
ISRAEL MÁRQUEZ
Universidad Complutense
de Madrid

Playing new music with old games: The chiptune subculture

ABSTRACT

Although video games have been studied from a wide range of perspectives, from film to literature, little attention has been given to the role of music and sound in games. Not only to the role of music and sound within games, but also to the many different forms in which video games are influencing the development of popular music. One of these forms is the so-called “chiptune music”. Chiptune (also known as chip music or 8-bit music) is electronic music that uses the microchip-based audio hardware of early home computers and gaming consoles and repurposes it for artistic expression. Chiptune artists reinvent the technology found in old computers such as Commodore 64, Amiga and ZX Spectrum as well as in outdated video game consoles such as Nintendo Game Boy or Mega Drive/Genesis in order to create new music. This paper is an attempt to document the chiptune phenomena and the subculture scene that has been created around it during the last years: a subculture that is resuscitating and redefining old and “dead” gaming devices to play new music at the periphery of mainstream culture.

KEYWORDS: *Chiptune, Video games, Popular music, Subculture, Hacking.*

“Less is more”
Ludwig Mies van der Rohe

INTRODUCTION

Although video games and computer games have been studied from a wide range of perspectives, from film to literature, little attention has been given to the role of music and sound in games. This tendency is part of a wider tradition of ignoring the audio side of audio visual media, as it happens in film and television studies, where music and sound have traditionally received less attention compared with the analysis of moving images. As a result, the study of audio in games remains relatively unexplored and there is a lack of

literature on the topic that makes difficult to discuss the importance of music, sound and even noise for the gaming experience. Something similar happens with the study of the many different ways in which video games and computer games have affected the development of modern popular music, lyrically, technically or aesthetically. Games are a cultural force that look and interact with other media and other cultural trends in novel and creative ways. Games are in complex interaction not only with music but also with art, cinema, literature, comics, and even with everyday objects such as pens, notebooks, posters, socks, caps, T-shirts, etc. Games thus represent a growing sub-program of a much broader and “ever-expanding entertainment supersystem” based on “transmedia intertextuality” (Kinder, 1991, p.1; Gottschalk, 1995).

In the field of music, some of the most famous orchestras around the world have recorded music for video games. Some records companies have begun to use video games to promote their artists. Prestigious electronic musicians such as Aphex Twin have used sound effects and sampled elements of game’s soundtracks. Artists and bands of different musical genres have incorporated video game aesthetics in their videoclips, album covers and merchandising. The same is true for more peripheral manifestations such as the chiptune subculture, which is an interesting case because it tells “an alternate narrative about the hardware, software and social practices of personal computing” (Driscoll and Diaz, 2009, p. 52) and how the music, sounds and noises of early games can develop a particular form of subcultural expression. This paper is an attempt to document the chiptune phenomena and the subculture scene that has been created around it: a subculture that has creative, nostalgic, political, and social dimensions, and that is centered around making conspicuous the multimodal aesthetic of old games that seems to be lost in modern devices.

A BRIEF HISTORY OF CHIPTUNES

Chiptune (also known as chiptunes, chip music or 8-bit music) is electronic music that uses the microchip-based audio hardware of early home computers and gaming consoles and repurposes it for artistic expression. Chiptune artists reinvent the technology found in old computers such as Commodore 64, Amiga and ZX Spectrum as well as in outdated video game consoles such as Nintendo Game Boy or Mega Drive/Genesis in order to create new music. The evolution of sound throughout the history of video games has been based on the technological capabilities of the computers or game consoles in which the game are played (McDonald, 2004). As with the visual side, the history of video game music is highlighted by the type of technology available at that time. As a result, we have the 8-bit, 16-bit, 64-bit, and the 128-bit eras. The first video games lacked a sound component, included only a brief theme, a few sound effects or were limited to simple melodies by early sound synthesizer technology.

Chiptune artists embraced the limitations of early computing platforms by experimenting with their chips through practices such as hacking, cracking and reverse-engineering. The Tracking, Cracking and Demo scenes that flourished between the 1980s and the 1990s played a major role in the chiptune development. In 1985, Commodore 64 programmers such as Rob Hubbard and David Whittaker started to explore the musical capabilities of the SID chip in order to produce interesting video game music. In 1987, Karsten Obarski built a tool called The Ultimate Soundtracker for his Amiga A500, which inspired great numbers of nonprogrammers to create computer music in their homes. Cracker groups and members of the Demoscene adopted tools like Soundtracker to compose the background music for their crack intros and demos. Demos were first created by crackers as a signature inserted at the beginning of a cracked programme, a kind of digital graffiti, but soon developed into complex audio visual “demonstrations” where music played an important role. In the 1990s, thanks to the growth of international communication via Fidonet and the Internet, tracker music became independent of their origins as the backgrounds of demos. Musicians and groups released their own collections of tracker music called musicdisks or musicpacks (Driscoll and Diaz, 2009).

