

8-Bit Heroes:
A Look into the Development and Presence of Early
Video Game Music in Popular Culture

by

Anthony Martello
Class of 2010

A thesis (or essay) submitted to the
faculty of Wesleyan University
in partial fulfillment of the requirements for the
Degree of Bachelor of Arts
with Departmental Honors in Music

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Introduction

Video games are more popular than ever. Youth spend their days with their eyes glued to the video screen spending countless hours gaining unimaginable power and prowess in simulated worlds. Video games are often written off as just another example of simple popular culture. But as many other art forms possessed similar conceptions in their beginnings, video games may one day be considered a new serious art medium.

Though there are many key aspects to the popularity of video games, most of them at base level are visual by nature. However, when it comes to relating a character or environment in a virtual world to a person in the real world, audio is a key component in empathizing with the gamer. The different sound effects in a game and the background music to each setting present the simulated world in a more defined environment that the player can relate to. For example, dark ominous music can represent impending danger, while upbeat cheery music allows the gamer to relax in safety. Not only does music give these video game worlds a sound environment, but it also creates a sense of feeling and emotion within the gamer. As the video game progresses and surroundings change, so does the music to relate the different situations.

With the continuing rise of popularity of video games, sound has taken on an increasingly more important role. Now game soundtracks are meticulously constructed, and often include a wide variety of timbres and song structures. While some games use electronic synthesizer beats, others create soundtracks full of modern pop songs, while even others have full ensemble orchestrations. Many soundtracks are often considered to be so strong, they are often released separately as albums. The video game soundtrack is slowly making its way to the level of the film soundtrack.

But as with all aspects of the video game, sound did not start out as a full-blown creative representation of the simulated world. It was originally just an extra detail added on to games based on space available for sound design – not at all a completely necessary component. With the growth of technology, though, music became an increasingly important facet. As arcade machines began to use multiple new and unique sound chips in the 1970s, sound in video games changed from only simple sound effects to full melodic lines. Furthermore, as the video game moved from the arcades to homes, music became even more complex and creative. Sound design became more consistent since every console had a unique sound generator that remained the same for every game on the system. While arcade machines often varied widely in their uses of sound chips, home consoles used advanced versatile sound chips to create a wide amount of possibilities for unique sound expression in countless distinct games.

Many of these early home consoles, though, did not reach high levels of popularity. It was Nintendo's first home console, the Nintendo Entertainment

System, that truly changed the home console market. Known in Japan as the Nintendo Family Computer or “Famicon”, the system was originally released in 1983. After an early recall, the Famicon soon became the most popular console in Japan.¹ Released in the United States in 1985 as the NES (Nintendo Entertainment System), America followed in similar fashion. Only a year after its release in USA, the system could be found in over 1.9 million homes. Nowadays, many NES games are known as classics among video gamers. The games produced by Nintendo for its system were more complex than other systems, and “with its software development focused on home games, Nintendo began churning out the most detailed and diverse game lineup ever seen in the consumer market.”² With their sales extending higher than \$750 million in 1987 and more than doubling to \$1.7 billion in 1988, the success of the NES was quite apparent. There is no doubt that this system had one of the greatest influences on the video game market of all time.³

Unlike other producers of video games, Nintendo treated every aspect of their games with care and close attention, producing quality rather than quantity in games. Compared to other companies, music was specifically quite unique on the NES. Not only was its sound chip different from any other system, but Nintendo also hired talented composers to create the music for their games. With this new emphasis on music, the NES led the trend of making music an inseparable part of the entire video game experience, adding an audio aspect that neither graphics nor gameplay could replace.

¹ “A Brief History of The Home Video Game Console” (website)

² Kent, *The Ultimate History*, 352

³ Kent, *The Ultimate History*, 345-366

Through Nintendo's use of music in NES games, they produced many of the most well-known classic video game tunes of all time. Many of these classic soundtracks continue to live on in the present day. New arrangements and covers of old NES songs are present in many different niches of the music industry. Furthermore, the primitive electronic timbres of the NES and other similar 8-bit systems have made their way over time into the modern music industry in new unique genres of music. Despite this apparent survival and success of the NES and other 8-bit music, the pioneers of this music still remain relatively unknown. People can sing the songs by heart and many 8-bit artists are highly influenced by the original music from the systems they use. Many of the classic video game soundtracks feature not only catchy, uplifting melodies, but also deep complex contemplative music. Especially with the technological restraints of the early home consoles, the work of these video game composers was anything but simple and straightforward. Even with the wide range of their influence in the modern day, the composers still remain unknown to the vast majority of gamers. They love the music, yet forget the artist.

Arcade Noises

Though the NES was the first console to successfully popularize video games in the private home setting, early arcades first brought these video games to the mass public. The very first electronic video games were produced in the late 1950s and early 1960s, yet the real first hit did not come until a decade later. The video game company Atari created the game *Pong* in 1972 and video games were never the same. The popularity of video games exploded, and Atari's *Pong* led many other companies

into producing video games. Though there was very little sound in the game itself, *Pong* began to establish the idea of using sound in video games to create a more realistic atmosphere. The beeping sound of the ball is of course far from realistic to present day gamers, yet in the era of the first video games, it was an important and essential feature. Interestingly enough, though, the sound effects were coincidental and not planned. Allan Alcorn, an Atari programmer who created the sounds for *Pong*, described the process of creating these sound effects:

“The truth is, I was running out of parts on the board. Nolan [Bushnell, one of Atari’s founders] wanted the roar of a crowd of thousands – the approving roar of cheering people when you made a point. Ted Dabney [the other founding member] told me to make a boo and a hiss when you lost a point, because for every winner there’s a loser. I said, ‘Screw it, I don’t know how to make any one of those sounds. I don’t have enough parts anyhow.’ Since I had the wire wrapped on the scope, I poked around the sync generator to find an appropriate frequency or a tone. So those sounds were done in half a day. They were the sounds that were already in the machine.”⁴

And in this unexpected way, the famous bleeps of *Pong* were created. These sounds became an integral part of the game, even though they were developed due to limited technology.⁵ [Figure 1]

As arcades began to prosper in the 1970s, sound effects were incorporated into almost every video game. Companies followed in the steps of Atari by creating the closest sound effects to realistic noises that were possible in order to gain interest and attention for their games. As the video game musicologist Karen Collins explains, these sound effects were extremely important in the development of early games since the “sound was a key factor in generating the feeling of success, as sound

⁴ Kent, *The Ultimate History*, 42

⁵ *Audio Example 1

Figure 1: An Advertisement for Atari's *Pong* Arcade Machine

The Features section promotes the “realistic sounds” of the machine.

