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Decolonising the Loop:
Reframing Circularity in Digital Audio Software Through African Philosophy

By

Josephine Afua Efe Zwaan

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Student number: 5947650

Thesis supervisor: S.M. Dasgupta

Second reader: T. Pape

Abstract

The increasingly complex integration of circularity in digital audio interfaces poses a challenge to electronic music scholars rooted in Western contexts. In response, studies have emphasized the technological aspects of digital audio interfaces. However, on closer inspection, it appears that Western linear values continue to shape their outcomes. This thesis enriches the framing of circularity in digital audio software through African philosophy. I combine insights from post-structuralism, musicology, decolonization studies, new media studies and Afrofuturism to reframe circularity on the level of musical and temporal ontology. Firstly, I uncover the limitations of the Western perspective, looking specifically at Mark J. Butler's (2016) framing of circularity in live electronic performance. Secondly, I establish a reframing of circularity using African philosopher John S. Mbiti's (1971) notions of 'actual time' and 'potential time,' which come to expression in the African time cycle – a musical and temporal structuring principle in traditional African drumming. This framing is applied in the analysis of Ableton Live's *Session View* (Ableton, 2021) and Logic Pro's *Live Loops* (Apple, 2020), where Michael D'Errico's (2016) notion of 'interface aesthetics' is used as a methodological approach. In comparing the interfaces to the African time cycle, a number of limitations of their rectangular grids come to the fore. These limitations are used as sources of inspiration for imagining an African DAW. I argue that the inclusion of an African perspective urges a rethinking of the temporality of electronic music studies itself. Finally, I hope this thesis inspires further research on the history, present and future of African music technology as a research field.

Keywords digital audio software, Digital Audio Workstation (DAW), electronic music studies, circularity, African philosophy, Afrofuturism

Preface

"Go back to the past and bring forward that which is useful."

- Akan proverb symbolized by the Sankofa bird

Table of Contents

Introduction

In the late 1980s, my father moved from Ghana to the Netherlands to pursue his career as a highlife musician. It was around the same time that the first affordable sequencers and drum computers for electronic music production entered the market in Europe. My father belongs to the first generation of African musicians who adopted electronic technologies in their musical practice. Like many of his peers he ran into a number of challenges in the process. Firstly, the early drum computers and sequencers only allowed for a rigid, robotic timing. At the time, the clock of the devices was not yet finely calibrated. As a result, my father spent days and nights trying to achieve the human feel that African music required – to get the computer to sound 'African.' Another issue that he faced was latency, which is the delay between recording and playback, which made it difficult to record in real-time. To maintain the musicality of the performance, however, it was important to have a feeling of liveness during recording. Thus, although the electronic technologies provided new musical possibilities, they also came with a set of limitations, especially for African musicians. Increased digitization in the 1990s solved some of these problems. The clock of the newer devices was increasingly fine-tuned, and the inclusion of audio recording in digital software, allowed the original character of a performance to be preserved. Today, the *Digital Audio Workstation* (DAW) – a collective term for digital audio software – allows for more flexibility and control than ever before. But, like the early technologies, the interfaces of DAWs continue to engender assumptions about the process and outcome of music production. This raises questions about the norms and values embedded in interfaces on the one hand, and their relationship with musical norms and values arising from specific social, cultural and historical contexts on the other.

This thesis draws attention to a more recently introduced feature of digital audio software, namely the loop-based interface developed specifically for live electronic performance. In 2004, Ableton first introduced *Session View*, one of two optional arrangement views in the Ableton Live interface. Contrary to the more traditional *Arrangement View*, which is based on a linear timeline (Figure 1), *Session View* allows users to record and arrange *loops* – short repeating segments of recorded music – in improvisational, nonlinear ways (Figure 2). Both views can be accessed through the same interface; however, they both involve a different

