

Re-coding the Musical Cyborg

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Abstract

Where does the line between musician and instrument exist, and can we redraw it? This paper defines the concept of the “musical cyborg:” a model for synthesizing human creativity and digital algorithms to create sounds that would not otherwise be possible through human production alone, rooted in the theories of thinkers like Juan Atkins, Kodwo Eshun and Donna Haraway. It then explores several different constructions of musical cyborgs, each demonstrating various degrees of opacity and accessibility: Kindohm, digital influencer-turned-musician Lil Miquela and Spotify-focused bands all rewrite the boundaries between human and machine in ways which effect how their work is consumed and replicated across digital networks. Most notably, the musical cyborg of the live coder is invoked in order to provide a potential model for future constructions of art-generating cyborgs. The paper assesses the impact of various open-source live coding projects in order to determine how these design choices can be replicated across a broader network of artistic practices. It concludes with the understanding that, while current technologies for open-source collaboration only presently exist through generous external funding, they nevertheless provide an imaginative and achievable vision for future projects, software and communities both within and beyond music.

Introduction

The guidelines for hosting an Algorave, posted on GitHub as a README file by British musician and academic Alex McLean, cautions users against framing the event as a revolutionary practice. After defining an Algorave as a live music show in which “most performances/acts should involve code-based and algorithmic generation of music and visuals, in a way that makes the code or algorithmic process visible,” the guide advises newcomers that “Algorave is not ‘the future of dance music’, we’re just trying things out as part of a much longer history” (McLean 2019). This longer history, as noted by

Roger T. Dean and McLean in the *Oxford Handbook of Algorithmic Music*, starts as early as the word “algorithm” itself around 900 AD (McLean & Dean, 2018, p. 5). More recently however, and perhaps unavoidably, algorithmic music - now commonly practiced through the digital medium of computers - has collided with the history of the digital algorithms which process data and people on a global scale. This is in part because algorithms, coupled with computational power, have the ability to execute processes far beyond the capacity of an individual person. In this way, algorithms have served to revolutionize the processing of data in the same way that mechanical tools once revolutionized the processing of raw elements. Algorithms undergird our financial systems and media landscapes, creating new paradigms for understanding the world. As such, whether by processing sound, consumer data or social interactions, the digital algorithm has become a notable cultural medium for artists.

The nature of how artists interact with algorithms, however, varies sharply between communities. Some musicians, like those who work within Digital Audio Workstations (or DAWs), use static algorithms as tools to produce a single desired output. Others use the algorithms created by streaming services like Spotify so as to better understand how they can shape their sound to increase audience engagement. Algorithms themselves now play a role in music as an aesthetic in and of themselves, as in the case of live coding: a musical practice which “foregrounds the human authorship of algorithms as the fundamental musical activity at play” (McLean & Dean, 2018, p. 4). This often takes the form of writing algorithms in real-time as a performance takes place, with the written algorithmic language itself being projected to audiences. “Algorithmic” has also become an identity: pop stars such as Lil Miquela and Hatsune Miku use the aesthetic of digital algorithms to generate a mystique surrounding their humanity or lack thereof. I want to suggest that all of these aesthetic relations to algorithms can be understood as differently-programmed constructions of the “musical cyborg:” a figure which combines human creativity and digital algorithms to create sounds and moments that would not otherwise be possible through human production alone. In calling forth

the metaphor of the cyborg, I do so according to Donna Haraway’s reading of it in the *Cyborg Manifesto* as “a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction.” (Haraway, 2016, p. 5) The cyborg musician is both a creative and social construction; its wiring produces sound while also providing insight into the “social reality” that produced it. Some musical cyborgs are a direct byproduct of our increasingly algorithmic society at-large: in a world shaped by black box algorithms developed by mega-corporations like Google and Facebook, musicians are presented with the challenge of navigating a hyper-reality in which information processing is entirely opaque; this results in a cyborg relationship that fosters an antagonism between its respective human and machine halves. Moreover, albeit on a smaller scale, black box musical cyborgs can conceal the humanity in their construction through further black boxing. Lil Miquela, a “digital influencer” based primarily on Instagram (Khan, 2018), bills herself as “not a human being” despite a lack of evidence for her behavior being produced by non-human processes (@lilmiquela, 2018). Human producers, then, are left competing with an invisible network of actors which manifest in these singular, fictional forms. This overall relationship elucidates an antagonistic relationship between humans and algorithms, despite their constant effect on each other.

