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15 March 2015

Computer Music: Making Way More With Much Less

I pop open the rickety disk drive on my beat up second hand laptop. I scored it on Craigslist for a hundred bucks on account of it being both outdated and dropped a few times. I carefully pull the Ableton Live basic version installation disk out of its paper sleeve, snap it into the disk drive and push it shut. After meticulously entering the 24 character registrations key, and waiting a half an hour, I finally crack open one of the most capable digital audio workstations on the market. That first Ableton Live disk, was tossed to me by a roommate who got it for free.

I had tried my hand at being a musician many different times, elementary school trombone, the obligatory high school guitar lessons, but I was never satisfied enough with the results to keep practicing. Although I loved music, I'd just assumed I wasn't cut out to be the one making it. As a kid I was exposed some electronic music, most of it downloaded quasi legally through Napster equivalents (it was the 90's after all), but I had no idea how it was actually being made. Watching YouTube videos of electronic musicians explaining their craft drew me back into the idea of making my own music. It turns out, that the internet has provided a wonderful platform for beginners like myself with limited budgets and a surplus of spare time to learn. YouTube and other online resources provide thousands of hours of free and low cost tutorials while SoundCloud, a website where users can share original sound files for free, boasts more than 40 million users who upload 12 hours of audio every minute. Computers and their

connection to the internet are providing millions of people access to the means and education needed to make electronic music. Considering that many of these people, like myself, wouldn't have made music otherwise, the computer's impact on music making is worthy of investigation.

Being an artist whose music is inspired and enabled by the platform that computers provide, I'm curious about how computers have changed who makes electronic music, it's sound, and the methods behind how it's made. I suspect that personal computers and music software have made electronic music production among one of the most accessible means of making music for those who lack monetary resources. Can we isolate the qualities that make computers such an accessible musical instrument? Are there technical constraints or practical limitations that reduced accessibility electronic music before personal computers? These questions, among others, seek to explore the relationship between computers and the who, how, and sound of electronic music.

First lets consider how computers have affected who has access to the tools needed to make electronic music. We can begin by examining the first clunky steps in electronic music that began around the turn of the 20th century. According to Peter Shapiro, the first electronic instrument, the Telharmonium, was 60 feet wide, 20 feet tall, and weighed 200 tons (4). According to the documentary *Magic Music from the Telharmonium*, it was built before electronic amplification, as a means of transmitting music to many different places at once over telephone wires. To overcome volume loss during transmission, the Telharmonium created electrical tones with a power output of more than 14,000 watts. Although it was lauded for its technical achievements, *Magic Music from the Telharmonium* details how difficult it was to play even with its two required keyboardists. Any small glitch in its intricate construction would

greatly deteriorate the quality of its singular, airy, organ-like sound. An online article written by Jay Williston for synthmuseum.com explains that because of the Telharmonium's inflation adjusted production cost of five million dollars and waning public interest, the last Telharmonium was played in 1912, and the last model was scrapped in 1962.

The Telharmonium is just about the most inaccessible and impractical musical instrument that one can imagine. It failed on many levels to provide the baseline of accessibility needed to encourage adoption by professional musicians, let alone the even greater level of accessibility needed to entice non-musicians. High cost, difficulty in use, limited sound possibilities, and lack of portability, relegated early electronic instruments to laboratories where only scientists and professors had access. The Telharmonium is a dramatic example of the obstacles to creating electronic music, in contrast it seems surprising that electronic music is now one of the most accessible means of making music for musicians and non-musicians alike. How did subsequent electronic instruments and computers overcome the technical constraints and practical limitations that limited the accessibility of the teleharmonium?