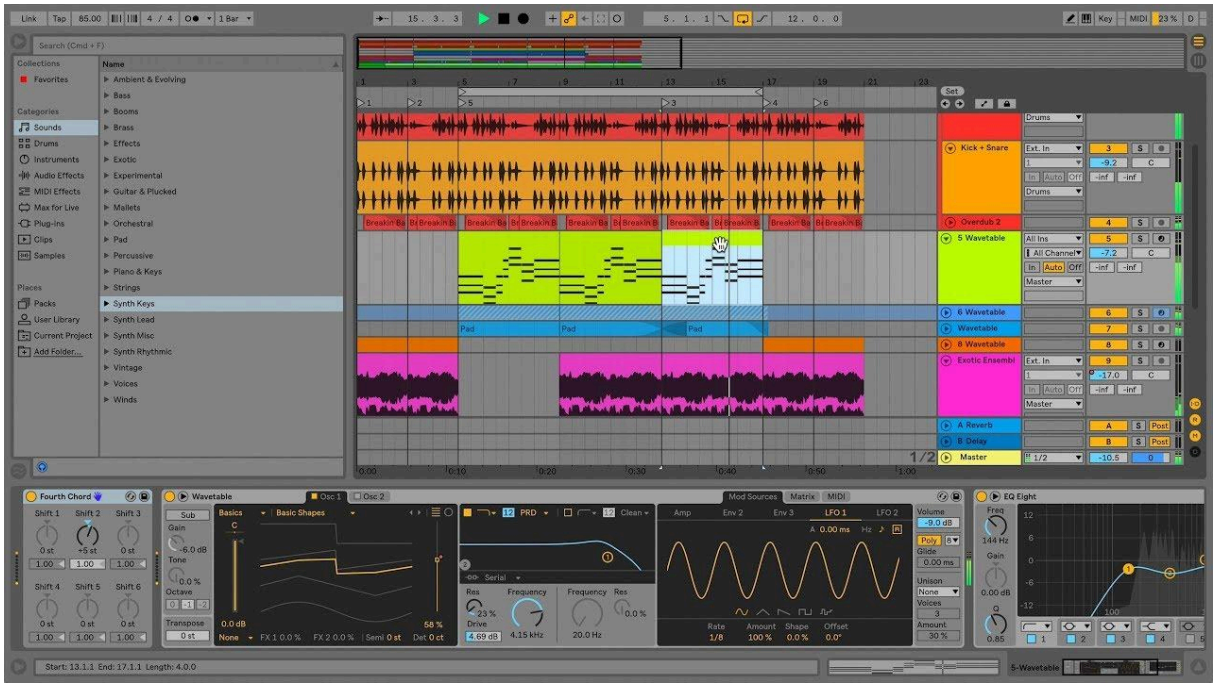

Figure 1. Ableton Live's *Arrangement view* is based on a linear timeline.

Figure 2. Ableton Live's loop-based interface *Session View* allows for the nonlinear arrangement of loops.

temporal and musical logic. Almost twenty years after the launch of *Session View*, Apple's Logic Pro introduced its own loop-based interface called *Live Loops* as part of its latest update. Like *Session View, Live Loops* contains a modular grid that allows for real-time, nonlinear arrangement and performance (Figure 3). The increasingly complex integration of loops in the digital audio interface signals a departure from the organizational principles of the analog recording paradigm. The linear timeline of the traditional audio interface mimics the shape of analog tape, as well as the left-to-right scanning of reading and music notation. Moreover, the complex integration of circularity as a musical and temporal structuring principle in the interface pushes the boundaries of Western linear notions of music and time.

Consequently, loop-based music technologies pose a challenge to electronic music scholars rooted in Western music-theoretical contexts. These challenges are central to Mark J. Butler's *Playing with Something that Runs: Technology, Improvisation, and Composition in DJ and Laptop Performance* (2014). Butler observes that musical repetition and circularity have been haunted by a negative scholarly framing. In referring to the Freudian inflected works of Theodor Adorno (2002 [1941]) and Jacques Attali (1985 [1977]), among others, Butler shows that musical repetition has been associated with standardization, commodification and passivity. He also argues that the conflation of musical cycles with geometric circles have often cast them as static and timeless. Thus, Butler sets out to establish a positive framing of musical repetition and circularity "to uncover the kinetic properties of musical cycles, revealing the ways in which they possess clearly perceptible points of origin, movement toward goals, and distinct phases with particular qualities" (p. 10). In establishing this framing, he briefly engages with African and Afrodiasporic studies; because, he states, "[a] positive account of repetition has been one apparent goal of scholarship on African and Afrodiasporic expressive practices" (p. 183). He discusses the works of James Snead (1981), Tricia Rose (1994) and Henry Louis Gates, Jr. (1988), among others; however, he concludes that these perspectives lack a temporal dimension, and are therefore unsuitable for the study of electronic loops. As a solution, Butler chooses to frame circularity and repetition as a musical technology itself.[1]

[1] This is based on a definition of technology not in a material sense. Rather, Butler (2014) regards technologies as "technologies of production, which permit us to produce, transform, or manipulate things" (p. 174), which he explains is inspired by Michel Foucault. Butler finally identifies seven musical technologies based on circularity and repetition, namely *repeating, cycling, going, grooving, riding, transitioning* and *flowing,*

Figure 3. Logic Pro's loop-based interface *Live Loops* (in the middle) in a split screen with the regular *Tracks View* (on the right).