In 1998, more specific chiptune labels began to appear, such as micromusic.net, which was also the first online community devoted to chiptune music. The same year the American collective Beige started working on the 8-Bit Construction Set, a vinyl battle record featuring music and software that can be played on Atari or Commodore 64 (Quaranta, 2009). 1998 is also the year in which Oliver Wittchow released *Nanoloop*, the first real-time Game Boy sound editor. It was developed by Wittchow as part of a study project at the University of Fine Arts of Hamburg. He performed the program for the first time in 1998 in a Lo-Fi context in Cologne, which he won.

In 2000, Johan Kotlinski created the program *Little Sound Dj (LSDJ)*, a type of four-track tracker. The basic idea was to transform a Game Boy into a full-fledged music workstation through a cartridge containing tracking software. As Driscoll and Diaz (2009) point out, *LSDJ* “embodies the history of chiptunes in software. It gives composers direct access to the four-voice poliphony of the Game Boy sound architecture” and it also “implements the digital sample playback and a piano roll sequencer introduced in Obarski’s Soundtracker” (p. 59). In the early 2000s, *LSDJ* implemented MIDI compatibility and this is one of the features that distinguish the Game Boy community of chiptune artists from those of the tracker era. Although tracker software enabled nonprogrammers to create music with their computers, it remained largely isolated from conventional recording studio technology. By adding a MIDI interface to a game console, a tool like *LSDJ* connects

chiptunes to the traditional electronic music world. Not only do non-programming musicians make music with their game console, they can now integrate the console with their existing studio practice (Driscoll and Diaz, 2009, p. 59). *Nanoloop*, and especially *LSDJ*, gave rise to the emergence of the Game Boy generation. The popular handheld gaming console started to gain prominence among chiptune artists, becoming the most popular (and powerful) symbol of the chiptune community, even today. Domenico Quaranta summarizes the reasons of the Game Boy popularity among chiptune artists in the following interview excerpt:

Accessibility: Gameboys are all over the world, easy to forget in a drawer to rediscover them years later, cheap on eBay etc. History: the first modified cartridges allowing you to play music were for Gameboy. Fashion, success and nostalgia: if you forget everything of your 8-bit infancy, you probably still remember Super Mario and his funny mustache (Márquez, 2011).

BEYOND THE CHIPS: AN APPROACH TO THE CHIPTUNE SUBCULTURE

Since the early days of chip music a whole subculture scene has been created around it. Just like every other subculture (punk, ska, hip hop, rave, etc.), the chiptune scene transcends from just music. It embodies different forms of expression sharing a common theme: a respect and devotion to the old sounds of the 8-bit era and the obsolete game technologies related to them. According to Sarah Thornton (1997a), subcultures are “groups of people that have something in common with each other (i.e. they share a problem, and interest, a practice) which distinguishes them in a significant way from the members of other social groups” (p. 1). What distinguishes the chiptune subculture from other social groups is precisely that its members are centered around a specific era in the history of videogames: the 8-bit era. What is unique about this subculture is its devotion to old forms of gaming devices through the playful exploration of their sound capabilities. As Quaranta (2009) says, while in the Demoscene of the 1980s “coding visuals as well as music were two sides of the same coin, in the chiptune scene of the late 1990s music took the foreground” (p. 23). Therefore, in the chiptune subculture music is the driving force. But the visual side is also important, although it often works at the service of the main activity: music. The chiptune subculture is about people playing music with Game Boys and other retro game devices but it is also about people making visuals for musical performances, designing covers for music albums, flyers and posters for concerts, creating videoclips with a pixelated 8-bit aesthetic, wearing retro gaming inspired clothing, etc. All these elements form the style (Hebdige, 1979) of the chiptune subculture, which allows chiptune members to recognize themselves and to be recognized by others. Style functions, as Gelder (1997) suggests, like the “totem” according to Emile Durkheim, as “something which gives visible expression to an individual’s sense of belonging to a group” (p. 373).