THE NEWEST ² PLAYER
VIDEO SKILL GAME

PONG

from ATARI CORPORATION
SYZGY ENGINEERED

The Team That Pioneered Video Technology

FEATURES

- STRIKING Attract Mode
- Ball Serves Automatically
- Realistic Sounds of Ball Bouncing, Striking Paddle
- Simple to Operate Controls
- ALL SOLID STATE TV and Components for Long, Rugged Life
- ONE YEAR COMPUTER WARRANTY
- Proven HIGH PROFITS in Location After Location
- Low Key Cabinet, Suitable for Sophisticated Locations
- 25¢ per play

THIS GAME IS AVAILABLE FROM YOUR LOCAL DISTRIBUTOR

Manufactured by
ATARI, INC.
2962 SCOTT BLVD.
SANTA CLARA, CA.
95050

Maximum Dimensions:
WIDTH - 26"
HEIGHT - 50"
DEPTH - 24"
SHIPPING WEIGHT:
150 Lb.

FEATURES

- STRIKING Attract Mode
- Ball Serves Automatically
- Realistic Sounds of Ball Bouncing, Striking Paddle
- Simple to Operate Controls
- ALL SOLID STATE TV and Components for Long, Rugged Life
- ONE YEAR COMPUTER WARRANTY
- Proven HIGH PROFITS in Location After Location
- Low Key Cabinet, Suitable for Sophisticated Locations
- 25¢ per play



effects were often used for wins.”⁶ Also, since arcades were often crowded and full of noise, these sounds had to be prominent and loud.

Similar to *Pong* most of these early arcade games were highly restricted to the types of sound effects they could generate. “Sound varied considerably from machine to machine, with the sound requirements often driving the hardware technology for the game.”⁷ Technological restraints and the need for small sound files made programming these sounds one of the more difficult aspects of video game programming. Gary Kitchen, an early video game developer, explains this

⁶ Collins, *Game Sound*, 8

⁷ Collins, *Game Sound*, 9

complicated process: “You put sound in and take it out as you design your game.... You have to consider that the sound must fit into the memory that’s available. It’s a delicate balance between making things good and making them fit.”⁸ There were many different techniques for making these sounds, yet they were all often laborious and complicated. As Hirokazu “Hip” Tanaka describes, some sounds were created “little by little, by combining transistors, condensers, and resistance,” while others were made “by writing 1s and 0s... directly into the CPU port...and outputting the wave that becomes sound at the end.”⁹

Eventually though, sound chips were added into the arcade machines, which greatly increased the potential of audio in games. Melodies and repeatable loops were finally incorporated into these games, furthering the sense of catharsis the player felt while immersed in the arcade. There were some earlier examples of somewhat melodic music in arcade games (for example *Space Invaders*¹⁰ [a four-note loop] and *Asteroids*¹¹ [a two-note loop]), yet it was the programmable sound generators (PSGs) that really opened the door for video game music. In the early 1980s, many video game companies began to incorporate different PSGs into their arcade games. Though PSGs still differed between games, a few sound chips became standards of the arcade, such as General Instrument’s AY-3-8910 and Texas Instruments’ SN76489.¹² Both the AY-3-8910 and the SN76489 were incorporated into home computers due to their utility. Instead of PSGs, some companies decided to use

⁸ Collins, *Game Sound*, 9 [Cited in Martin, 1983]

⁹ Brandon, “Shooting from the Hip: An Interview with Hip Tanaka” (website)

¹⁰ *Audio Example 2

¹¹ *Audio Example 3

¹² Collins, *Game Sound*, 15

digital to analog converters (DACs) to sample sounds and recreate the sound waves through digital samples (binary code). Throughout this time of audio development in video games, “roughly half of [the arcade machines] were using DACs... and half PSGs, usually the AY series... the SN chip... or Atari’s own custom chip, the Pokey.”¹³ Soon enough, arcades began to use multiple chips in single machines to increase the amount of options available for audio. One of the main advantages of using multiple chips was simply to have background music continue while different sound effects played. These advances in audio opened a path for future programmers and composers to really explore music in specific video game environments. And by specific environments, I mean a single console used for multiple games – the video game home console.

Sound in the Home

Despite the original success of video games through arcades, some home gaming consoles existed before the arcade machines. For example, the Magnavox Odyssey was released in 1972 and the Sears Tele-Games systems (a collection of Atari produced games released by Sears) were first released in 1975 with Atari’s home version of *Pong*.¹⁴ Similar to their arcade counterparts, early home consoles used a variety of different sound chips to create many different types of music for their video games. Nevertheless, the very first home consoles were quite similar with their sound chips, mainly because of game content rather than technologic restrictions. As described earlier, Atari’s arcade game *Pong* was the first video game

¹³ Collins, *Game Sound*, 15

¹⁴ “A Brief History of The Home Video Game Console” (website)

to gain widespread popularity. By 1976, “some seventy-five companies had launched a home version of *Pong*.”¹⁵ Since the game concept and graphics were so simple, it was an easy game to reproduce. Furthermore, since the sound effects were also quite straightforward, most companies used the exact same chip to replicate the sounds of *Pong* – the AY-3-8500 – another General Instrument’s chip from the AY series. Not only did the majority of these games look like the original *Pong*, but they also sounded like it.