Throughout Butler's argument, various social and cultural tensions arise with regards to the inclusion of non-Western perspectives in the framing of circularity. The use of a technological discourse finally absolves him from the need to reckon with these tensions. Thus, it seems that the emphasis on the technological materiality of loop-based practices allows electronic music scholars to frame circularity as a new, and ultimately Western, phenomenon.

This thesis assumes that it is not only possible but preferable to establish a musical and temporal framing of circularity using an African perspective. This is based on shifting the focus from the discursive to the ontological level. Ontology is a branch of philosophy that focuses on the nature of being and the question of what it means to exist.[2] If we recognize that the West has routinely prioritized linear notions of time and music, then any positive, or even neutral, framing of circularity first needs to uncover, and reckon with, the norms and values surrounding linearity.

[2] See for example Jacquette (2002) for an extensive discussion of ontology.

Subsequently, to reframe circularity using an African perspective requires a theoretical framework that operates on the level of ontology as well. Contrary to Western philosophy, African philosophy upholds a notion of time that is neither linear nor circular. Moreover, it is based on a holistic worldview in which the boundaries between music and time are broken down.

How might African philosophy enrich the framing of circularity in the loop-based interface? And what are the implications of placing the loop-based interface in an African genealogy?

To answer these questions, I combine insights from post-structuralism, musicology, decolonization studies, new media studies and Afrofuturism. In creating a new encounter between these fields, I seek to contribute to the decolonization of electronic music studies in general, and of digital audio software in particular. Walter Mignolo (2012a) argues that as academics, 'we think where we are,' meaning that our epistemologies are shaped by our position in what he calls "the colonial matrix of power" (p. xvi). This casts the field of electronic music studies as a site of hegemony and representation. Mignolo's observation also urges a reflection on my own 'location' of thought. Being a student at the University of Amsterdam there is no doubt that my epistemology is shaped by a Western, Eurocentric perspective. However, having grown up between two cultures – European and African – I have regularly felt unease with the unquestioned centering of the Western worldview. My close connection to Ghanaian culture has made me well aware that the world could always be viewed differently – that the Western view can be peculiar and at times outrightly exclusionary. The perspectives that are brought together in this thesis, then, are in some ways reflective of my own dual position in the colonial matrix of power.

African music has had a global impact ever since the first Africans were shipped across the Atlantic. More specifically, the influence of African-American and Afrodiasporic culture on electronic music production practices has been widely noted (Weheliye, 2005; Butler, 2014; Wiltsher 2016; Eshun, 2018; Reuter, 2022).[3] To this day, African musical thinking informs much of global popular music – from the infectious rhythms of reggaeton, hiphop and afrobeats, to the viral dance moves circulating on video-apps like TikTok. It still rings true, as John Collins (2004) states, that "[i]n spite of the technological supremacy of the West its dominant popular

[3] Contemporary music production practices are said to derive primarily from hiphop and electronic dance music. Hiphop originated in the 1980s in impoverished black neighborhoods in New York. Electronic dance music has its roots in black club culture in Detroit.

music today is largely derived from the very people that it enslaved in the Americas and colonised in Africa" (p. 17). This reality is what electronic music scholars seem to have a hard time grappling with. By including an African ontology in electronic music studies, this thesis seeks to acknowledge the indebtedness of electronic music to the cultures, practices and worldviews of Africans and Afro-Diasporans.

The first chapter decentralizes, or in the words of Dipesh Chakrabarty (2009) *provincializes*, the Western perspective in electronic music studies. In doing so, it makes visible that which has tried hard to conceal itself. Using a post-structuralist perspective I show that establishing a framing of circularity cannot occur in isolation; rather, it requires an examination of the linearity/circularity binary as a whole. Since the Enlightenment, the West has prioritized linear conceptions of music and time based on an association of linearity with rationality and progress. Moreover, modern technologies have presented them as laws of nature. These ideas have spilled over into music theory, and continue to underlie contemporary Western understandings of music and time. Loop-based practices have increasingly caused electronic music scholars to move away from traditional music theory to focus on the material aspects of electronic music technology. However, a deconstructive reading of Butler's (2014) 'positive' framing of circularity shows that the Western linear lens continues to shape the study of loop-based electronic music practices. This urges a reframing of circularity on the level of temporal and musical ontology.