International chiptune events such as Blip Festival are the best way to understand the chiptune style. As Bittanti (2009) points out: “if chip music was a purely technological practice, its impact would be minimal, if not irrelevant. The true relevance of chip music lies in the social aspect, that is, in the live performance itself” (p. 34). It is in the chiptune performance at concerts and festivals that we can see all the symbolic elements that take part in this subculture –music, visuals, dress, appearance, language, styles of interaction, rituals, etc. A chiptune event is an interesting flow of 8-bit sounds and images that requires the co-presence of the artist, the technology and the audience. Sebastian Tomczak, alias Little-Scale, talks about the role of performance in the chiptune events:

It's not like a rock band where you can see each person playing each note, so it's much less live in that sense. On a Game Boy, you might have everything pre-written, and then what you're controlling is the structure of the music. Or you might be controlling the effects in real time. So it's sort of a macro performance in some way. I guess one big part of it, which I get the sense of playing live here at Blip Festival, is to get the audience excited. To be dancing or moving on stage is really important (Chang, 2010).

Most of what the audience hears during a typical chiptune set is pre-programmed. So, the chiptune performance is like DJing, “except with original compositions instead of vinyl and 8-bit microprocessors instead of turntables” (Kopstein, 2011). At concerts and festivals, chiptune musicians need to actually perform in order to get the audience excited, just as the DJ does. They are the DJs of the game community, the techno-shamans that guide the audience through game sounds and images, through playful flows of 8-bit aesthetics.



FIGURE 1. Live 2007 12 01 @ The Blip Festival, New York NY US.
Photo by Marjorie Becker.

But the most important aspect of these events is that they are unique meetings in which members from this subculture can experiment face-to-face dialogue within the same geographical space. Meeting in a physical place is part of an “intertextual network” that also includes communicate in Internet and sharing music, videos, readings, and other popular materials, as the fan communities studied by Henry Jenkins (1992) do. Chiptune members are also fans. They congregate around specific gaming symbols and meanings that make them unique as a subculture, that is, as a social formation that has developed its game-specific lingo, online and offline. They form a “knowledge community” (Levy, 1997) that shares information about music, videos and games via websites, online forums and face-to-face conversations. Gaming is thus a resource for conversation, social interaction and identity construction. In fact, many chiptune artists and fans identify themselves as “chiptuners”, just as other game fans identify themselves as “modders”, “LANners” or “hardcore gamers”.

If chiptune is a subculture it is because is something different and there is a distinction between this particular social group and the larger culture/society. As Thornton (1997a) says: “the emphasis is on variance from a larger collectivity who are invariably, but not unproblematically, positioned as normal, average and dominant” (p. 5). Chiptune music works in opposition to the mainstream culture and its trendy products. In fact, the prefix “sub” in “subcultures” ascribes “a lower or secondary rank to the entity it modifies” and “gives us a clue to one of the main assumptions of this tradition of scholarship”: that the social groups investigated “are subordinate, subaltern or subterranean”, even deviant or debased (Thornton, 1997a, p. 4). In this sense, chiptunes musicians are sometimes qualified as infantilized geeks, nerds or fans, groups that are also seen as deviant or outsiders, whose interests are alien to the realm of “normal” cultural experience and whose mentality is out of touch with reality, as Henry Jenkins (1997) says about the fans. As I already said, chiptune artists are also fans: fans of Game Boys, Commodores, Amiga computers and other old gaming and computer devices. For people outside the subculture chiptune musicians and fans can be interpreted as fanatics with obsessive or weird likings, but for people inside the subculture it is just a particular lifestyle: “an underground sound community, a digital lifestyle platform”, as can be read in micromusic.net, the first online community devoted to chiptune music.

LOCAL AND GLOBAL CHIPSONGDS

The description of micromusic.net as an “underground sound community” and a “digital lifestyle platform” shows the importance of online communications for the development of the chiptune subculture. As Thornton (1997b) suggests: “mediated communication has long been integral to the definition and operation of subcultures” and they can have “a strong sense of unity over vast geographical and social distances” (pp. 473–475).