Atari’s own system, though, used a completely different sort of sound chip. Atari’s Video Computer System released in 1977 (also known as the VCS, and later renamed the Atari 2600 in 1982¹⁶) used a custom chip made by Atari themselves. This chip, known as the Television Interface Adapter (TIA), was produced by Atari for use in both sound and graphics. The audio component of this chip only had two channels, yet each channel had a 4-bit waveform selector. This means that even though only two sounds could be heard simultaneously, each channel could produce 4 different types of waves, allowing 16 combinations of waveforms. The two sound channels, though, had difficulties with tonal music. Each channel had a slightly different tuning scheme, which created different pitch values in the channels. Furthermore, there were also frequency variations between the North American (NTSC – the North American Television Broadcast Standard) and European (PAL – Phase Alternating Line – the European television encoding format) versions of the VCS console. Though many sounds were very close to equal-tempered pitches, some were off by as much as 50 cents (a quarter tone). Additionally, since the pitches were

¹⁵ Collins, *Game Sound*, 20

¹⁶ “A Brief History of The Home Video Game Console” (website)

all more or less perfect waveforms, the audible difference in pitches could be easily perceived. This more or less restricted most games to using only one channel at a time for melodic content. Harmonies were often avoided since bass and treble voices could possibly be very out of tune.¹⁷

Other early home systems used chips from different arcade systems. In the first big run of home consoles, Atari's main competitors were Mattel and Coleco. Mattel's Intellivision (Intelligent Television) used one of the most popular arcade sound chips – the General Instruments PSG chip, the AY-3-8914. This chip gave the programmers some more freedom with audio, since the capabilities of the AY chip series were developed and documented throughout the rise of the arcades. Therefore equal-tempered tuning could be more easily implemented into their games. Many video game producers took the liberty of implementing well-known marketable Western songs (such as Beethoven's *Für Elise* and other Classical or Romantic music) into their games. Released in 1980, Mattel marketed the Intellivision as a video game system, which could also be used as a home computer. Yet, with the drawn-out process of releasing the keyboard attachment, Mattel never achieved its goal of surpassing the popular Atari 2600.¹⁸

Coleco's somewhat successful console, the ColecoVision, used the Texas Instruments SN76489 sound chip. With the capabilities of this sound chip along with the impressive "arcade-like graphics," Coleco introduced a brand new concept to home video game systems – the possibility to release games created by other companies. The ColecoVision, released in 1982, produced home versions of many

¹⁷ Collins, *Game Sound*, 21-22

¹⁸ "A Brief History of The Home Video Game Console"

already popular arcade games, including Nintendo's arcade hit *Donkey Kong*.¹⁹ This not only increased the success of the system, but also spread the popularity of other video game producers.²⁰

Nintendo's Musical Advantage

It was the NES, though, that truly opened up the door for composers in video game music. First of all, the NES sound chip was invented by a composer, Yukio Kaneoka. This already gave the NES a unique aspect over its competitors. Most sound programmers for early consoles were not composers, and therefore, often borrowed the music for their games from already composed music. This chip was also quite useful for tonal music. The NES sound chip was a custom made PSG chip for the console. It was a five-channel chip, and although it was not extremely versatile, composers were able to use it to its fullest extent.

Two of the channels were pulse wave channels with a range of about 8 octaves. Pulse waves are rectangular waveforms that contain only the odd harmonics of the fundamental pitch. The size and shape of the rectangle describes its duty cycle, which is the on and off slope of the waveform. If the on and off slopes are equal, then the waveform is symmetrical. The symmetrical pulse wave is often known as the square wave (since the shape of the waveform is a square). Changing the duty cycle (the ratio of on and off) of the waveform changes the timbre of the pitch. Also, a frequency sweep function was available on one of these channels, which allowed

¹⁹ The release of *Donkey Kong* on the CollecoVision was the game's first appearance on a home console.

²⁰ "A Brief History of The Home Video Game Console" (website)

sliding between frequencies (glissandos and other portamento effects). With the different aspects of the pulse wave channels, many different effects could be simulated including “vibrato (pitch modulation), tremolo (volume modulation), slides, portamento, echo effects and so on.”²¹ Additionally, the two pulse channels could work together to create phasing and other delays.

Another one of the channels was a triangle channel. Triangle waveforms are (as the name implies) triangle in shape, and similar to pulse waves, contain only odd harmonics. The higher harmonics of a triangle wave die much faster than a pulse wave, and therefore, it sounds less harsh than a square wave. The triangle wave channel was less versatile than the pulse wave channels, yet it held a specific function. Many of the effects available on the pulse wave channels were not possible on the triangle channels, and the triangle wave channel had a much smaller range. Also, this channel lacked a volume control, unlike the pulse wave channels. Nevertheless, this channel was set an octave lower than the other pitch channels, and therefore held a vital bass function in compositions.

The fourth channel was a noise channel, which could generate white noise. Most people recognize the common static sound of white noise. By definition, white noise is all frequencies at once in equal amounts. This channel was used for different sorts of percussive effects (drum simulations) and also the obvious example of static noise. And finally, the fifth channel was a delta modulation channel (DMC). The DMC had a complex processing system, yet its overall function was quite simple – it was a sampler. Basically this channel was used for mostly short sound effects and

²¹ Collins, *Game Sound*, 25

speech sampling. The sampling could not be very long, nor was it extremely precise, yet it was definitely a useful function. [Figure 2]

Altogether, these five channels gave composers many opportunities to compose a wide variety of dynamic music. For some video game compositions, the three pitched channels (the two pulse wave channels plus the triangle wave channel) had a fairly consistent role. One of the pulse wave channels was used for the main melodic content, while the other was used for harmonic accompaniment, and the triangle wave channel played a bass line. The channels were also used in many other ways, though. All three channels could be used simultaneously in chords to create strong harmonic progressions. Also, with the versatility and similarity of the two pulse channels, these two channels could work in melodic counterpoint to each other, while the triangle channel held the chordal harmonic progression.²² With the wide variety of functions of each channel and the different ways the channels could interact with each other, the NES sound chip gave composers many opportunities to revolutionize video game music.

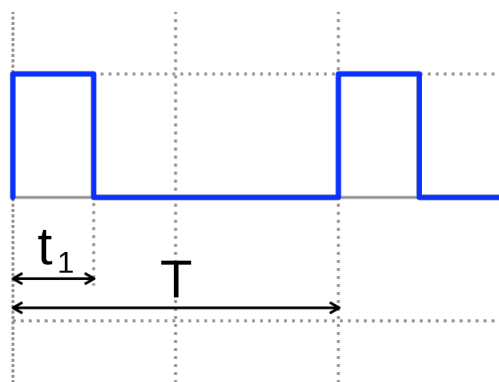
Nevertheless, other home consoles of around the same time had comparable sound technology. Some arcade games actually had even more advanced sound components, and some machines were even equipped with multiple sound chips, a few having up to five chips, not including a DAC. This would allow even more opportunities for composers.

