Turntable Music in the Digital Era: Designing Alternative Tools for New Turntable Expression

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ABSTRACT

Turntable musicians have yet to explore new expressions with digital technology. New higher-level development tools open possibilities for these artists to build their own instruments that can achieve artistic goals commercial products cannot. This paper will present a rough overview on the practice and recent development of turntable music, followed by descriptions of two projects by the author.

KEYWORDS

Turntable music, DJ, turntablist, improvisation, Max/MSP, PIC Microcontroller, Physical Computing

1. INTRODUCTION

The vinyl record has lost its function as a practical audio playback media, gradually being replaced by magnetic tape, CDs, and now by compressed digital audio files. However, this century-old medium is not yet obsolete because its playback device, the turntable, proved to be an irreplaceable performance tool. The performers of this device, the DJ and turntablist, have played significant roles in the emergence of distinct musical genres and have been at the forefront of musical experimentation. They have become a cultural phenomenon replacing the guitar with the turntable as a symbol of youth musical culture [4]. The vinyl record and the turntable have convolved into a single musical instrument that is now universally recognized across multiple musical genres and disciplines.

Today, pro-audio manufacturers have a strong focus on DJ related products. New digital DJ tools both in software and hardware are being developed at a rapid pace, eventually to replace the vinyl as the primary audio source for DJ performances. However these new tools do not necessarily open doors to new musical expression. Simulation and efficiency of existing practice is the main focus of these tools, and artistic experimentation is difficult or just not possible. These products promote a future that only evokes the familiar past. Turntable music has evolved through both aesthetic and technological experimentations by the artists. Affordable computers and high-level programming environments have created a rich context for artists to build their own unique digital performance tools. It would benefit the modern day turntable musician to embrace this new technology and knowledge for both critically reflecting on their practice and creatively projecting new ideas for expression.

2. ASPECTS OF TURNTABLE MUSIC

The following section will introduce some aspects of turntable music that have directly influenced the author's projects. There are other publications that have covered the subject more thoroughly. Kjetil Falkenberg Hansen [5] has written an overview on the practice of turntablists and numerous reports on scientific analysis he has conducted on "scratching." Also, Bill Brewster and Frank Brougton's *Last Night A DJ Saved My Life* [3] is a valuable source for DJ history.

2.1 The DJ, The Turntablist, and The Turntable Materialist

The turntable musician can be roughly divided into three categories based upon their focus on skills and musical practice.

The DJ (sometimes written as Dee Jay to distinguish from the disc jockey) composes a sound-event by skillfully playing an array of recorded music. Many techniques exist for transition between different records, but the most critical technique lies in the ability to create a narrative flow through the selection of records. The DJ must continuously and spontaneously create a linkage in time that inspires a collective musical atmosphere. When the DJ is successful their presence becomes unstable, constantly emerging and withdrawing from the musical consciousness of the audience.

The turntablist in the context of Hip-Hop music, also referred to as the scratch DJ or battle DJ, strictly focus on turntable and DJ mixer manipulation techniques. The term "Turntablism" was born out of their devotion to hours of practice and their strong sense of community. Many of these turntablists will insist on only using the Technics SL-1200 series turntables. The high motor torque created by the company's Direct-Drive technology gives a wonderful tactile feeling for platter manipulation, and many Turntablism skills rely on the physical power of this turntable. In recent years they have pushed instrument manufacturers to produce tools that they desire,

sometimes resulting in products with truly innovative designs [15].

So-called "experimental turntablists" have had very little connection to Hip-Hop music or DJ culture, and are part of the experimental and improvisational music scene. Similar to how experimental filmmaker Stan Brackage [2] treated film at its materialistic level and emphasized its physical quality; these musicians sonically extract the fundamental characteristics of the turntable. The recorded sound on the vinyl is merely just one sound source amongst the other rich sound textures, such as the hiss and crackle from the damage of the vinyl, the feedback noise from the pickup needle, and the hum generated by the motor. These musicians each use a different setup of tools, combining numerous effect boxes or handmade devices with the turntable. Improvisation and conscious listening is often their main concern during a performance. Every sonic event is a reflection of what the turntablist decides to listen to, whether it is played from the turntable or something that emerges through not playing. Listening to the 'act of listening' becomes an important aesthetic for both the performer and audience.

