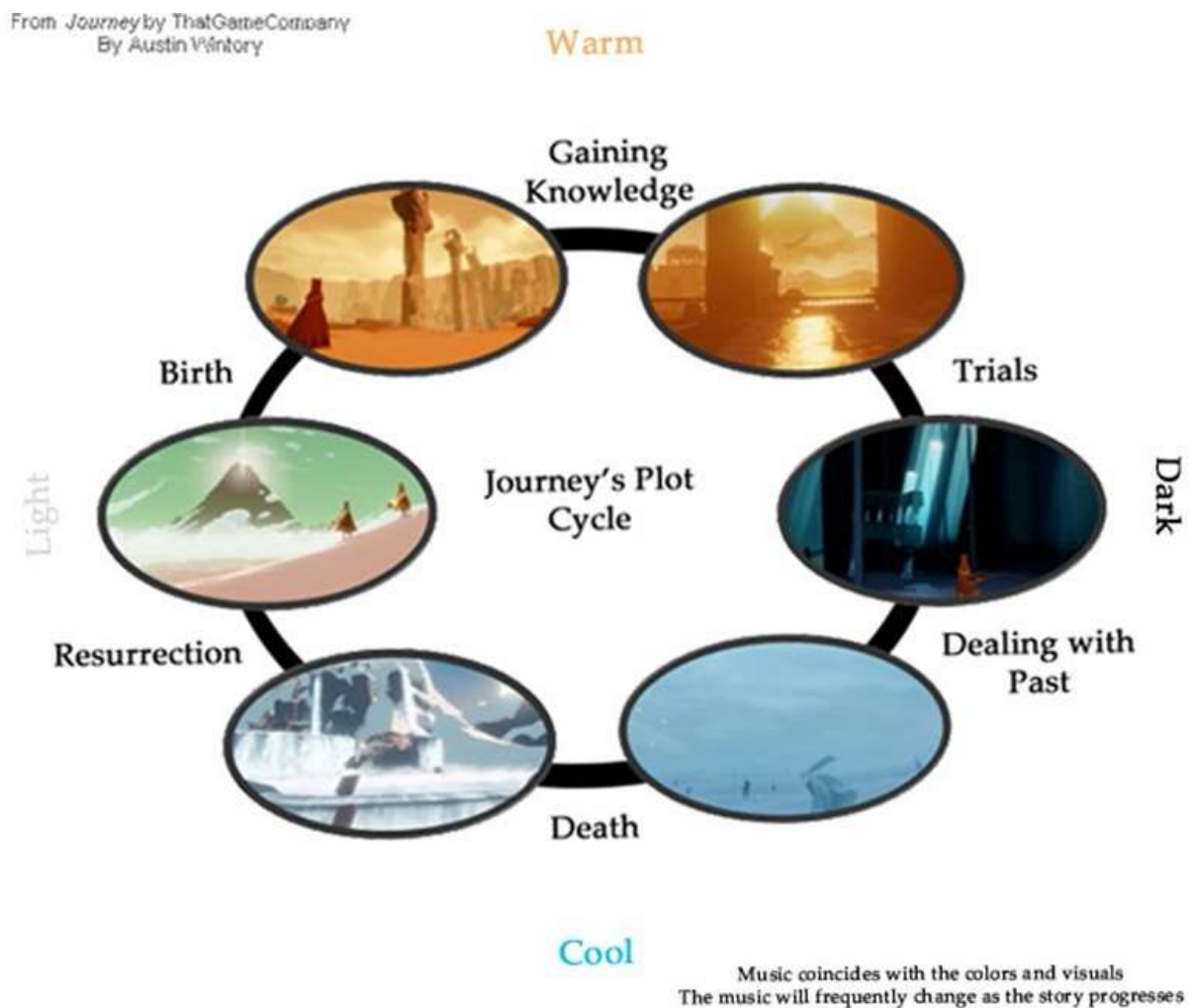
One of the most intriguing aspects about *Journey* is that there are not any spoken or written words throughout the entire game. The player is left to figure out how to play the game and where to go. Due to this, an emphasis is placed on visuals and music so that the player needs to pay attention to their surroundings rather than the verbal cues. The music in the game, as described by Wintory, is essentially a gigantic cello concerto. The game, itself, is rather short and takes approximately one and a half to two hours to complete. Therefore, the music was composed in such a way to flow seamlessly from one section to another.