Electronic instruments developed over the next 60 years reduced cost, increased portability, were easier to play, and had greater sonic possibilities. The Moog synthesizer, invented in 1963, was one of the first synthesizers that utilized compact and clear sounding transistors to produce sound. With a listed price of $4,000 to $10,000, according to the Moog *Synthesizers Professional Systems* catalogue, the Moog was still an expensive musical instrument, but it was simple to play and could be moved without too much risk of damage. The Moog also allowed for complex sound modification through a system of wires and plugs on the front panel. The Yamaha DX7, released in 1983, is the best selling digital synthesizer of all time

(Bijsterveld, Karin. Pinch, T. J. 556). With a list price of two thousand dollars, the DX7's microprocessor provided sonic flexibility, and a rich sound consisting of seven simultaneous voices compared to the Moog's three. With a slim form factor, and hard plastic construction, the DX7 proved to be a potent mix of power, convenience, and value. Both the Moog and the DX7 increased the popularity of electronic music by overcoming practical and technical limitations that restricted the accessibility the Telharmonium.

If pervious electronic electronic instruments became popular because they could overcome practical and technical obstacles that limited access, how do computers compare? Author Nick Prior argues that the convergence of functions capable on a modern laptop make it a "Meta-Instrument."

> "At once a means for recording audio, generating drum patterns, hosting software synthesizers and mixing down to a single file, the laptop encapsulates technological convergence. Indeed with the right software it replaces the function of a host of hardware devices, including multi-track portastudios, hardware synthesizers, mixing decks, samplers, channel strips, compressors, guitar amplifiers, effects units and sound modules" (914)

If computers can perform all of these roles simultaneously unlike the Teleharmonium, and even the Moog and DX7, does it effectively eliminate all the conventional barriers to electronic music production? Another way to explain the computer's role in electronic music production, is to compare it to mediums used in visual art. Give an artist oil paints and they will use their unique

set of properties to create a wide range of oil paintings. Give an artist pastels and they will use its particular qualities to create reams of pastel drawings. Although within each medium an artist can make limitless number of variations, the artist cannot make oil paintings with pastels, or a pastel drawing with only oil paints. Give the artist a well equipped studio and they can create oil paintings, pastel sketches, and whatever else they can get there hands on. If previous means of making electronic music could equated to paints or pastels, the computer is a well equipped studio. Previously electronic music was created and recorded through a collection of individual pieces of equipment that each performed one or two functions each. Even if the individual pieces were becoming more inexpensive and portable, adding up all the different pieces negated most of the gains in accessibility as electronic musicians had to amass and transport significant amounts of gear. The computer has made electronics the most accessible means of creating music, not because it inherently has a great sound, or is individually cheaper or more portable than other individual pieces of electronic equipment, but because it can provide the capabilities of the whole system of instruments at a fraction of the cost, while still fitting in your backpack. With a competent Dell laptop costing less than a mid-range electric guitar, computers have the greatest capability to price ratio of any musical instrument.

Now that we have established how a convergence of functions has made computers a popular choice for making music, I would like to examine how computers enable and shape the sound of electronic music. Initially it seems difficult to examine how computers affect electronic music because a computer does not inherently produce a particular type of sound, like in our previous analogy, an art studio itself doesn't create a specific kind of art. A computer’s unique sound instead comes from its ability to combine pre-existing sounds and technologies. In the

simplest sense computers can replicate the sound of a piano, or a flute. It can emulate a drumset, and recreate the scratching of a turntable. It can synthesize or record sounds and arrange them using the same methods used in a traditional music studio, by recording separate channels and mixing them together. The computer is a competent emulator of pre-existing instruments, technologies, and methodologies for their use, and certainly makes those techniques more accessible, but the computer's unique impact of the sound of electronic music comes from how it allows converged elements to interact and be expressively controlled in ways that were impossible to fathom pre-convergence. When electronic musicians had difficulty even gaining access to a couple of different technologies for making electronic music, they were not thinking about how to artistically combine the whole library of audio technologies. A man on a horse thinks about inventing a car long before he thinks about how to give that car better handling. In this sense, computer's convergence of pre-existing technologies, creates new sonic possibilities that were impossible beforehand.