This seemingly bleak path where algorithms are either the masters or slaves of humanity is not the end: Part of the reason the boundaries between human and computer production have been collapsing is because they have always been ripe for reconstruction. As Donna Haraway notes in the *Cyborg Manifesto*: “It is not clear who makes and who is made in the relation between human and machine. It is not clear what is mind and what is body in machines that resolve into coding practices[...] we find ourselves to be cyborgs, hybrids, mosaics, chimeras[...] There is no fundamental, ontological separation in our formal knowledge of machine and organism, of technical and organic” (2016, p. 60). Just as a cyborg’s construction can represent the world from which it was born, so too can it gesture towards not-yet-realized futures through its fictive components. Because “the ma-

chine is us, our processes, an aspect of our embodiment,” as Haraway continues, “We are responsible for boundaries; we are they” (2016, p. 65). This “we”, however, has become a case of contested ownership in the 30 years since Haraway published the Cyborg Manifesto between those steering the cyborg network towards optimized profiteering and those seeking to generate life within it. As Mackenzie Wark notes in her retrospective of Haraway’s work, “it was prescient of Haraway to notice, and early on, that ‘the new communications technologies are fundamental to the eradication of ‘public life’ for everyone.’ The reduction of a wide range of processes, and not just labor, to a thing, or in this case to code, supports a vast extension of private property relations” (Wark 2015). The algorithms that undergird musical cyborg network, with its musicians and instruments, now bear patents and code that make true interoperability a distant dream. Later in this paper, I explore how these components, found installed in artists that are optimized for the streaming economy, make it increasingly difficult to build communal knowledge. The more we accept this mode of algorithmic cyborging, both in and outside of music, the more hard-coded the network will become against any redistribution of power. The guidelines McLean lists for an Algorave construct an alternate model dependent on the transparency and experimentation of algorithms, which in turn proposes a new model for the musical cyborg. Though algorithmic music production takes many forms which vary in human agency, for this paper I want to focus specifically on musicians within the practice of live coding because live coders have the most deliberate and intimate relationship with algorithms among musicians. Moreover, it is a practice in which algorithms are equally visible to both the performer and the audience. Live coders, through this intimate relationship with their tools, offer a vision of what the cyborg musician could look like in an age of digital automation and reproduction, as realized through a few key practices, such as open sourcing and human-computer dialogue. These practices define protocols for discourse in the live coding community. As such, live coders can encode their own desired futures: “The boundary is permeable between tool and myth, instrument and concept, historical systems

of social relations and historical anatomies of possible bodies, including objects of knowledge. Indeed, myth and tool mutually constitute each other (Haraway, 2016, p. 33). Thus, the live coding community, through the development of their own agreed-upon tools and practices, proposes a future for all human computer relations.

Redefining the terms of algorithmic culture

In order for a musician to be able to author their own algorithms, the tools for algorithm authorship must be accessible at an individual level. Naturally, open source software has become one of the tenets of live coding: programs like TidalCycles and SuperCollider have dozens of contributors that continue to make changes to the software to this day. This accessibility makes the live coded cyborg both highly visible and mutable.

This creative paradigm stands in stark contrast to the music industry’s relationship to algorithms at large. At present moment, the influence of black-box technologies in popular music culture is simultaneously opaque and exploitable. Perhaps most notably within the context of creative development, Spotify offers artists the ability to understand themselves through the data the platform generates so as to appeal to a wider demographic. In a video titled “How to Read Your Data,” Spotify executives note that “Data can help you learn things you hadn’t even thought about before.” To demonstrate this, they feature a testimony from musical group slenderbodies [sic]. “Through the Spotify data we’ve come to realize that a lot of people consider us as electronic artists... it’s surprising to see that considering how organic our sound is... maybe there’s, like, a future for us doing some DJ sets on the side rather than just playing full live musician sets with a live band” (Youtube, 2018).

The band came to this conclusion through Spotify’s artist tools, which allow artists to see their most popular songs for given times and locations. Though they existed as musicians before Spotify, the data processing nudged slenderbodies towards new behaviors and creative decisions in pursuit of further quantifiable audience engagement.

There is a clear difference in slenderbodies' use of algorithms compared to a live coder's use, though, which is that a live coder's algorithm generates sound while the other generates consumer data. What this example is meant to show, rather than product of the algorithms, is the artist's relationship to algorithmic processes as a whole. The Spotify cyborg is blind to the large-scale processes which inevitably shape self-image, whereas the live coded cyborg actively shapes the algorithms they use to optimize their output on an individual level.