Since visuals are an important aspect of gameplay, Wintory composed the music to directly correlate with the environment. The mood of the music is directly related to the color of the scenery and the desired mood that the game works to create. When playing through the game, the more upbeat and hopeful a section is, the warmer and brighter the colors of the scenery and the music are. On the contrary, the more somber a section is, the darker and cooler the colors are. This correlation between music, visuals, and gameplay is shown below.

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<sup>42</sup> Harper, Nick. "Journey and the Art of Emotional Game Design." The Guardian, <https://www.theguardian.com>, p. 1-8.

Figure 2: Graphic Representation of Music in Journey (2012)



As one can see, the game's theme is fairly religious with the concepts of life and death presented in the game as well as rebirth. Wintory composed the music with this idea in mind by ending the final song with the opening gesture of the game to bring not only a sense of finality, but also the idea that the player could start the game again right away if they wished.



Although the music was intended to be a pseudo-cello concerto, there are some unique challenges that are presented when transferring this concept to a video game. This is due to the non-linear aspect in which the story is presented as well as the fact that players ultimately choose how long to stay in each area.

Wintory had to include subtle ways to ensure players would transition smoothly from area to area or to notify players when they had remained in an area for too long. In *Journey*, when players explore an area, the music for the most part is a constant part of the game. Individual triggers were placed in locations of the game to indicate when the player was ready to move on to the next section of the music. Until that trigger is activated, the music will loop on itself seamlessly until the program's parameters change. At this point, if a player decides to explore for too long or to stay stagnant, that a certain time parameter will be activated. Since the game is non-verbal in nature, the game must find a way to inform the players when they have remained in an area for too long. This feature, when activated, will remove the music entirely and leave the players listening only to the sound of the wind. When players finally decide to move on, the game will reward the player by starting the music back up. This tells the player nonverbally that they have once again started to progress in the game.

Another feature of *Journey* is the ability to work with another person from anywhere around the globe. However, because *Journey* is a non-verbal game, they had to find a way to communicate with one another without breaking the non-verbal barrier. One of the ways that this was achieved was through a special button designated solely to resonate a tone as well as a special, randomized, and unique symbol to be designated to each player. When the player presses the button, the symbol will appear and the tone's pitch frequency, amplitude, and attack will all change based on how hard or long the player pressed the button. Due to this feature, a player can

use a series of shorter, softer beeps to indicate when they feel nervous, anxious, or scared about their surroundings or to even warn their partner of imminent danger. The player can also use slightly longer, louder beeps to indicate that they are feeling happy in the presence of the other player or if they are feeling playful. Another way that players have used these tones to communicate is as a greeting or to indicate to have their partner follow them. Although the game never notified the player how to interact with one another, most players used these trends to communicate. Due to this unique form of communication, the producers of the game found that people instantaneously felt more connected with the person they were playing with through these tones rather than if they were using verbal communication.

### Implementing Interactive Music

Interactive music must flow and adapt seamlessly to ensure that the music does not interrupt the player's experience. The music must change quickly and be able to portray different types of emotions from one scene to another.<sup>43</sup> When composing music for video games, the composer must keep many things in mind such as composition tools for interactive music and possible interactive music systems that composers may work with.

There are several factors that composers need to consider before they start writing music for a video game. These factors can include a variety of things such as genre, art style, pace of game, time period, budget, and more. One of the main factors that a composer should consider is game design. Composers should look at the story's presentation, the pacing of the story telling and game play, and the possible different routes that players could take. Another factor that

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<sup>43</sup> Franco, David. "How to compose Video Game Music: An Intro to Interactive Composition." <http://www.midifilmscoring.com>, p. 1; Phillips, Winifred, p. 2-3; Hart, Iain. "Meaningful Play: Performativity, Interactivity and Semiotics in Video Game Music." *Musicology Australia* 36 (2), <http://www.tandfonline.com>, p. 278, 285.

composers should look into are the audio engine limitations. Will the music be for an iOS system or a big budget console and how would this affect the compositional process? The last factor that will be discussed is the game state. Composers must look at all the possible scenarios and write music that can change based on variances in intensity, the number of enemies, winning/losing conditions, and more.<sup>44</sup>

Another aspect that should be in the forefront of the compositional process is what the goal of the music within the game is. The interactive music should not only underscore the gameplay, but also emphasize key elements of the game play while making sure that the player does not get bored with repetition. The composer should also look at how the music could be used to influence the player's actions and decisions whenever it is necessary.<sup>45</sup> One good way to understand the mechanics of the video game is to be in the development cycle of the game as soon as possible and to play the game as much as possible. As Austin Wintory stated, "if there are flaws in the music, players will eventually find the flaws if the composer does not."<sup>46</sup>