So then, what makes the NES so important in the evolution of video game music? There are many aspects to the Nintendo company that would explain its

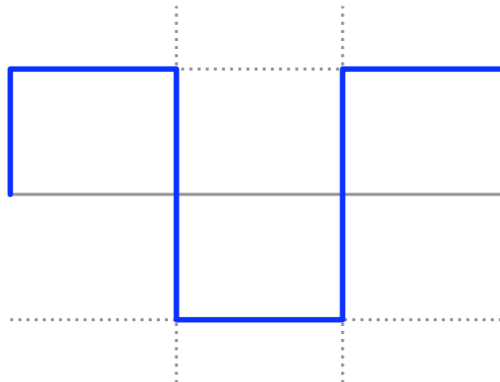
²² see Koji Kondo's *Super Mario Bros.* – "Main Theme" composition analysis below

Figure 2: Various Waveforms

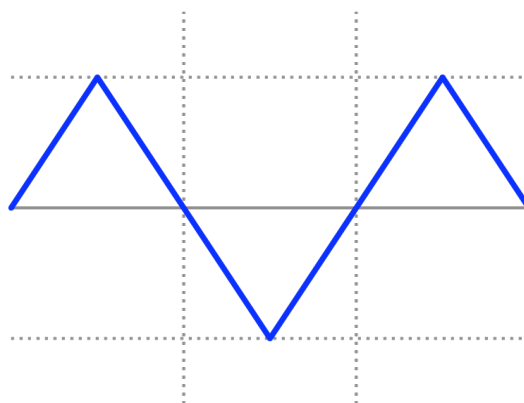
Pulse Wave –



Square Wave –



Triangle Wave –



popularity during the rise of home video games and its continuous survival and success to the present day. Many of these reasons, though, are more connected with the business aspect of the company. The tunes from many NES games have not become classics because of business strategies, though. The first composers who created music for NES games possessed a certain attitude that other companies simply overlooked. They treated the game audio as a real soundtrack – an inextricable part of the game itself. Never again would video game audio simply be a

series of sound effects to imitate instantaneous actions in games. The music was written to be part of the game, and would interact with the player as much as the graphics would. This increased attention toward audio allowed an increased cathartic release in the player allowing him/her to experience a world created by video games to an even greater extent. Simply put, music in the NES became more expressive than in any other previous system.

Hip Tanaka's Perspective

Hirokazu “Hip” Tanaka, as an early video game sound designer, truly delved into this idea of creating music as an essential part of video games. Working for Nintendo since the 1980's, Tanaka was in the center of the video game explosion created by Nintendo and made his mark in the industry through many of his memorable soundtracks.

Originally, he entered Nintendo as a sound engineer. He studied electronic engineering in college, yet his focus was always in music. At five years old, he began music lessons at the Yamaha Music School in Japan, and continued learning music through piano lessons from ages nine to eleven. Other than this, though, Tanaka claims he has had no other formal music training. As he says, “My composing is almost entirely self-taught. I used to listen to the classics and movie soundtracks quite often, since my mother was always playing them in the house.”²³ Since an early age, he was immersed in popular music, listening to artists such as the Beatles, Burt

²³ Brandon; “Shooting from the Hip: An Interview with Hip Tanaka” (website)

Bacharach, and Simon and Garfunkel. Surprisingly enough though, he claims that reggae dub was one of the largest influences on his career.

After his studies as an engineer, Tanaka gained his job at Nintendo through a newspaper ad. There was an opportunity for him to pursue popular music in his band, yet he decided to take the Nintendo job. And through this job, Tanaka went on to produce audio for some of the most famous and popular video games of all time. The first game he worked on in Nintendo was *Space Firebird* (1980). Originally, he produced sound effects for arcade games such as this and others, including *Donkey Kong* (1980)²⁴ and *Pac-Man Fever* (1982). When the Famicom was developed, Tanaka went on to write music for the Nintendo-produced games on the system, writing the soundtracks for many now-classic games. His work on the NES includes titles such as *Duck Hunt* (1985), *Gyromite* (1985), *Kid Icarus* (1986), *Metroid* (1986), *Dr. Mario* (1990), and *Fire Emblem: Ankoku Ryū to Hikari no Tsurugi* (1990).

One of the important defining aspects of Tanaka's career is the era in which his work took place. He not only made classic soundtracks to popular Nintendo games, but he was also working for Nintendo during the era of arcade sound effects. Tanaka experienced the evolution of audio in video games as it was happening. As mentioned earlier, the role of music in video games increased with the development of new sound chips in home consoles. Video game music was no longer simply audio sound effects, but instead a real musical soundtrack. Tanaka was one of the first real composers to truly embrace this new aspect of the video game. Hirokazu Tanaka explains this new "remodeling/transformation" of video game music while describing

²⁴ The first appearance of Jumpman, later renamed Mario

his thoughts behind composing the score for the NES game *Metroid*, the classic revolutionary game that started the extremely popular science-fiction video game series:

The sound for games used to be regarded just as an effect, but I think it was around the time *Metroid* was in development when the sound started gaining more respect and began to be properly called game music... Then, sound designers in many studios started to compete with each other by creating upbeat melodies for game music. The pop-like, lilting tunes were everywhere. The industry was delighted, but on the contrary, I wasn't happy with the trend, because those melodies weren't necessarily matched with the tastes and atmospheres that the games originally had. The sound design for *Metroid* was, therefore, intended to be the antithesis for that trend. I had a concept that the music for *Metroid* should be created not as game music, but as music the players feel as if they were encountering a living creature. I wanted to create the sound without any distinctions between music and sound effects. The image I had was, 'Anything that comes out from the game is the sounds that game makes.' As you know, the melody in *Metroid* is only used at the ending after you killed the Mother Brain.²⁵ That's because I wanted only a winner to have a catharsis at the maximum level. For [this] reason, I decided that melodies would be eliminated during the game-play. By melody here I mean something that someone can sing or hum.²⁶