2.2 Technology Hacking

Turntable musicians have hacked and modified their tools to achieve new artistic expression. Grandmaster Flash revolutionized the art of DJing when he added a headphone monitor feature to his DJ mixer. Although the practice of modifying and hacking has declined with so many products catered toward the turntablist, some musicians still find it necessary for means of new expression. Janek Schaeffer [12] and DJ Peaky have each constructed multi-arm turntables to play multiple sections off a single vinyl record. Kitundu [7] builds beautiful hybrid turntable-string instruments.

3. TURNTABLE MUSIC IN THE DIGITAL ERA

Though many DJs still prefer to play vinyl records, it seems only a matter of time for better physical interfaces to be developed and become standardized to shift the majority of the practice to digital technology. For the non-DJ turntablist, intuitive tools are scarce and musical experimentation still rely on clunky samplers and guitar effect pedals for the most part.

3.1 Digital DJing

One of the annoyances for a DJ is the bulkiness and weight of the vinyl records that one must carry to perform. Tools that can play more compact media with the same feel as the vinyl on the turntable was eagerly anticipated. Commercial products such as Stanton's Final Scratch [13] and Rane's Serato [11] accomplish this through a combination of time-coded vinyl records and de-coding software running on a host computer. Pioneer's DVJ-X1 [10] and Technics SL-DZ1200 [9] are digital hardware devices that simulate the analog turntable. On these devices conventional turntable gestures can playback and manipulate sound data stored on multiple media types such as CD, DVD and flash memory sticks. The primary goal of these products is to perfectly simulate characteristics of the analog turntable and vinyl media. This goal is nearly achieved, but it is questionable whether these products will bring anything more to the practice than relieving the DJ's chronic shoulder pain.

3.2 D'Groove and Ms. Pinky

The potential for new expression in digital turntable music lies in more experimental and open-ended projects. D'Groove [1] by Timothy Beamish is a prototype for a force feedback turntable controller. The most novel feature of this project is that it presents a new possibility to monitor and manipulate digital information. Turntablists already intuitively work with the strong force feedback from the motor. Adding characteristics of the audio source that is being played to the motor's feedback would not only be practical but would also encourage new improvisational techniques. Ms. Pinky [16] by Scott Wardle is a combination of a vinyl record with a constant signal source and a pitch tracking Max/MSP object to read the change in rotation speed. The strength of this tool is that it can easily expand the turntable gestures to be used for any application through the Max/MSP programming environment. Numerous interactive art projects have used Ms. Pinky as an input controller for physical output devices or for live video manipulation.

4. DESIGNING ALTERNATIVE TOOLS FOR TURNTABLE EXPRESSION

Like any musical instrument, the tactile feel of the turntable is essential to its performance. The challenge for designing new tools for the turntablist comes in two-fold: 1) how to translate useful characteristics and information into the digital domain without sacrificing the integrity of the instrument, and 2) how to apply that data in a meaningful way for a musical performance. The following section will discuss two projects by the author. Both projects focus on building peripheral hardware tools to a single Technics turntable and DJ mixer, which are the primary instruments, and creating software environments that encourage new performance methods and aesthetics. Physical Computing [6], C compilers for PIC microcontrollers and Max/MSP are all relatively high-level and resourceful development tools that helped achieve the technological tasks.

4.1 Lupa – A Real-Time Sampling Environment for the Turntable Musician

Lupa is a custom hardware and software toolset that enables the turntable musician to capture, layer, and manipulate the sounds that are generated during a live performance. It is a tool to condense the DJ performance into a shorter span of time, allowing the DJ to spontaneously compose with fragments of sounds rather than entire tracks. Prohibiting all physical interaction and reducing visual interaction between the musician and laptop computer during the performance became a prominent guideline for the design and development.