Since the early days of chiptunes, in the tracker and demo era, groups of people used online communication technologies such as BBS “to trade software, communicate with friendly users, and taunt others” (Driscoll and Diaz, 2009, p. 57). With the rise of the Internet and the World Wide Web, it was possible to communicate more easily with people around the world. The Web made possible for the first time to store images and sounds in a manner accessible to millions and technical information about how to hack gaming platforms and how to create chip music became more accessible. A whole Internet music scene started to grow up around the net, especially with the release of micromusic.net and 8bitpeoples in 1998 and 1999 respectively, the first and most important online communities devoted to chiptune music. In micromusic.net users could upload their own works, to advertise local events and to interact as a global community. 8bitpeoples [Figure 2] is a record label centered in New York City that was founded in 1999 by Jeremiah “Nullsleep” Johnson and Mike “Tangible” Hanlon. It is currently run by Nullsleep and Joshua “Bit Shifter” Davis, two of the most important chiptune international figures.



FIGURE 2 –8bitpeoples. Source: 8bitpeoples.com.

1. Publishing quality music for free and with limited copyright (Creative Commons License, or Copyleft) has been another characteristic of the chiptune scene, firmly embedded in open source culture. Chiptune artists have pioneered new distribution strategies, encouraging the dissemination of their work rather than its systematic protection and taking the counterpoint to the record industry (Weil, 2009).

8bitpeoples is also involved in the organization of the international Blip Festival event series, probably the most important chiptune events in the world. As it can be read in the website:

The 8bitpeoples first came together in 1999 as a collective of artists sharing a common love for classic videogames and an approach to music which reflected this obsession. Our primary interests were to provide quality music for free and most importantly to have fun. In the years since, we have grown in rank and expanded our goals¹.

Indeed, with the explosive growth of international communication thanks to the emergence of the web 2.0 and the development of social networks services such as MySpace, Facebook, Flickr or Youtube, the chiptune audience has grown significantly. The result, as Bittanti (2009) says, is a phenomenon that is both local and global: “Local because these artists still perform in small electronic clubs that dare to be different” (p. 35); and global because thanks to the Internet and the social networks the community is growing in novel and creative ways, taking advantage of the tools provided for the web 2.0 for the production, distribution and reception of this type of music.

HACKING AND PLAYFULNESS IN THE CHIPTUNE SUBCULTURE

The experimentation with old gaming devices and computer platforms that is at the center of the chiptune scene is in close relationship with the hacker culture and its sense of playfulness. There is a passion within the chiptune subculture -especially during its early days- of forcing a limited machine to make unexpected things and create new types of sounds. This is another form of immerse oneself in game culture: exploring the details of gaming devices and how to stretch their sound capabilities.

According to hackers’ self-definition, a hacker is a person who enjoys “exploring the details of programmable systems and how to stretch their capabilities”, or “one who enjoys the intellectual challenge of creatively overcoming or circumventing limitations” (Raymond, 1996, pp. 233-234). Playfulness is therefore “absolutely central to what hackers do and how they perceive themselves” (Danet, 2001, p. 26). In fact, the origin of the term hack is ludic. It derives from MIT jargon for “prank”. A hack is thus a project undertaken or a product “built not solely to fulfill some constructive goal, but with some wild pleasure taken in mere involvement...”, to qualify as a hack, the feat must be imbued with innovation, style, and technical virtuosity” (Levy, 1994, p. 23).

Chiptune artists, like the first hackers and the home computer hobbyists to follow, were seeing what the machine would do, interacting with the computer system in a playful and exploratory rather than a goal-directed way. The history of chiptune subculture is thus the history of people modifying and hacking early computer devices and video game consoles in order to explore their sound capabilities and make them full-fledged music workstations. The result is the development of a multi-faceted cultural phenomenon that lies at the intersection of technology, music, art, and politics (Bittanti, 2009) and that tell us an alternate history about personal computing and gaming practices in the digital age.

CHIP MUSIC AS THE NEW PUNK

In November 2003, Malcolm McLaren, former Sex Pistols manager, wrote an article for *Wired Magazine* claiming chiptune music to be the new punk. The article was very controversial among the chiptune community because it was interpreted as a McLaren's effort to create a new hype around what he called "8-bit punk". The result was an open letter from chiptune community member Gareth Morris (2004), aka gwEm, questioning McLaren's statements. Morris and the chiptune community understood the McLaren's portrait as "at least inaccurate, certainly without acknowledgement of the 25 years of chip music history, and possibly even using ideas and concepts taken from us", for example the phrase "Fuck Pro Tools":

In Wired magazine you mention that the phrase "FUCK PRO TOOLS" perfectly described what you'd "been feeling for months". However we wonder if you were aware the phrase 'Fuck Pro Tools' was one original voiced by the founders of micromusic in the Spring of 2000, and one that we still stand by? (Morris, 2004).