Hirokazu Tanaka's work with Nintendo furthered the role of audio in video games. Tanaka genuinely tried to make music a part of the game. Composers like him contributed to the evolution of video games as a whole. Through the efforts of composers like Tanaka, the medium of the video game changed from a solitary game occasion to a multi-sensual experience. Programmers in all aspects of the video game were trying to relate to the gamers in as many ways as possible. And even in the modern era, video game composers continue with this aesthetic in their work. In talking about differences between 1980s and present day video game music, Tanaka says, "what really doesn't change is that sound designing is a human-to-human

²⁵ *Audio Example 4

²⁶ Brandon; "Shooting from the Hip: An Interview with Hip Tanaka" (website)

business... you have to tackle gamers' feelings, which is something we've never been able to grasp completely. The understanding on the technology side is a must, but most importantly, I think we are required to have various ideas and techniques in order to cope with the living beings that we are targeting."²⁷

The Super Mario Musician

Another Nintendo composer who worked with these same ideals in mind was the Super Mario genius, Koji Kondo. Born in 1961 in Nagoya, Japan, Kondo did not experience the life of a typical master composer. He was not a young musical prodigy or even fully dedicated to music from a young age. His musical experience began at the age of 5 with lessons on an electric organ. Kondo continued with keyboards, playing in cover bands throughout his teens, yet even through his university education (where he studied general arts), he was never solely a musician. In his final year of his university education, Nintendo sent a recruitment message looking for composers. Since Kondo was both a musician and a fan of the new video game media present in arcade games, he decided to apply for this position, and in an amazing stroke of luck got the job. In 1984, Koji Kondo became the first composer hired by Nintendo with the single task of writing music. In this way, Kondo became Nintendo's first company composer. And ever since then, Kondo has continuously worked for Nintendo producing some of the most iconic soundtracks in the history of video games.

²⁷ Brandon; "Shooting from the Hip: An Interview with Hip Tanaka" (website)

Kondo began his career for Nintendo by working on the arcade games *Golf* (1984) and *Punch-Out* (1984). It was not until the Japanese Famicom was released, though, that he got his big breaks. As Nintendo's first home console rose in popularity, "Kondo was assigned to exclusively compose for the console's subsequent games."²⁸ Through the Famicom, he was able to assert himself as a unique and masterful composer. In the lifetime of the NES, he composed the classic soundtracks of the iconic games *Super Mario Bros.* (1985), *Super Mario Bros.: The Lost Levels*²⁹ (1986), *Super Mario Bros. 2* (1988), *Super Mario Bros. 3* (1988), and *The Legend of Zelda* (1986) among a few others.

The mastery of his composing skill is especially present in these early video game titles. Not only did NES composers have to write music that fit with the game play and genre of the game, but it also had to be repeatable or "loopable" (to create ongoing music through a continuous level) and adaptive (to change simultaneously with gameplay elements). Furthermore, they had to create all of the music within the technological restraints of the system's early and primitive sound chip. But even with this shortcoming of the early home console, Kondo was able to write some of the most memorable video game music of all time.

When most gamers think of video game icons, the most obvious response is Super Mario. As soon as Mario entered the American video game scene he almost immediately became a star. "According to the 1990 Q ratings, a series of surveys that grade the recognizability of real and fictitious public figures, more American children

²⁸ "Koji Kondo :: Biography" (website)

²⁹ Known as *Super Mario Bros. 2* in Japan

recognized Mario than they did Mickey Mouse.”³⁰ Additionally, whenever the Italian plumber is called to mind, most people can recall by memory the game’s catchy main theme music. *Super Mario Bros.* was actually Kondo’s first major score in the video game world. However, it is now the best selling video game of all time. Some composers of the 8-bit home console era saw the technological limitations of the systems as restraints to the music. Kondo, though, was able to use these limitations to keep the music simple and catchy. With the three pitch channels of the NES’s PSG chip, many composers often composed video game music by writing simple melodies that were enforced through ever-present harmonic progressions. For example, one of the pulse wave channels would often play a melody, while the other pulse wave channel would arpeggiate the chords of the harmonic progression. The triangle channel would then strengthen the harmonies through a simple continuous bass line. Some game music even went completely without a melodic line in preference of solidifying the harmonic progression. In the NES game *Ultima*, Karen Collins points out that “all three channels were used as chords... in *Ultima*’s battle music, in which two pulse waves create a chordlike lead in the first two channels, and the triangle creates the bass of the chord.”³¹

Kondo, however, used a slightly different approach for some of the music in *Super Mario Bros.* Most of the themes in *Super Mario Bros.* focus entirely on lush melodies reinforced by secondary melodic lines in counterpoint, not heavy harmonic progressions. The main theme of *Super Mario Bros.*³² can easily be plotted out into

³⁰ Wolf, *The Medium*, 46

³¹ Collins, *Game Sound*, 25

³² *Audio Example 5

the pitch channels of the PSG chip. [Figure 3] In doing this, one will realize that two of the sound channels and even sometimes all three (instead of one) are used for the melody. The first square wave channel plays the main melody, while the second plays a second melodic line in harmony with the first. In the first section, the second channel plays mostly a minor 6th below the main melody, while in the second section, the intervals switch and the second channel mostly harmonizes with a major 3rd below the higher channel. Because these intervals are the reciprocal of each other, it gives the audio illusion of the channels switching roles – the higher pitched channel moving down while the lower pitched channel moves up. With these melodies, the tune resides mostly in major harmonies giving it a jovial and cheery feel. Instead of focusing on making the harmonic progressions obvious and ever-present, Kondo put the majority of the focus on the melody. The appeal of this musical theme is not only due to the multiple melodic lines, though. The rhythms Kondo uses throughout this theme bear a slight resemblance to Latin music. The rhythm of the bass line in the second section (sounded through the triangle channel) gives the tune a bouncy feel and a sense of motion. The unexpected rising triplets of the third bar followed by the syncopation of the emphasized upbeat create simple, yet still interesting musical surprises.

What cannot be put into words is the sheer “catchy-ness” of the tune. No matter how many times one listens to the theme, it can still excite and bring a smile to the average listener. It is easy to remember and difficult to forget. It allowed the gamer to experience the video game world of Mario. And this is exactly what was needed in the production of music in 8-bit consoles – something that could be easily

repeated, but still keep the attention of the average gamer's ear, while enhancing their experience.