In video games, it is easy for the listener to tire of the music. To remedy this, there are many different types of compositional tools that a composer may employ. The first of which is a "Bored Now" Switch. This tool is used to keep a player from getting tired of the music if they stay in an area for too long. This switch keeps count of how many times the music has repeated. After a pre-determined number of repeats, the music will stop. This not only keeps the player from getting tired of repetition, but it also allows to serve as an indicator for the player to know when they have stayed in an area for too long. This function also acts as an incentive to the player to start the music back up when the player starts progressing in the story line again.<sup>47</sup>

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<sup>44</sup> Franco, p. 2; Young, p. 24; Szinger, John. "On Composing Interactive Music." <http://zingman.com>, p. 3-4.

<sup>45</sup> West, p. 4.

<sup>46</sup> Sarner, Lauren. "Austin Wintory Knows how to Score Assassinations" <https://www.inverse.com>, p. 3-4.

<sup>47</sup> Tyler-Jones, p. 2.

Another tool that composers can employ are transitions. Previously, the earliest games would cut the music between cues to transition from song to song. This, however, resulted in a rather jarring experience for the player. To remedy this, one of the most frequently used techniques that composers would use is Cross-Fading. This is a technique that is used to transition seamlessly from one piece of music to another. One track will fade in while the other track fades out simultaneously. This does have advantages and disadvantages that come with it. One benefit is, when composers cross-fade, it is easy to compose and implement into a game. Composers do not have to worry about writing cues and worrying about how the music will transition. They can focus solely on writing music. It also allows for immediate changes to music based on in-game events.<sup>48</sup> However, cross-fading may interrupt the music in the middle of a phrase and it cannot account for tempo or key changes. It is also possible that cross-fading may continuously interrupt the player's experience of the game if it is employed incorrectly.<sup>49</sup>

Another way to transition is to use Fragments. Composers can write small cue fragments that will allow for seamless transition from one piece to another. The disadvantage of using this technique is that the composer may have to write hundreds of cue fragments for different portions of a song.<sup>50</sup>

The last form of transitioning is to use stems. Stems are segments of music that can be overlaid on top of each other that will sound well together. They can be used either as musical or

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<sup>48</sup> Tyler-Jones, p. 2; Sweet, Michael. "Top 6 Adaptive Music Techniques in Games – Pros and Cons." <http://www.designingmusicnow.com>, p. 4-5; Cote, p. 2.

<sup>49</sup> Sweet, p. 5; Cote, p. 2.

<sup>50</sup> Szinger, p. 5; Makuch, Eddie. "Star Wars Battlefront Composer Talks Challenge of Making His Mark in John Williams' Universe." <http://www.gamespot.com>, p. 4-5; Jim Bonney, personal communication, December 2, 2016; Tyler-Jones, p. 2.

percussive layers and they are added to enhance the desired mood of the game or to transition to a new mood.<sup>51</sup>

When composing with stems, it is important to make sure that the stem library is well organized. Each of the stems should be organized by a musical function or instrument group. The article, “How to compose Video Game Music”,<sup>52</sup> suggests that you should organize your stems into four different categories which can then possibly be broken down even further. These four categories (also referred to as the Four Layers of Intensity) are: Basic, Adventure, Tension, and Melodic. These categories could either be played solo or in combination with one another. It is important, therefore, that each stem is exported to precisely the same length so that the music can be looped without any additional effort.<sup>53</sup>

The first layer, Basic, should introduce the player to the atmosphere of the game. This layer will most likely loop indefinitely except for certain conditions such as player death. The next layer, Adventure, should try to create a different mood for the music. This mood could depend on the scenario such as light hearted, or exploratory. This layer can add woodwind runs, a basic melody, or soft percussion elements. As an example of branching off into a new layer, the percussion could even be separated into its own group (Adventure 2). Use this technique of separating the percussion from the other instruments as often as necessary to introduce a new element of tension. The third layer, Tension, will aim to increase the intensity of the music. It will feature all of the heavy drums and bass swells that should be placed in a way to not intrude the piece. This layer should have a solid beat from start to finish to create a sense of urgency. The last layer, Melodic, will tend to be a single instrument that carries a melody throughout the

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<sup>51</sup> Hayes, p. 7; Franco, p. 2; J. Bonney.