The Music of Matt Moldover is a prime example of how a convergence of technologies creates a new sound. Moldover is a pioneering multi-instrumentalist who uses Ableton Live software and custom made hardware interfaces to create unique and innovative live performances. As a cofounder of the controllerist movement, Moldover has inspired and educated new artists through YouTube videos and online publication of tools and tutorials. Moldover's approach to composition and live performance embraces the musical possibilities provided by computers, unifying different sounds and technologies that were traditionally separate. In his 2007 YouTube video "Moldover's Approach to Controllerism," Moldover rapidly remixes the Peanuts cartoon theme, a hip hop acapella, and Beethoven's 9th symphony.

Moldover's computer software setup and heavily modified keyboard controller form an architecture specifically designed to quickly and expressively combine audio clips and apply audio effects. One set of keys allows him to quickly mute, unmute, and restart five different audio clips while Ableton Live music software keeps the five clips playing in time with each other. Rows of knobs and a panel of touch pads control computer generated audio effects that are applied to individual tracks or the final signal. Moldover also uses Ableton Live music software to organize sound clips into a grid of sonically compatible sounds so he can easily combine harmonically compatible clips. In a 2014 video titled "Vancouver Producers Forum Presents Moldover" he explains that the artistic manipulation of sound clips and audio effects represents "a whole new musical vocabulary." He continues, "The technology has been around for maybe 30 or 40 years, but it has only been in the hands of every music making person out there for maybe 10 years." This technique of rapid musical juxtaposition of disparate sonic elements, and the hardware interfaces it has spawned, represent a unique form of music that is shaped and enabled by computer's convergent properties..

Previously in this essay we described the computer's capability to replace other pieces of electronic equipment, but Chibi-Tech and the Chiptune genre show how computers can be used to unlock the sonic potential of equipment that was previously inaccessible. In a 2008 interview for denpanosekai.com, Chibi-Tech explains how she uses a piece of software called Famitracker to compose music on a computer and send that complex note data to vintage game consoles that in turn generate the actual sound. This compositional method creates a sound that is reminiscent of the energetic low-fi soundtracks of 80s video games, but enables tones and musical arrangements that are far more complex than what was possible when these devices were

invented. Chibi-tech specifically was involved in programming a unique vocal tone that has become his signature. According to the same interview, this specific technical innovation was a major factor in his initial rise to fame. The combination of innovation within restraints and drive to recreate the nostalgic feelings associated with early video game systems have contributed to the quick growth of artists like Chibi-Tech and the Chiptunes genre as a whole. If Moldover's work creates new sonic possibilities by unifying access to many different music production tools, Chibi-Tech and other Chiptune artists are taking this a step further by using computers to access and converge electronic devices that were never conventionally considered musical tools.

Who would have guessed that electronic music, the realm of Avant-garde musicians and university laboratories, would end up in the hands of the average amateur musician. The computer has broken down many of the obstacles that traditionally limited access to electronic music production by combining all of the necessary technologies into one portable and convenient package. Without computers, electronic music would have continued to be an inaccessible genre for the majority of musicians, especially those like myself who were discouraged by traditional instruments. Although computers may serve as a means of replicating previous technologies, the unique sound of computer music surfaces when their convergent properties combine sonic elements and equipment in ways that were previously unfathomable. In the case of Moldover, convergence allowed for rapid juxtaposition of disparate elements and effects, effectively inventing a whole new musical vocabulary. In Chibi-Tech's case, the computer allowed for utilization and optimization of devices that were not conventionally considered musical tools. The computers continued role as a musical catalyst many evolve similarly to the evolution of the internet, revealing possibilities that were not obvious at

inception. Future approaches to electronic music are difficult to predict, but the computer's unifying role as a convergent and access granting instrument warrant further examination for years to come. As adoption of tablets and mobile computing continues to grow, electronic musicians may replace computers by placing lighter more portable devices at the center of music making systems. Despite this trend, it's important to understand the large step forward that computers have caused in electronic music, seeding a generation of electronic musicians and enabling new dimensions of sonic exploration

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