Figure 3: A Transcription of the Main Theme from *Super Mario Bros.*

Uematsu's Rise to Fame

Video game music composers such as Kondo and Tanaka created many of the most memorable and classic video game tunes of all time, yet they are still relatively unknown. Of course, many dedicated fans of these games know the composers' discographies by heart. Nevertheless, most people who have played these games know little to nothing about the composers and their work. For example, millions of people can hum or sing the main theme from *Super Mario Bros.*, but in comparison,

few would be able to name Koji Kondo as the genius behind the music. Many of the classic tunes for video games on the NES were so well incorporated into the games that they became part of the games. Therefore, the composer is overlooked, and the music is simply attributed to the production studio (which happens to be Nintendo for the case of Kondo and Tanaka).

A few of these early video game composers, though, were able to use their reputation and influence to break out of the video game scene and gain real recognition as composers. Probably the most famous example of this comes from the composer Nobuo Uematsu. Similar to both Kondo and Tanaka, Uematsu composed music for many extremely well known games on the NES. Unlike them, though, his video game career has led him to other outside musical opportunities and international fame. Not only has Uematsu traveled around the world playing his video game music with live orchestration, but he has also composed scores for films and released 3 albums with his rock band The Black Mages. *Time Magazine* named Uematsu as a modern music “Innovator” in one of their feature articles, “Time 100: The Next Wave – Music”³³ and at times, he has been called “the John Williams of the video game world.”³⁴

Though his reputation is quite expansive, his beginnings were quite simple. Similar to many of the other early video game composers, Uematsu had no formal musical training as a child. At the age of 12, he began teaching himself the piano. Like Tanaka, Uematsu’s musical interest was greatly inspired by popular music. Uematsu himself admits that he was inspired to learn piano from the music of Elton

³³ Farley; “In Fantasy’s Loop” (website)

³⁴ Huang; “Biography” (website)

John. After graduating from the University of Kanagawa, Uematsu played keyboards in a few amateur bands. While playing in bands, he discovered his talent for writing music. At this point, Uematsu went on to write music for commercials. Unlike Kondo and Tanaka, Uematsu did not get his video game start from Nintendo. In 1985, a friend of Uematsu offered him a job for a then-small video game company called Square Co., Ltd. His first job was to write the music for the video game *Genesis* (1985), and after that, Uematsu was hired as a full time composer for Square. In his first few years with Square, he continued to write music for other small-time games produced by Square, including the NES titles *King's Knight* (1986) and *Rad Racer* (1987). Unfortunately, though, Square (unlike Nintendo) did not achieve much success with their start on the NES console. Soon enough, Square was down to its last game.

In 1987, Square was facing impending bankruptcy, and decided to make one more game. An RPG,³⁵ its success or failure would likewise determine the fate of the company, hence its title *Final Fantasy*. Uematsu was chosen to write the music for this new game.³⁶

This NES title was the start of the still popular, worldwide known Final Fantasy franchise. Needless to say, this game not only saved Square, but it also launched Uematsu's career. After the original *Final Fantasy* game, Uematsu continued to compose music for Square's Final Fantasy series, writing the music for *Final Fantasy II* through *Final Fantasy IX* and contributing to the soundtracks of *Final Fantasy X*,

³⁵ A role-playing game (RPG) is a popular genre of video games in which the player takes the role of one or multiple characters within the game.

³⁶ "Nobuo Uematsu :: Biography" (website)

Final Fantasy XI, and *Final Fantasy XII*. But Uematsu didn't stop with his Final Fantasy in only video games.

Partly due to the success of the video games he scored and their dedicated fan base, Uematsu gained opportunities to spread his music outside of the video game world. In 2002, two other Square musicians, guitarist Tsuyoshi Sekito and keyboardist Kenichiro Fukui, approached Uematsu with some rock arrangements of Uematsu's own Final Fantasy work. Uematsu enjoyed the music and was impressed by the arrangements. He showed the work to some others, and a few other Square members joined the band creating The Black Mages. Though they have played relatively few live gigs (because of the schedules of the band members), the band was well received by both *Final Fantasy* fans and critics alike. The music is completely instrumental, featuring mostly arrangements of many different *Final Fantasy* songs from throughout the series in a progressive metal / symphonic rock sort of style. And due to their popularity, they have released 3 albums – *The Black Mages* (2003), *The Black Mages II: The Skies Above* (2004), and *The Black Mages III: Darkness and Starlight*.³⁷

The Black Mages was not Uematsu's only venture outside of video games. Uematsu's work in the Final Fantasy series is also often featured in symphonic game music concerts. These concerts have always been successful, creating even more opportunities for his music to spread throughout the world. "After a string of successful concert performances in Japan including a six-city, seven-show concert series titled 'Tour de Japon –music from FINAL FANTASY-' the first stateside

³⁷ *Audio Examples 6 & 7

concert, ‘DEAR FRIENDS –music from FINAL FANTASY-’, followed May 10, 2004 at the Walt Disney Concert Hall in Los Angeles, CA selling out in 3 days.”³⁸ Furthermore, many unique compilations of piano arrangements, vocal arrangements, and symphony arrangements of the music from the Final Fantasy games have been released as albums. For example, one recent album called *Those Who Distorted*³⁹ (2009) features a cello quartet called Cellythm playing arrangements of “Immigrant Song” by Led Zeppelin and “Eleanor Rigby” by the Beatles alongside three of Uematsu’s Final Fantasy songs. Nobuo Uematsu has even written the music for a few popular Japanese movies and shows.

Due to all of his work outside of the video game industry – while using his reputation *from* the video game industry – Uematsu brought recognition to the profession of the video game composer. Since video games are seen as popular media in the modern era, video game composers during the time of early video games were often overlooked as “pop” composers incapable of real artistic music. Uematsu proved this notion wrong through his many musical endeavors. As *Time Magazine* says, “To stand up to repeated scrutiny, his work is suitably complex... [and] the melodic core is strong.”⁴⁰ His work spans many video game systems, but it all started with a hopeful RPG game on the NES. And even though some people may consider the multiple NES Final Fantasy soundtracks to be simple and not fully developed (due to the systems limitations), people around the world still arrange and perform

³⁸ “N’s Profile” (website)

³⁹ Released off of Uematsu’s own label – Dog Ear Records

⁴⁰ Farley; “In Fantasy’s Loop” (website)

Uematsu's songs from the first three Final Fantasy titles, all originally released on the NES.