<sup>52</sup> Franco, p. 3

<sup>53</sup> Franco, p. 3; J. Bonney.

piece. There could be several different melodic tracks that could change from instrument to instrument. Try to apply the technique of allowing for different instrumentations for each layer wherever possible to have even more variance in the score.<sup>54</sup>

Two important tools that a composer may also use are Vertical Re-Orchestration (or layering) and Horizontal Re-Sequencing. Vertical Re-Orchestration requires that composer have a musical foundation that could be interpreted many ways emotionally. At this point, the composer will break up the piece of music into two or more musical layers that can then be separated by musical function or by instrumentation. By doing this, the composer can now create new and different harmonizations, rhythmic elements, and even instrumentations. Once these variations have been created, the composer must work with the developer to find the different control inputs, or triggers, that affect when the layers fade in and out. These different versions can be faded in and out in real time to allow for instantaneous switches in emotion. For example, the game could fade in dissonances for tension while using consonances and beat-centric percussion to display happiness.<sup>55</sup> This type of composition also allows for the use of stingers throughout the music.<sup>56</sup> Vertical Re-Orchestration is beneficial because it allows for immediate changes to the score in a subtler way. However, the musical phrases can easily be interrupted and it may cause the piece to lose its musicality. It also may be difficult to notice if anything changed within the music if the variation was too subtle.<sup>57</sup>

The other technique that the composer can use is Horizontal Re-Sequencing. This is a technique where music is strung together based on player actions. The music is written to shift to

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<sup>54</sup> Franco, p. 3-6; J. Bonney.

<sup>55</sup> Young, p. 25; Sweet, p. 2; West, p. 6; "Dynamic Music." Wikipedia, [https://en.wikipedia.org/wiki/Dynamic\\_music](https://en.wikipedia.org/wiki/Dynamic_music), p. 1.

<sup>56</sup> Young, p. 26.

<sup>57</sup> Young, p. 25; Sweet, p. 3; Cote, p. 2.

different sections at any time without the player noticing. These sections can be intertwined by short musical statements with the use of cross-fades or quick transitions. These transitions can have different orchestrations and cues to add variety to the music. Therefore, composers need to make sure that they have allowed for multiple start points in their music so that the music can transition seamlessly.<sup>58</sup>

An offshoot of Horizontal Re-Sequencing, Horizontal Branching, uses linear music that has multiple points where the piece can transition into a new piece. This is beneficial because this technique does not interrupt musical phrase. However, because the phrase isn't interrupted, the music does not change immediately to the environment and it can be disruptive to the player's experience.<sup>59</sup> Another form of Horizontal Branching that tries to remedy this issue of having a delay in the music changing from piece to piece is Musical Demarcation Branching. This technique allows for the music to transition at a demarcation point in the music such as a beat or a measure. This technique is quicker at transitioning than phrase branching, but the musical phrases can still be interrupted.<sup>60</sup>

Another form of Horizontal Re-Sequencing is Bridge Transition. In this form, short musical cues connect one musical cue to another for more seamless transitions. This allows for immediate changes in music. However, with the other types of Horizontal Re-Sequencing, the phrases can easily be interrupted and the music can get repetitive.

The last form of Horizontal Re-Sequencing is Flourisher/Stinger-Based Sequencing. Stingers, one-shot phrases that are composed to overlay important moments and accentuate gameplay, can be used to mask the transition from one piece to another. The player will trigger

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<sup>58</sup> Young, p. 25; Sweet, p. 4; Cote, p. 2; West, p. 5; "Dynamic Music." Wikipedia, p. 2.

<sup>59</sup> Young, p. 25 Sweet, p. 5-6; Cote, p. 2; West, p. 5.

<sup>60</sup> Sweet, p. 6-7.

these stingers in the game individually by progressing throughout the game. These stingers are composed primarily of crescendos and accents with silence in-between each stinger. They won't connect, but stingers can overlap with one another. This is beneficial to use multiple stingers to punctuate events, however, they cannot be linked musically with one another and they are dependent on in-game events.<sup>61</sup>

When composing music for a game, composers seldom choose to use either Vertical Re-Orchestration or Horizontal Re-Sequencing alone. Usually, composers will use a combination of the two. Horizontal Re-Sequencing is commonly used between events like level changes, boss battles, and victory conditions being met while Vertical Re-Orchestration can be used to create more subtle and gradual game changes to evolve to each player's play style.<sup>62</sup>

Another tool that has been used more in recent years is physical modeling. The purpose of using this technique is to create a way to further immerse the player in the gameplay. In this technique, the music's reverberation and other qualities are altered in a response to the environment. An example of this would be that the music, footsteps, or other environmental sounds produce more echoes when the player is in a tunnel or using a low-pass filter on the soundtrack and sounds when a grenade explodes near a player.<sup>63</sup>

It is also important to know what type of engine will be used for the video game. Generally, there will be two types of engines employed: The Array-Based Engine and the Generative-Based Engine. Array-Based Engines can employ both Horizontal Re-Sequencing and Vertical Re-Orchestration. Therefore, this is the more common of the two engines that are used.

