AUTHENTICITY AND EMULATION: CHIPTUNE IN THE EARLY TWENTY-FIRST CENTURY

Sebastian Tomczak
Postgraduate Student
Electronic Music Unit
University of Adelaide,
South Australia, Australia

ABSTRACT

The modern practice of *chiptune* music is based around the appropriation of sound generation as utilised in video game technology. The obsolete consoles and their integrated circuits explored in this practice focus almost exclusively on synthesis techniques rather than sample playback.

The unique sonic characteristics of the devices used and the way in which they are controlled form an integral part of the identity that is shared by many chiptune musicians and performers. This paper will explore the role and the importance of authenticity within the chiptune genre of the early twenty-first century.

Conversely, the function that this authenticity serves within the genre will be contrasted against the advantages afforded by the emulation of video game sound chips within modern computer music environments.

1. INTRODUCTION

1.1. Chiptune Overview

This paper will examine the field of modern chiptune– being the composition and performance of present-day electronic music on obsolete videogame hardware. Recent software utilities neither authorised nor endorsed by first or third party corporations are used in the process.

Examples of consoles that have been extensively explored include the Nintendo Entertainment System, the Nintendo Gameboy and the Commodore 64.

It should be noted that hardware and software development within the field of chiptune continues into the present day.

The availability of accessible software development tools in the late twentieth century for obsolete consoles such as the Gameboy helps to explain the growing number of programs and subsequently users that the scene has enjoyed in the last decade. As explained by the programmer of the well-known Gameboy music program Nanoloop, Oliver Wittchow [7]:

"In the late 90s, development tools (compilers, flash carts, etc) became available and it's just natural that music software development started immediately."

1.2. Hardware

The importance of hardware within the chiptune genre can be viewed as being at least two-fold in nature.

On the one hand, it is the original hardware that provides the musicians with a unique-sounding tool for the creative process.

On the other hand, the hardware can hold a symbolic strength for many persons involved with chiptune music, from nostalgia to anti-consumerism.

2. EMULATION

2.1. Conceptual Basis

In recent years, the rise in the computing power available to consumers has made the emulation of non-host computer systems a reality in regards to a faithful reproduction. Sound chips from various video game consoles and arcade machines have been emulated successfully for many years in emulators such as MAME (Multi-Arcade Machine Emulation) and MESS (Multiple Emulator Super System). These systems aim to accurately emulate the complete behaviour of a video game system, including graphics, user input, physics engine and sound generation.

It is software such as this that provides a conceptual basis and a precursor for the emulation of the sound generating circuits for the use of musical production. In the case of arcade machine or game console emulation, data is retrieved from the read-only memory file in real time in the same process that memory is accessed and that the sound generation hardware is written in a physical machine.

This concept is not too far removed from having a software-based plug-in running within a software music environment (such as a sequencer) and routing data to that instance of the plug-in. Thus, a sequence of music can be played back. The sequencer represents the game memory, the plug-in represents the sound generation hardware and the routing in between the two represents the data and address bussing physically found within a real-world device.

2.2. The benefits of Emulation

The emulation of sound generation hardware within a host computer system whereby the main synthesis parameters can be controlled by the end-user holds a

number of clear benefits over the more 'traditional' method of using actual, original hardware. Such advantages include ease of integration and synchronization into a host sequencer music environment, potential cost effectiveness and accessibility and the freedom of musical control via an interface or system as chosen by the user (not the music software programmer).

2.2.1. Ease of Integration

If a sound generation integrated circuit is emulated successfully and used as software plug-in, any data that is routed to the plug-in will play as expected from a software -based synthesiser (i.e. quickly and directly). This affords a high level of integration into a musical work with relative ease when compared to using purely a hardware-based approach.

2.2.2. Affordability

In addition to the ease of integration aspect of using emulated sound circuits, there may also be financial incentives. A number of freely available synthesisers or sample libraries are direct reproductions or have been inspired by classic chiptune hardware.

For example, Basic64 is a virtual instrument synthesiser inspired by the sound chip of the Commodore 64, released by de la Mancha production studio. This software is compatible with a wide range of modern sequencing environments. [3]

Kyle Buza's Mmonoplayer site features programming objects and virtual instrument plug-ins that aim to emulate the sound chips of various consoles directly, including the Atari 2600, 5200 and 7800, Sega Master System, Gameboy and the Nintendo Entertainment System, among others. [2]

Both of these resources are freeware.

Compare this to the costs of purchasing a Gameboy, a flash cart, a transfer device and a digital license for LSDJ (a music tracker program for Gameboy), which can easily add up to AU$130 or more.

Of course, this reasoning assumes that the end-user already owns a personal computer of some description as well as appropriate audio mixing and sequencing software that is compatible with the sound chip emulation software.

2.2.3. Accessibility

There may also be an advantage through the use of emulation if certain hardware solutions are difficult to acquire. For example, a number of instruments and packages have been produced in very small quantities.

At the time of writing, one of the most recent Gameboy synthesiser programs titled Pixelh8 by Matthew Applegate has already sold out after a small run of only twenty-five physical cartridges. A second batch of cartridges has been planned [1].