While it is true that McLaren was trying to create a new hype around chip music, it is also true that this music shares some of the characteristics of the punk ideology, that is, the group of varied social, aesthetic and political beliefs associated with the punk subculture: DIY (do it yourself) ethics, rebellion, anti-establishment, sincerity, authenticity, etc. For example, in the chiptune subculture we can see a small-scale "do it yourself" world of music recording and distribution, events, concert promotion, festivals, and visual texts such as posters, t-shirts and flyers. Also, chiptune music sounds raw, noisy and subversive, just as early punk music. People not familiar with chiptune music describe it as "noisy" or "unlistenable".

As Laing (1997) points out, this is always one effect of innovation in popular music: "the introduction of material from a discourse outside the mainstream is recognized by many as 'unlistenable'" (p. 418). According to this author, the identity of punk as something different "depends in part of its achieving a disquieting impact on listeners whose expectations are framed by mainstream popular music and its values" (p. 419). Punk is not alone here. Chiptune music is another manifestation of this consciousness of "otherness" or difference built at the periphery of the mainstream culture. It is music that has "shock effects" and that, like punk, "involves confronting an audience with unexpected or unfamiliar material which invades and disturbs the discourse to which the audience is attuned" (p. 416), in this case that of the clean, quiet, and unobtrusive modern gaming devices and their bright and pure sounds.

LESS IS MORE: THE POLITICS OF CHIPTUNES

As we can see in the hacker/punk implications pointed above, chiptune artists tend to present themselves as inherently subversive. From the oppositional standpoint they claim, they disregard the latest technological developments, upgrades, sound and 3D graphic cards. Also, they tend to oppose the idea of the “planned obsolescence”², which has proved to be one of the best ways to control and manipulate the masses through technology, especially in the digital age. They prefer old computers and gaming devices to the latest digital audio workstations. “Fuck Pro Tools”, as the member of the micromusic online community said.

Dragan Espenschied of Bodenständig 2000, a popular German chiptune band, recognizes this: “There is no secrecy about it, or elitism. It’s not about having the latest Pro Tools or whatever. This is what made me first go into this chip music: the do-it-yourself thing” (Van Buskirk, 2007). Chiptune musicians design their own music workstations by modifying and hacking commercial products such as the Game Boy, exploring their details in playful and exploratory ways. In so doing, they shed new life to old and “dead media” (Sterling, 2008) creating new uses, new practices, new aesthetics, and a whole new sound/gaming community.

These practices exemplify Michel de Certeau’s (2002) distinction between “strategy” and “tactics”. According to this author, governments, corporations and other institutional bodies produce “strategies” to achieve their goals (for example, to produce things like maps to describe the city as a unified whole and transmit the idea of a unified view). By contrast, individuals can go beyond these systems of meaning by using “tactics” that are never fully determined by the strategies of the institutional bodies. De Certeau gives us the example of the walker taking shortcuts in spite of the strategic grid of the streets that appear in the maps. The French author then claims that everyday life works by a process of “poaching” on the territory of others, using already existing rules and products in new ways. That way “consumers” can be “producers” by using “tactics” in novel and unexpected ways, as for example appropriating Game Boys and other obsolete technologies to transform them into useful music workstations. In this sense, chiptune artists are similar to game modders who take the resources which capitalism gives (or more accurately, sells) them and use these creatively, subverting their “intended meanings”, making their own games, adaptations or levels or even sometimes for deviant ends, such as illegally “cracking”, copying and distributing software (Crawford and Rutter, 2006, p. 160).

2. It was the American industrial designer Brooks Stevens who in 1954 coined the term “planned obsolescence” to describe the strategy of “instilling in the buyer the desire to own something a little newer, a little better, a little sooner than is necessary” (Adamson, 2003). The term “planned obsolescence” refers thus to the forceful policy of planning or designing a product with a limited useful life, so it will become obsolete, unfashionable or no longer functional after a certain period of time in ways that are designed by the corporation itself.