4.1.1. Hardware and Software

The hardware (see figure 1) was designed after two previous prototypes [8]. An 18F452 PIC microcontroller is used to translate numerous sensor inputs to MIDI messages. Sounds are sampled by a foot switch and later transformed by different modes of the joystick. Large game components are chosen to match the overall gestural movement of the turntable musician.

Figure 1. Lupa - hardware controller.

The software (see figure 2) is written in Max/MSP with four sample banks displaying the waveform, loop point, time progression and volume. The software not only records sound, but also can record every physical input applied to the controller. While the large red button is pushed down, all parameter changes that take place on each sample bank is stored. This data is played back as an automated sequence when the same red button is hit twice.

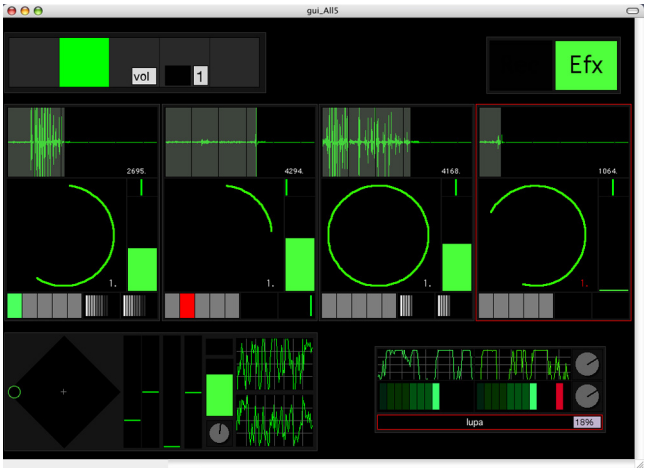

Figure 2. Lupa - software interface.

4.1.2. "At Glance" Graphical interface

The graphical interface needed to display data that the hardware interface could not represent, such as the sample waveform and time progression of the loop. It was important to design a single layer layout that was comprehensible at a glance and not engage too much of the performer's attention. Text labeling was kept minimal both to save screen space and to encourage the performer to learn the layout through practice. The LCD object in Max is used extensively to create large planes with moving parameters or for simple on/off indicators.

4.1.3. Anti-presets, anti-automation, anti-prerecorded samples

Building a system that was coherent to the audience was another strong motivation for this project. This was a reaction to the typical laptop musician and performance that was becoming prominent at the time. As a result, no parameter presets, automation algorithms, and prerecorded samples can be used in Lupa. Every sound generation and manipulation must take place during the performance on stage. Therefore all sound sources are restricted to what is generated from the turntable and any automation was merely a recorded sequence of a physical input that previously happened. The only predetermined factors are the instrument, the system, and the records that the turntable musician decides to bring. The execution completely depends on the skill of the musician and is often improvised.

4.1.4. Evaluation and future development

Lupa proved to be a successful tool, both as an intuitive sampling environment for turntable musicians and as a performance with clear sound relationships for the audience to understand. The undetermined nature made every performance unique, but at the same time placed enormous pressure on the performer. Unless constant attention is paid to multiple sound events and changes are applied, the sound structure quickly becomes repetitious and boring. Virtually the turntablist becomes a one-man marching band where one must question whether this much effort is contributing or distracting from the desired musical expression. Successful performances have been done with two turntablists, and this direction may be further considered. The system still requires the performer to look at the computer monitor for some critical parameters. Another hardware update is planned with improved visual feedback on the hardware itself. MIDI is sufficient for simple fader and switch data transmission, but USB will be chosen to power the device through the bus and reduce an adaptor that one might forget to bring to a gig.

4.2 Audile – Semi-Automated DSP Effects for Turntable Improvisations

Audile is a set of DSP effects controlled by a custom USB controller. Max/MSP is used to write the signal processing software and an 18F4550 PIC microcontroller is used to read the sensory input and transmit the data through the USB HID class protocol. The purpose was to create a dedicated tool for the turntable musician to perform with other improvisational musicians. Turntablists, especially scratch DJs, occupy both hands during sound generation with little bandwidth to control signal-processing parameters. Foot switches and expression pedals are useful interfaces, but are limited by the coordination of the foot. In order to create an instrument that is controllable without disrupting the existing performance flow, two approaches are taken.