Official LSDJ cartridges for Gameboy have not been produced in a long time. In order to use the program on original hardware, users must acquire reprogrammable cartridges with flash-based memory and an appropriate transfer device [4]. Although this equipment can be purchased, it should be noted that at the time of writing only a small number of suppliers stock these products.

Naturally, digital emulation of sound chip hardware can be distributed electronically via the internet and as such there are no limitations of accessibility in the same manner as there is with actual hardware (although the end user must have appropriate host-computer hardware and software).

2.2.4. The Issues of the Human Interface

The final benefit that comes with emulation is one of how the sound chip and the sounds that it produces are accessed by a human user.

When chiptune software is used only on related hardware, it is obvious that the software must also provide an interface to the sound chip and that this interface must always be limited by the memory, clock speed and methods of user input native to the system in question.

These limitations can take a number of forms. LSDJ for Gameboy has a maximum of two hundred and fifty-six musical phrases (termed *chains*) where each chain is up to sixteen subdivisions in length. Although this is a large quantity, it is by no means comparable to the amount of data that can be stored in a sequence using a modern sequencing environment.

The Synthcart program for the Atari 2600 console by Paul Slocum [6] is another example of where the limitations of the console in question (beyond its sound producing capabilities) also constrain the way in which music may be created. Due to the memory constraints, only preprogrammed percussive patterns are available to the user.

However it should be noted that the assembly source code is freely available and with enough knowledge and effort, it is possible to reprogram the percussive patterns and build a new ROM image that can be burnt to an Atari cartridge.

Additionally, the range of tempi that are available within the software is small and quite non-standard. This is due to the clock speed of the Atari hardware [5].

There are some instances of chiptune software and hardware where this is not such a problem. An example is Chris Kann's MIDINes device, through which the sound chip of a Nintendo Entertainment System can be accessed via MIDI. In essence, this turns the console into a sound module rather than a standalone music creation tool (as is the case with LSDJ and Synthcart). The upcoming MSSIAH cartridge for Commodore 64 has features of a similar nature.

None of the limitations discussed above are of any concern when emulated sound sources are used. The tempo, the amount of data and to some degree the way in which that data is entered is left open to the desires of the end-user.

2.3. Emulation and *Mainstream* Music

The various benefits discussed above will undoubtedly influence the popularity of timbres and melodic structures from chiptune to be included in more mainstream music.

3. AUTHENTICITY

3.1. The Importance of Authenticity

If emulation offers so many possibilities and advantages, why do chiptune performers still place such an importance on hardware solutions? Even though emulation is desirable in certain circumstances when requiring the timbres of sound chip devices, original, 'authentic' hardware plays an important role within the chiptune genre.

3.2. Unique Sonic Characteristics

The devices used in the chiptune genre posses unique sonic characteristics. xwElements that add character to the sonic identity of the hardware include specific noise bands that differ on a model-to-model basis as well as a unit-to-unit basis as well as frequency components affected by the electronic specifications and behaviour of an integrated circuit.

It can be stated that these elements that help shape the sonic identity of such a device are a direct product of the function of a video game console. That is to say that the design and manufacturing process employed for such machines plays an integral role in the aural outcome when these machines are taken out of their original context and used in a musically creative activity. It subsequently follows that the purpose and original function of the device (in this case a video game console) directly influences the practical issues of design and manufacture.

For instance, the fact that the device in question must be able to perform a number of other complex tasks (such as monitoring user input and generating a video signal) whilst remaining financially competitive results in a product whose sound producing capabilities are completely different than those of a commercial synthesiser purchased from a music store.

Thus, elements that might be considered as undesirable in many other contexts of instrument building within music technology such as inherent noise bands and relatively simple waveforms acquire the status of adding character.

In part, it is these unique sonic characteristics as well as the emotional and nostalgic attachment felt by a certain demographic that helps perpetuate and evolve chiptune as a computer music genre.

3.3. An Attitude of Rebellion

It would appear that another driving force behind the chiptune music genre is a sense of rebellion or anti-consumerism. Although a number of references have been made comparing chiptune to the birth and rise of punk music, it is unclear how far such a comparison will stand. However, the fact remains that through the use and development of new chiptune software, obsolete machines that have stood the test of time (and of children) have matured and found a second life through their use as musical instruments.

In the case of chiptune musicians and performers, the latest software synthesiser plug-in or tactile interface simply isn't a necessity to own in order to create electronic music.

In essence, it is the re-assignment of a device to a role that is in opposition to the purpose it was designed for that underpins this anti-consumer sentiment. By inverting the function of a video game console from providing a purely passive experience to where the end-user is able to actively create and achieve a musical outcome, the consumer is transformed into a creator. This attitude is concisely expressed by the Gameboy musician Emma Davidson [5]:

"The joy is to take this toy and turn it from a passive consumer device for killing time into something creative."

To some degree, this is also connected to the idea of an intellectual challenge; to take something and use it outside of its normal boundaries. This can be linked to the origins of chiptune music software development as part of the 'demo scene'.

In conclusion, the emulation of sound chips via desktop computer software does have its place. However, not all roles of sound chip hardware can be fulfilled simply by using the software equivalent.

The hardware aspects of chiptune music and the importance of authenticity play an important role in the identity of the genre. This is something that has continued into the twenty-first century.

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