Most chiptune artists express an explicit reaction against new technologies and trendy gaming devices such as Wii, Playstation or Kinect. As chiptune artist Nullsleep says: “There’s nothing inherent to the Wii

that you hear it, and it makes you say, ‘Oh, this is music from the Wii.’ It sounds the same as music you go and buy on CD” (Ryzik, 2007). Chiptune artists are very tied to a particular sound synthesis chip. The Game Boy sound chip, for example, has a very distinctive style that is not possible to find in the sound of modern gaming devices. As Little-Scale points out: “Old video game consoles have got a very unique sound, and each console has its own unique sound because it’s got different hardware inside of it that generates the sound, as opposed to modern video games that can play anything” (Chang, 2010).

The same is true for up-to-date audio programs and the newest personal computers. Chiptune production is not about sitting in a modern computer like Apple and pretty much do whatever you want with heaps of tracks and channels provided by programs like Pro Tools or Ableton. Chiptune production is about having limited resources that will force you to work creatively within those limitations, like finding clever ways of getting new sounds out of a system that might not have been heard as much before, or working around limitations. For example, the Game Boy only has four channels, so you can only make four sounds at once. The challenge is how to write music that sounds really full and textually interesting with only those four channels (Chang, 2010).

This is thus a new version of Ludwig Mies van der Rohe’s motto “Less is more”, that is, to use the simplest and fewest elements to create the maximum effect. “Giant sounds from small machines”, as chiptune musician Bit Shifter describes his own work. As he says in its webpage bit.shifter.net:

Bit Shifter explores high-impact, low-res music produced using primitive gear and synthesis as a deliberate aesthetic choice. Adopting a distillation of the less-is-more philosophy, Bit Shifter operates with a standard Nintendo Game Boy as a means of exploring the aesthetics of economy, pushing minimal hardware to its maximum.

The hacker philosophy is very clear here: the goal is to stretch the capabilities of the systems in a ludic and exploratory way; to enjoy the intellectual challenge of creatively overcoming or circumventing limitations, just as the hacker does. However, it is also true that some chiptune producers are using programming tools that can be freely downloaded on the Internet and that do not require such a detailed technical knowledge (Morris, 2004). Modern computers can also play a variety of chiptune formats through the use of emulators and platform-specific plugins. The hacker practice was more common in the beginning, but it remains as a reminder of the politics of appropriation embedded in the hacker philosophy and its ability to disrupt a system of power in unexpected ways. But all chiptune artists play music under some limitations, and the intellectual challenge of creatively overcoming or circumventing those limitations will always be a hacker thing.

CONCLUSIONS

Chiptune music is an interesting cultural phenomenon that has not received significant scholarly attention. This is far from strange if we acknowledge that there is a wider tradition of ignoring the audio side of audio visual media. The case of the chiptune movement is special because it is a mainly musical scene born out of a particular audio visual and interactive medium: video games. It is an interesting case of study because it shows how the music, sounds and noises of early games and gaming devices can develop a particular form of subcultural expression.

The chiptune subculture has grown significantly since the tracker and demo era and there are more and more artists and persons interested in this type of music and the subculture that has been built around it. They form a “knowledge community” (Levy, 1997) where individuals exchange information about music, videos and games via websites, online forums and face-to-face meetings.

What distinguishes the chiptune subculture from other social groups and what makes it an important object of study is that its participants are centered around a specific era in the history of video games: the 8-bit era. It is a movement that is socially constructed through artists’ playful congregation around retro-gaming symbols. What is unique about this subculture is its reaction against the latest technological developments and digital workstations and its respect and devotion to old forms of gaming devices through the exploration of their sound capabilities. But as I have shown throughout this paper, although the music is at the center, the visual aspect is also important, as well as the social, political and performative implications.

To study this particular subculture is thus to study a multi-faceted cultural phenomenon that lies at the intersection of technology, music, art, and politics (Bittanti, 2009). It is also to study an interesting and alternate history about personal computing and gaming practices in the digital age: a history about how old, obsolete and “dead” gaming devices can be sources of innovation and creativity in contemporary digital society.

REFERENCES

- Adamson, G. (2003). *Industrial Strength Design: How Brooks Stevens Shaped Your World*. Cambridge, MA: MIT Press.
- Bittanti, M. (2009). So, When did Planned Obsolescence become an Artistic Practice? In D. Quaranta (Ed.), *Playlist* (pp. 32-36). Gijón, Spain: LABoral.
- Chang, T. (2010). Little-Scale has a PhD in Making Party Jams on Obsolete Game Systems. *Motherboard*. Retrieved from <http://www.motherboard.tv/2010/1/7/little-scale-has-a-phd-in-making-partyjams-on-obsolete-game-systems>
- Crawford, G., & Rutter, J. (2006). Digital Games and Cultural Studies. In J. Rutter & J. Bryce (Eds.), *Understanding Digital Games* (pp.148-165). London, UK: Sage.
- Danet, B. (2001). *Cyberpl@y. Communicating Online*. Oxford, UK: Berg.
- De Certeau, M. (2002). *The Practice of Everyday Life*. Berkeley, CA: University of California Press.