There has been another curious effect of widespread black box algorithm use: a new aesthetic has developed wherein human-produced artworks present as if they were algorithmically produced. This 1 cyborg, unlike the live coder, has their circuitry concealed in order to generate tension and confusion as to which parts of their construction are human and which are machine. With over 1 million followers on Instagram, Lil Miquela presents as a CGI generated model with feminine features, dressed in the latest high fashion and streetwear. Whether Miquela's actions are those of a robot or those of a human is unclear: the company behind her, however, is made of human actors. "Brud," the creator of Miquela, "[is] a mysterious L.A.-based start-up of 'engineers, storytellers, and dreamers' who claim to specialize in artificial intelligence and robotics" (Petrarca, 2018). Here, a black box conceals the efforts of human labor rather than those of an algorithm. That Miquela chooses to present as a robotic being shows that there is social capital at stake in the establishment of creative entities which, authentically or not, traffic in the aesthetics of computation and algorithmic production.

She's released several singles and an entire album, for which the credits are not publicly available. As perhaps alluded to by the title of one of her singles with electronic musician Baauer "Hate Me" (LuckyMe, 2018), the reception to Lil Miquela has been somewhat antagonistic. Nora Khan notes that fans "dissect her photos online and IRL, expressing disgust, disbelief, annoyance, loyalty, and adoration" (Khan, 2018). In her public announcement of being a robot, Lil Miquela acknowledges reading comments such as "You're Fake," "You're CGI" and "Show us your ACTUAL face" (@lilmiquela, 2018).

Even large institutions have participated in Miquela's dissection; one video by New York Magazine walks viewers through the process of "Hijacking" Lil Miquela in order to produce the digital figure in-house. The designer in the video superimposes an image of Lil Miquela over a featureless 3D model and subsequently distorts the image to lay over the model like a tight cloth (New York Magazine, 2018). This practice of "hijacking" the cyborg is only possible because of the gates constructed by Miquela's creators. With more visible circuitry, one could construct a similar influencer avatar without the invasive practices demonstrated in the video.

If people want to access the underlying circuitry of a digital art work, why not hand them the keys to the gate instead of forcing them to break in? Live coders also wield digital aesthetics for their projects, but do so in a way which makes the creative processes at play transparent. While it is not necessarily radical or new to publish the code of an art project on GitHub, live coding musician Mike Hodnick, aka Kindohm, uploaded the repository of his RISC Chip release on Conditional Records when it was released in 2017. Through the GitHub repository alone, one could navigate to the software, samples and code used for the project and theoretically recreate the entire album themselves from scratch. Hodnick even went as far as to include a Readme file and inline comments for each of the songs, as well as links to downloads for samples used in the project (Hodnick, 2017).

It took only a few minutes to boot up my copy of TidalCycles and paste in Hodnick's code to run it for myself. From there, I began fiddling with the numeric parameters for his functions, which in some cases noticeably changed the nature of the sound being produced and in other cases made no perceivable change. This moment presented an alternate vision of remix and sampling culture, in which the source was not degraded or otherwise wrested from the hands of its originator. In *The Work of Art in the Age of Its Technological Reproducibility*, Walter Benjamin posits that "to an ever-increasing degree, the work [of art] reproduced becomes the reproduction of a work designed for reproducibility" (2010, p. 17). With RISC Chip as evidence, it seems as if open-sourced albums are works of art designed

for not just reproducibility, but also mutability.

This careful documentation, however, ends up further blurring the lines between artist and artwork, producer and consumer, and even one work of art from another. At what point did my substitution of variables and functions in the code for RISC Chip become my own creative product, rather than Hodnick's? What is clear is that such art does not belong to any one person or entity. Without the inherent black box of an exported MP3 file in which all instrumentation, production and human labor are condensed into a single file, RISC Chip explicitly eliminates the possibility of constructing what George E. Lewis refers to as the "superperson:" "The better the machines played—and for my money, they do play quite well now—the greater the threat to the mystery, and to an artist's strategic self-fashioning as one of a select band of designated superpeople with powers and abilities far beyond those of mere Mortals" (2018, p. 4). The blurred lines here are not the same which conceal Lil Miquela's true construction; they serve to erase the preconceptions of an artwork's true identity, but in a way that can be rewritten by more than just the initial creator.