Modern NES Inspirations and Representations

Uematsu is not the only person to bring a renewed interest to NES music. NES music has recently found a new home in the music industry in both modern rock and electronic scenes. As the generation of children who grew up during the rise of the NES came to age, a few people were inspired by the music to start bands. The use of NES-inspired music in the modern music industry generally has two streams: 1) rock covers of NES songs using typically mainstream music instrumentation, and 2) original compositions using the NES sound chip as a synthesizer.

The first trend generally deals with huge fans of the NES. Many of them probably experienced the system as a child and were greatly influenced by it. The music left such an impression that they decided to keep it alive through the genre of rock. The average NES cover band features the typical rock setup: electric guitar, bass, drums and possibly a keyboard. A perfect example of this type of band comes from The Advantage. Their cover of "Kraid's Lair" – one of Tanaka's compositions in *Metroid* – shows how they seamlessly incorporate typical rock structures and effects into the classic NES tunes.⁴¹ Other similar bands include The Minibosses and The NESkimos, who both add a heavier distorted metal style to their NES covers. Though many of the more popular video game bands choose not to limit their repertoire to a single system, these mentioned bands limit themselves almost entirely

⁴¹ *Audio Example 8 & 9

to NES games. Unfortunately, this move has not gained much extra popularity for them. Most of these bands remain unsigned (or signed to very small independent labels dedicated to this sort of music) and therefore release albums by themselves or through the internet. None have gained mainstream success with their fan base often consisting of a close group of dedicated followers.

The other representation of the NES in the modern music industry comes in through the electronic scene. Electronic music artists in the 1990s found a new home for their work through the lo-fi beeps and bleeps of the NES and other early video game systems. As more artists used these old consoles as synthesizers, the electronic genre of 8-bit music, widely known as chiptune music, grew in small clusters across the world. The chiptune artist Bubblyfish describes the genre as follows: “8-bit or chiptune music refers to music created using video game platforms such as Amiga [first released in 1985 as the Amiga 1000], Commodore 64 [released in 1982], NES, and Gameboy [released in 1989].”⁴² The timbre of the different sounds is generally similar due to the specific hardware, yet the styles of chiptune music tend to vary including styles from dance to punk to experimental.

Even though most 8-bit music is still generally underground, the genre is surprisingly international. Since the genre has spread, artists are often given the opportunity to showcase their music to other chiptune artists and fans in many diverse locations. Through blogs and other internet communities “individual artists communicate... inviting overseas artists to play in their city.”⁴³ The artists involved in this scene are so dedicated to their work, they have even created large events to

⁴² d’Escrivan and Collins ed., *The Cambridge Companion*, 189

⁴³ d’Escrivan and Collins ed., *The Cambridge Companion*, 189

showcase the small, yet global movement. The chiptune collective 8BITPEOPLES helps to present the yearly chiptune festival called Blip Festival. The yearly festival has been held since 2006 in New York City.⁴⁴

Furthermore, the chiptune scene has recently made some headway into mainstream music. In 2007, *8-Bit Operators: The Music of Kraftwerk* – a chiptune album of Kraftwerk covers – was released. The album, produced by the collective 8-Bit Operators, features some of the foremost chiptune artists from North America, South America, and Europe, including the above mentioned Bubblyfish.⁴⁵ The prominent mainstream artist Beck also released a remix album in 2005 called *Guerolito* that presents some chiptune music. The album features a unique and addicting remix of the Beck song “Hell Yes” with typical NES sounds by the prominent chiptune artist 8-Bit.⁴⁶ Not only this, but other chiptune artists are beginning to garner attention from mainstream crowds.

The chiptune band Anamanaguchi has recently gained much attention in indie music scenes throughout the East Coast. Their indie rock style with chiptune sounds have made them a young upcoming band with the “bleeding-edge culture rag L Magazine [naming] them one of New York City’s ‘8 Bands To Watch’ for the year [of 2009].”⁴⁷ Part of the reason they have seen such success is due to their musical choices. Though they use 8-bit timbres, they try to stay away from video game music styles. Anamanaguchi’s lead guitarist Peter Berkman says, “We’re using the 8-bit sounds as a piece of the picture instead of the whole thing... I grew up playing video

⁴⁴ “8BITPEOPLES” and “Blip Festival 2009” (website)

⁴⁵ *Audio Example 10

⁴⁶ *Audio Example 11

⁴⁷ Alexander, “The Chiptunes Band That Just Might Break Through” (website)

games as much as the next Generation 2K-bro, but I view it as something that's separate from my music... [It's] important to make the distinction that we aren't writing video game music – I'm thinking way more about Brian Wilson and old Rivers Cuomo than Hip Tanaka – who rules, though – when I'm composing.”⁴⁸ This of course opens up their music to a wider audience, which has led to their participation in the annual independent music festival, SXSW 2010. Their website states the basic idea behind their music quite clearly in large print, “Anamanaguchi makes loud, fast music with a hacked NES from 1985.”⁴⁹ Not only are they appealing to video game music addicts and 8-bit diehards, but also to indie “scenster” music fans.⁵⁰

The first artists of 8-bit music used to be a very close-knit group of dedicated musicians that upheld a sort of “DIY” (Do It Yourself) attitude. But as the genre has recently expanded to younger musicians, like Anamanaguchi, aspects of the genre have become more popular and commercialized. For example, while early chiptune artists used to rely solely on their knowledge of electronics and the video game console systems, newer artists can simply buy the pre-made electronics to easily create an NES synthesizer. The most well-known NES hardware interface, the Midines, can be bought online for \$90. The pre-made cartridge is simply a hollowed-out regular NES game cartridge with the Midines circuit board replacing the insides. All you have to do is plug the Midines into an NES console, turn on the system, and plug the MIDI cable into a MIDI controller. Then you have complete control over the

⁴⁸ Alexander, “The Chiptunes Band That Just Might Break Through” (website)

⁴⁹ “Anamanaguchi” (website)

⁵⁰ *Audio Example 12

five channels of the NES sound chip. Not only that, but the Midines comes with NesFX, which is “a real-time retro graphic visualization that is seeded by incoming MIDI sound data. Changing layers of pixel patterns and colors are adjusted in response to combinations of MIDI channel data.”⁵¹ In other words, if you plug the NES video cable into a monitor of some sorts, you can make retro NES graphics that follow the music you play. With the Midines, anyone can be an 8-bit artist.