4.1.2. Semi-automated parameter shifting

Inspired by the rotation of the turntable, constant movement is given to the parameters of the signal processing modules in the program (see figure 3). The movement can be stopped or modulated through the physical controller interface. This allows the turntablist to treat the effect module as an autonomous machine, each with a distinct but constant characteristic to work with and alter. *Turn* is a stereo delay module that changes its parameter based on a rotating dot. The position of the dot specifies the different delay time in both channels, with the maximum delay time depending on its rotating diameter. This diameter is changed through a foot pedal. The rotating movement can be turned on and off with a switch, and the speed of rotation and feedback amount are controlled by potentiometers. A 360-degree potentiometer disc controls the position of the dot. *Ghost* is a module that moves a point between four locations in a random "drunken walk" manner. Each location is assigned with reverb, delay, and distortion. The parameters of these effects are changed by the proximity of the drifting point. The foot switch triggers the drift and a mini joystick influences the tendency mask on which direction it moves to.

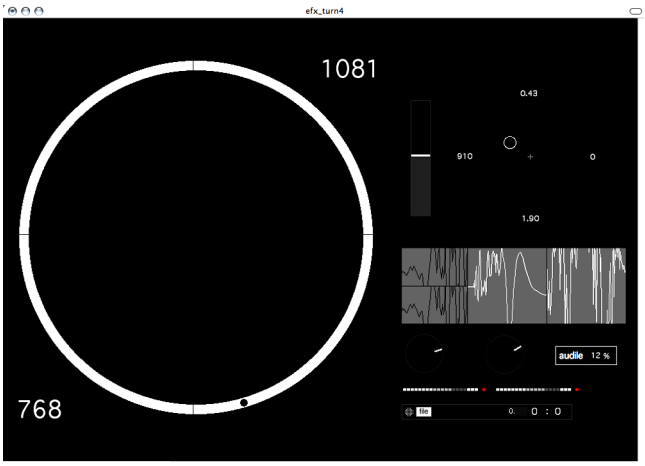

Figure 3. Audile - software interface.

4.2.2. Extracting gestural information from platter manipulation

There are several methods one can use to translate the gestural movements on the turntable to useful data. When a method that was portable and least intrusive was sought, the Tascam TT-M1 turntable controller (see figure 4) [14] became an ideal interface to incorporate. TT-M1 is a small device that attaches to the turntable and reads the rotation speed of the platter. Unlike the encoded records of Final Scratch or Ms. Pinky that are meant to play digital files on a computer, this device can read the platter movement while playing the sound from the vinyl record. Because this device is intended to be used with designated CD turntables, some reverse engineering was needed. The TT-M1 works like an optical mouse. An encoder disc attached to a wheel rotates at the same speed as the turntable sending pulses through an IR receiver. The firmware on the PIC chip interprets these pulses and transmits it to the host application. This data is used to change the amount of reverberation applied to the incoming sound. Another potentiometer is used to control the subtlety of this reverberation.

Figure 4. Tascam TT-M1 and Audile hardware interface.

4.2.3. Future development

Audile is still under development. The use of semi-automated effects and simple physical controllers has minimized the performer's attention to the computer monitor and allows more concentration towards the sound events. However, musical mapping of the turntablist's gestures needs to be further developed. Simply mapping reverberation to platter speed proved not to be that sonically interesting. Other gestures, such as fader movement and mouth movement will be explored. Additionally, Max/MSP does not have an object to receive and send HID data. Creating such an external object will benefit not only for this project but for others as well.

5. CONCLUSION

Designing new digital tools not only result in new sound textures and sound arrangements by means of computation, but also bring forth characteristics of existing tools that would otherwise not be noticed. This process has contributed to my expression as a turntable musician, forcing me to look deeper into my musical practice. New open-ended and developmental tools that are becoming readily available provide another option for the turntable musician to explore their musical possibilities and advance the practice to a new level.

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