To reveal the circuitry of one's creative process, rather than diminish the role of the human, however, recasts them as an essential organic component of a networked sonic machine. As live coders use each others' code, they engage in mechanic processing at a different pace and scale than their digital instruments, but nonetheless contribute to the global computation of algorithmic noise. In this way, live coding is the materialization of the fictional techno cyborg proposed by Kodwo Eshun: "To cyborg yourself you name yourself after a piece of technical equipment, become an energy generator, a channel, a medium for transmitting emotions electric" (1998, p. 106).

Live coders "cyborg" themselves whenever they create GitHub accounts under their artist names, or reveal the code on their screens to show which processes are human and which are machine. This cyborg, in contrast to Lil Miquela, lays its circuits visible for rewiring and recycling by others. As the role of the individual musician is diminished, the contours of a larger, alien structure begin to take

shape. Eshun repurposes the words of Norman Mailer to further his definition of cyborging, quoting that the process "'takes the immediate experiences of any man, magnifies the dynamic of his movements, not specifically but abstract so that he is seen as a vector in a network of forces.'" (1998, p. 106) The ideal live coder then, becomes a transparent processing unit which processes the ideas that pass through it into a form that's both simultaneously legible by an individual, yet illegible without the additional processing power of the live coding cyborg's computational organs.

Machines are some of the most important collaborators in a live coded work. To quote Andrew R. Brown, live coding creates "a potentially enhanced sense of agency or otherness brought about by automated processes and their unpredictability or apparent intentionality" (2016, p. 184). The communication between human and computer is amplified through live coding, but has been identified in other artistic practices as well. Hatsune Miku is a Japanese virtual pop idol owned by the company Crypton. She performs via projection for physical audiences and is relevant to discussions of live coding in that, along with being a musical cyborg, her interactions with fans take place through open-source software and licensing, thus allowing for her to be copied and pasted, just as text-based algorithms would, into vastly different contexts.

The Miku cyborg has a healthier relationship to her fans than Lil Miquela, evidenced primarily by said fans accepting her cyborg status as opposed to frustratingly prying at a black box. But Miku's aura is nevertheless dependent on the unifying force of an idolized avatar projected onto stages and laptop screens. The labor of many fans, or "prosumers," funnels directly into a single entity that is, decidedly, a reflection of ourselves. Jelena Guga writes that Miku's "new aura projects the intensities of our own bodies into new holographic humanoid forms." (2015, p. 43)

As Wark notes in her essay on Haraway, cyborgs can also give us insight into "the point of view of the apparatus itself, of the electrons in our circuits, the pharmaceuticals in our bloodstreams, the machines that mesh with our flesh. The machinic enters the frame

not as the good or the bad other, but as an intimate stranger.” From this perspective, the Miku cyborg construction is incapable of fully embodying our second halves, our machinic side, in order to restructure the musical cyborg as a whole. The live coding performance in its most simple form - the coder, the computer and the visual of the screen - could be seen as simulating this same projection onto the coder’s body itself. But as was the case with a live-streamed performance, the body of the coder need not be visible for their presence to be felt. Instead, the aura of the live coding performance could be seen as projecting the intensities of our cognitive processes on to a new hybrid structure that is as machine as it is human. This object is a network of computers and humans which make up the global processor of live coding, where humans are both the instrument and the producer; nodes in a larger, shapeless network available for restructuring. Rather than clinging to humanoid idolatry, the live coding network distributes its resources more evenly across a constantly reshaped landscape of coders and software, allowing for a more heterogeneous soup of cross-collaboration and creation.

This form of the cyborg was foretold by the fictions realized by the techno producers of Detroit. As Kodwo Eshun notes of Juan Atkins’s Model 500 project, “The producer is now the modular input, willingly absorbed into McLuhan’s ‘medium which processes its users, who are its content.’ Tapping into the energy flow of the machine, the Futurist becomes an energy generator” (1998, p. 106). The live coding realization of this is slightly less strong-handed in its posthumanism, as human input is still an essential component of performance. But this compromise, held together by open source code, has the potential to be reconstructed. Perhaps then, the producer-as-instrument as foretold by Eshun, rather than the individual live coder, is the entire network of live coding musicians, hyperlinked by code and wire for the purpose of networked sonic computation.