Conclusion

With the recent rise of chiptune music, it seems that the NES sound chip is beginning to gain a renewed sense of respect from musicians around the world. Hardware is even produced by the company Wayfar.net, allowing any musician to enter the 8-bit scene. Though this may somewhat detach the music from its original aesthetic, it is still popularizing the genre. More and more casual music listeners are being exposed to the timbres of chiptune music as it slowly permeates into the modern music industry. In general, electronic music has recently seeped deep into the genre of pop music. As the average pop singer now sings on top of highly synthesized electronic beats, popular music around the world has taken advantage of electronic avenues. Since the timbres of the NES sound chip (and other similar early sound chips) are so distinct, more musicians begin to turn to chiptune methods and distinctions to achieve a truly unique electronic sound.

Not only has chiptune music recently gained a larger following, but video game music in general has also reached new heights of popularity. As video game

⁵¹ “Midines 1.1.0” (website)

home consoles become more and more complex and advanced, the music in these games have followed in step. In the past decade, graphics in video games continue to advance, edging its way closer to reality. And since primitive PSGs are now outdated, video game music is now as close to reality, i.e. live music, as is possible. Keith Arem, a video game composer and sound designer, has worked in the industry for over 15 years. Through his work, he experienced this change to higher quality music in video games.

In recent years, there has been a strong effort to enhance sound for games – and next-generation systems and speakers have made great strides to address memory and bandwidth for audio... One fascinating aspect of the games industry is that the technology changes continuously... As technology improves by leaps and bounds each year, every game title attempts to implement new ways of making games faster, bigger, and louder than before.⁵²

But the growth and development of video game music is not only affected by technology.

Instrumentation of video game music also continuously adjusts with the times. Nowadays, full orchestras are even sometimes recorded to create intricate and complex soundtracks for video games. Epic games like the *Halo* series create expansive soundscapes produced by countless instruments to match the feel of the games. Furthermore, orchestral concerts presenting popular video game music often outsell concerts of classical Western music. In some ways, video game music is keeping traditional music culture alive in the youth. Some parents try to expose their children to classic music conventions (for example, orchestral or chamber performances or musical theater such as opera) to present another outlet to music not

⁵² Marks, *The Complete Guide*, xx-xxi

tainted by the aesthetics or ideas of the music industry and pop music. With video game music on the rise, orchestral video game music concerts like Uematsu's "DEAR FRIENDS –music from FINAL FANTASY–" are one of the few avenues left for both the young and old to enjoy traditional music settings.

Obviously, the importance of music in video games has drastically increased over the past 20 years. The video game industry is more successful now than it ever was. As film theory developed over the past decades, video game theory will soon follow in the same way. Karen Collins sums up the origins and growth of video game theory quite succinctly:

Despite thirty years of technological development in games, academic research into games audio has been slow to develop. There have been but a handful of academic articles published, often in conjunction with or in comparison to film music... Perhaps, [this is] how a new discipline should begin; with a variety of theoretical perspectives and practices that can create a diverse spectrum in which discussion and opinion can clash, develop, and grow.⁵³

Many people are beginning to take these games more seriously as video games slowly grow out of the label of simplistic popular culture. More video game designers throughout the world continue to generate new and unique ideas through their games, presenting new aspects of art and culture present in no other medium.

With the appearance of early video games in arcades, sound was often seen as a somewhat minor aspect of the games. It was useful, but not essential. But as sound grew to become an integral part of the video game, the music was given more attention in the context of the game. The job of the simple sound designer changed to a creative composer. While many early home consoles continued with the idea of

⁵³ Collins, *From Pac-Man*, 6

simple music based on pre-composed Western classics, Nintendo embraced the idea of adaptive and innovative video game music. Part of the reason the NES became such a successful system was due to the attention put into all aspects of the games. Genre, graphics, gameplay, and music were all intricately woven together to create a cohesive event.

It is important to give these early composers their due respect. As with all art forms, young artists study those who came before them to learn skills and techniques and acquire inspiration. Many people dismiss early video game music because of its primitive audio quality. Also, since many game designing companies did not initially take it very seriously, neither did the audience. But as I have shown, composers such as Kondo, Tanaka, and Uematsu, were anything but simple uninvolved sound designers. They immersed themselves into the games to create a fuller multi-sensual experience. The limitations of the technology only made their complex jobs even more difficult. And since they created music for some of the earliest video games, they were the pioneers of their industry. They took their job very seriously and helped to create some of the most popular games and series of all time. Furthermore, as many of these video game series continue to live on in more recent incarnations, the classic tunes are continuously implemented in these new games in new arrangements and settings.

As the first decade of the new millennium comes to an end, video games are only becoming more widespread. Numerous gamers spend countless hours exploring the expansive worlds created in video games. The music is a vital aspect of this entire experience, creating atmospheres of sound to define the moods and characters.

Yet without the path set by these composers of the past, none of this would be possible. Many of these artists, like Kondo and Tanaka, still remain widely unknown. However, the early tunes they wrote are now the video game classics of the modern day. Hopefully as video games slowly gain more recognition as an actual art form, so too will these composers receive recognition for their work. In due time, these composers will be appreciated as the architects of video game music– the true 8-bit heroes.

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Audio Examples

- 1) *Pong* Sounds
- 2) *Space Invaders* Melody
- 3) *Asteroids* Melody
- 4) *Metroid* Ending Theme
- 5) *Super Mario Bros.* Main Theme
- 6) *Final Fantasy* Battle Scene
- 7) The Black Mages, “Battle Scene” (from *Final Fantasy*)
- 8) *Metroid* Kraid’s Lair
- 9) The Advantage, “Kraid’s Lair”
- 10) Bubblyfish, “It’s More Fun to Compute”
- 11) 8-Bit, “Ghettochip Malfunction” (“Hell Yes” remix)
- 12) Anamanaguchi, “Helix Nebula”