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<sup>61</sup> Sweet, p. 9-10; West, p. 8-9.

<sup>62</sup> Young, p. 26.

<sup>63</sup> Mirapaul, p. 2; *Effective Audio in Game Design*. YouTube. Directed by Kevin Regamey.

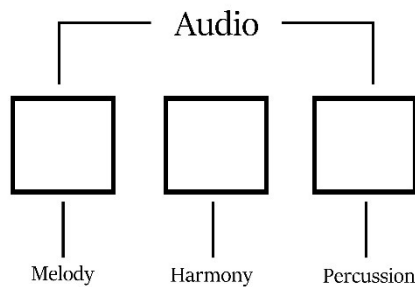


The original music is split up into blocks that are about one bar in length. This pre-determined length can either be longer or shorter to fit the compositional needs.<sup>64</sup>

Each block will be stored as a single audio file where the Array-Based Engine will load these audio files to reconstruct the music. Each of these blocks are like a track and the computer decides where and when to use them based on given parameters. Therefore, it is important that all the tracks are the same length so that they can be looped as necessary. It is also important to be extremely organized when using this type of system to remember which block is what part of the music as well as determining the tempo and the time signature of the music beforehand.<sup>65</sup>

The image below shows the concept of using an Array-Based Engine:

*Figure 3: Array-Based Engine Diagram*



As can be seen from the diagram above, each track has been given its own array (block) that the computer can use to create the music. The arrays can be assigned to specific instruments, but they could also be a harmony, a melody, a stinger, etc. The game engine will constantly analyze the game states and when a parameter is met, it will turn a specific array off or on. Therefore, the music will be able to change dynamically with the player's environment. In a

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<sup>64</sup> Robertson, Si. "Dynamic, Sequential Soundtracks for Games." <https://gamedevelopment.tutsplus.com>, p. 3.

<sup>65</sup> Robertson, p. 3-4.

sophisticated form of the Array-Based Engines, the arrays will be constantly running but with the volume muted until each array is designated to fade in. This is an interesting system because it allows for the same song to be played for the duration necessary while also allowing for subtle changes to the music that keeps the player from getting bored.<sup>66</sup>

The second engine, Generative-Based Engines, are used to allow for greater adaptability in the music. In this engine, the music will essentially compose itself. Therefore, this is a form of dynamic music, also known as algorithmic or procedural music, and it allows the scores to be written and rendered in real time. The composer and game designers will create a set of parameters for the engine to run from and when the parameters are met, it will string together certain pieces of information to create randomized music. The most common example of a video game using this type of engine is *Spore* (2008). In *Spore*, everything, excluding the story itself, is completely randomized. The player customizes their own avatar that starts as an amoeba and eventually grows into a race that dominates the space trade. However, all other aspects, including surroundings, atmosphere, flora and fauna, and more are completely procedurally generated. Due to this, the designers felt that it was apt to have the music to be created as the player played the game with the environment and species determining the parameters for the music. This music was created based on varying rhythmic elements, harmonic progressions, ambiences, and counterpoints.<sup>67</sup>

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<sup>66</sup> Robertson, p. 6-10.

<sup>67</sup> Young, p. 27; Seznec. Yann. "Procedural Music." *Game Developer* 19 (10), p. 1-2; Szinger, p. 5; "Dynamic Music." Wikipedia, p. 2.

## Conclusions

The introduction of interactive music into video games did not happen overnight. It took decades for the hardware capabilities to get to a point where symphonic scores that reacted to player actions could exist. With the introduction of interactive music came a new way for gamers to interact with the story and become more immersed into the video game's world and lore. By using these techniques, it became much easier for game developers to find ways to communicate with the player nonverbally and give them insights into what was happening into their world around them. By looking at the history of the development of video game music, we can see the increasing sophistication of this music, the improvement of tools and techniques of writing music for video games, the increasing importance of game music, and the significant effect of music in video games on players. In summary, the importance of using interactive music in video games to further immerse players in the video game world becomes clear.

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