Conclusions

In this last section, I wanted to outline some of the essential qualities of the live coder as a potential model for the musical cyborg. Their use of legible, personal algorithms and open source software envision a relationship between human and machine which is symbiotic, mutable and transparent. Whether using live coding software such as Tidal-Cycles or SuperCollider, as well as performance specific softwares as in Sonic Biking, the live coder has the potential to reshape the boundaries between their human and machine counterparts. It was difficult pinning down what wasn’t a live coded cyborg precisely because the definition by McLean, which simply calls for the human authorship of algorithms to be a primary creative goal, allows for endless constructions and reconstructions. One can be a live coder and still use hardware instruments, collaborate with other humans as well as non-algorithmic entities, so long as there is some degree of processing the world through an algorithmic process.

Even the politics of live coding, due to their open source, mutable nature, have been iterated on as one would an iterate an algorithm. In charting the development of the TOPLAP manifesto, Christopher Haworth explains that “it outlined the conceptual, performative, technological, and philosophical conditions live coders should meet or engage with, performing the dual function of materializing and speculatively positing an idea of authentic live computer music in the form of ten short commandments” (2016, p. 13-14). Over time, though, these commandments changed - notably, demands about what specific languages or tools could be used by live coders disappeared. What remained was a focus on transparency that, according to Haworth:

“(…)conveys an ontological politics of live computer music, one that is positioned against two dominant tendencies in electroacoustic and computer music: one, electroacoustic art music, where fixed-media music is played back in concert halls over loudspeakers; and two, the club-based laptop performance of the early 2000s, where audiences watched performers from behind their laptop screens, and

the performativity of the spectacle was largely taken on faith” (2016, p. 14).

The examples Haworth picks are telling, in that they are instances of performance specific to a time and culture of reproducible music. The TOPLAP manifesto, then, both reacts to and affects the development of computer music, much like a live coder’s algorithms are affected by and subsequently affect the live coder themselves. The manifesto reveals that the design ethos of live coding relates not just to the individual live performance, but also at a meta level in terms of how live coders interact with each other and develop cultural standards for these practices. Having these standards laid out in precise terms, available to all but always subject to change, reinforces the open source accessibility, productive interaction and vision of an algorithmic future that live coding generates. Whether the practice generated the politics, or the politics generated the practice, is perhaps irrelevant; both aspects components feed off each other as smaller parts in a larger cyborg system. Nevertheless, there are lines to be drawn between the live coder and other algorithmic cyborgs. Though Lil Miquela, Hatsune Miku, and Spotify’s artists exist within an algorithmic culture, the nature of their relationship does not qualify for the continued authorship essential to McLean’s definition of live coding because their algorithms have been authored by third parties. In addition, their black box nature leaves them immutable, and thus unable to be reconfigured so as to connect with the human in a symbiotic relationship. These intentional distinctions posit the live coding cyborg as a cultural figure whose construction could be applied beyond the world of music. Haraway might see the live coded cyborg as but one piece of a larger potential restructuring of society; “Taking responsibility for the social relations of science and technology means [...] embracing the skilful task of reconstructing the boundaries of daily life, in partial connection with others, in communication with all of our parts.” (2016, p. 67) As algorithms pervade everything from industry to culture to politics, the utopian model of the live coded cyborg can serve as a model for further rewiring in order to gener-

ate empathy and symbiosis between human and machine. Though the live coded cyborg exists today, it is still an unattainable fiction for many: I would be remiss not to mention what Haworth discovered to be fundamental fuel in the development of live coding: the institutional support of universities. “Being subsidized by arts and engineering grants,” he notes, “the earlier-cited emphasis on novelty and formal experimentation (to the detriment of questions of musical style and genre) emerges as an institutional and economic mediation as much as a performative genealogy” (2018, p. 21). The only places where these generative ideas can survive are those that have yet to be completely recoded by platforms of privatization. As it stands, the reality for many musicians is that black boxing technique or influence is essential to generating profit from their work. But, with Eno as inspiration, planting seeds now can lead to great and unexpected things later. If the barrier between human and machine is now more malleable than ever, we must work towards the betterment and interoperability between machines as much as we do between humans, lest we ignore a vital organ simply because it bears circuitry. The systems which govern current human relations are composed of the same unnatural, ideological code that govern copyright and creative relations. The cyborg is an ideal, and thus it can be an aspirational goal at every level of the stack, from government to culture. But the same can be said of a network recoded from the bottom up; it too can generate systems beyond those which they are conceived in. Building our networks towards the live coding cyborg brings us closer to building a protocol of trust between human and nonhuman, nature and machine, if such a boundary still exists.

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