- Driscoll, K., & Díaz, J. (2009). Endless Loop: A Brief History of Chiptunes. In D. Quaranta (Ed.), *Playlist* (pp. 52-62). Gijón, Spain: LABoral.
- Gelder, K. (1997). Sounds, Styles and Embodied Politics. Introduction to Part Seven. In K. Gelder & S. Thornton (Eds.), *The Subcultures Reader* (pp. 373-379). London, UK: Routledge.
- Gottschalk, S. (1995). Videology: Video-Games as Postmodern Sites/Sights of Ideological Reproduction. *Symbolic Interaction*, 18 (1), pp. 1-18.
- Hebdige, D. (1979). *Subculture. The Meaning of Style*. London, UK: Methuen.
- Jenkins, H. (1992). *Textual Poachers: Television Fans and Participatory Culture*. London, UK: Routledge.
- Kinder, M. (1991). *Playing with Power: From Muppet Babies to Teenage Mutant Ninja Turtles*. Berkeley, CA: University of California Press.
- Kopstein, J. (2011). Magical Game Boys: Demystifying the Live Chiptune Performance. *Motherboard*. Retrieved from <http://motherboard.vice.com/blog/new-diy-game-boy-synth-will-bring-8-bit-to-the-masses>
- Quaranta, D. (2009). *Playlist. A Reader*. In D. Quaranta (Ed.), *Playlist* (pp. 20-24). Gijón, Spain: LABoral.
- Laing, D. (1997). Listening to Punk. In K. Gelder & S. Thornton (Eds.), *The Subcultures Reader* (pp. 406-420). London, UK: Routledge.
- Levy, S. (1994). *Hackers. Heroes of the Computer Revolution*. Harmondsworth, UK: Penguin Books.
- Levy, P. (1997). *Collective Intelligence. Mankind's Emerging World in Cyberspace*. Cambridge, MA: Perseus.
- Márquez, I. (2011): Israel V. Márquez interviews Domenico Quaranta (June 2011, Unpublished). Retrieved from http://domenicoquaranta.com/public/TEXTS/2011_06_marquez_interview.pdf
- McDonald, G. (2004). A History of Video Game Music. *Gamespot*. Retrieved from <http://www.gamespot.com/articles/a-history-of-video-game-music/1100-6092391/>
- McLaren, M. (2003). 8-Bit punk. *Wired*, 11 (11). Retrieved from <http://www.wired.com/wired/archive/11.11/mclaren.html>
- Morris, G. (2004). Open Letter to Malcolm McLaren. *Micromusic.net*. Retrieved from http://micromusic.net/public_letter_gwEm.html
- Thornton, S. (1997a). Introduction. In K. Gelder & S. Thornton (Eds.), *The Subcultures Reader* (pp. 1-11). London, UK: Routledge.
- Thornton, S. (1997b). Mediated and Virtual subcultures. Introduction to Part Eight. In K. Gelder & S. Thornton (Eds.), *The Subcultures Reader* (pp. 473-477). London, UK: Routledge.
- Raymond, E. S. (1996). *The New Hackers' Dictionary*. Cambridge, MA: MIT Press.
- Ryzik, M. (2007). Making Old Hardware Play New Tunes. *New York Times*. Retrieved from <http://www.nytimes.com/2007/11/28/arts/music/28blip.html>
- Sterling, B. (2008). The Life and Death of Media. In P.D. Miller (Ed.), *Sound Unbound. Sampling Digital Music and Culture* (pp. 73-81). Cambridge, MA: The MIT Press.
- Van Buskirk, E. (2007). “Chiptune” Bands Blitz New York for Blip Festival. *Wired*. Retrieved from <http://www.wired.com/entertainment/music/news/2007/11/blipfestival>
- Weil, B. (2009). The Re-Invention of Technology: An Act of Creative Resistance. In D. Quaranta (Ed.), *Playlist* (p.12). Gijón, Spain: LABoral.