The second chapter establishes a reframing of circularity based on an African temporal and musical ontology. John S. Mbiti's (1971) notions of 'actual time' and 'potential time' are used to establish an African temporal framework that is neither linear nor circular. Unlike the West, the African tradition is based on a holistic worldview. This comes to expression in the African time cycle, a temporal and musical structuring principle that is central to traditional African drumming. The African time cycle blurs the boundaries between music and time, and offers a framing of circularity that is musical and temporal at the same time. Applying the African perspective to recent insights in electronic music studies shows that the 'new' shifts that electronic music scholars have identified, are actually not so new; rather, they are reconciliations of what the West separated in the first place. The African holistic perspective invites a reevaluation of the way that rhythm, dance and repetition have been framed in electronic music studies.

The third chapter puts the African framing of circularity to practice in the analysis of Ableton Live's *Session View* (Ableton, 2021) and Logic Pro's *Live Loops* (Apple, 2020). Michael D'Errico's (2016) notion of 'interface aesthetics' is used to draw attention to the use of geometric shapes and structures in the interface. In comparing the interfaces to the African time cycle, it becomes apparent that they operationalize circularity in similar fashion; using a rectangular grid and a relative notion of time. Although many similarities can be found between the interfaces and African time, the African time cycle also reveals a number of limitations in their affording of liveness and real-time response. The analysis shows that the rectangular grid in *Session View* and *Live Loops* disintegrates the unity of the African time cycle, and is still largely bound by a linear logic and the absolute measure of the clock.

The fourth chapter uses the insights from the analysis to formulate solutions for the limitations of *Session View* and *Live Loops*. Drawing inspiration from Afrofuturism, speculation is used as a chronopolitical act, and as a device to set ideas in motion. By imagining two new features for a radically circular interface, I show the potential of African musical knowledge as a source of technological innovation.

Lastly, I argue that the inclusion of an African musical and temporal ontology in electronic music studies urges a rethinking of the temporality of electronic music studies itself. As a new form of externalization of musical knowledge, digital music technologies offer new opportunities for exploring the exchange between different worldviews, musical histories and traditions of thought. At the same time, this exchange requires caution. As social, cultural and historical ownership slowly disappears from view, inequalities of power can now operate in invisibility behind a veil of innovation. In demonstrating that African music and technology are not in opposition, I hope this thesis inspires further research on the history, present and future of African music technology as a research field.

1. The Limitations of Western Linearity

This chapter addresses linear thinking in the West and considers its relationship with electronic music studies. Firstly, I use a post-structuralist approach to show that a positive framing of circularity cannot occur without a critical examination of its constitutive opposite: linearity. Secondly, I locate the origins of linear conceptions of time and music in the Enlightenment and the technologies of modernity. Lastly, by critically examining the work of Mark J. Butler (2014) on circularity in live electronic performance, I argue that the persistence of Western binary oppositions such as body/mind, composer/performer, performer/audience in electronic music studies urges a reframing of musical circularity on the ontological level.

The term 'electronic' in electronic music studies implies a categorical separation from the study of non-electronic music. Indeed, electronic music scholars have emphasized technological materiality in the study of electronic music, drawing attention to the affordances and aesthetics of devices and interfaces. In response to the increasingly complex integration of screens, buttons and loops in electronic music production, various scholars have argued for the adoption of a process-oriented approach (Butler, 2014; D'Errico, 2016; Reuter, 2022). For example, Butler (2014) regards live electronic and DJ performance as a dialectic between process and product. D'Errico (2016) situates the digital audio interface as a process in which agency is distributed among interfaces and users. He argues that the skill of 'procedural listening' "allows both musicians and audiences to focus on the process-oriented mechanics of media forms, rather than simply audio content" (p. 77). Similarly, Reuter (2021) argues that "music production's increasing shift towards a digital process ontology challenges anthropocentric, performance and difference-based interpretations of agency and time" (3). Reuter (2022) further argues that the introduction of networks and cloud-based connectivity in the DAW "characterize[s] a fundamental shift toward a logic of controlling interrelational processes" (p. 114). The recent shift from text-based to process-based analyses in electronic music studies seems to have caused music theory to gradually disappear from view. However, if we look more closely, as I will do later in this chapter, it becomes apparent that the norms and values of music theory have not yet disappeared; neither in the interfaces of the technologies, nor in the study of electronic music practices.

But first I will explain why I begin this thesis on circularity with a discussion of linearity, using Derrida's notion of deconstruction. Post-structuralism, an intellectual movement that emerged in the 1960s and 1970s, engaged critically with Western philosophy, and with its construction of absolute truths on the basis of binary oppositions in particular. Post-structuralist thinker Jacques Derrida argued that the meaning of every word is constructed precisely through what it is not. For example, 'light' is not 'light' in isolation; it is 'light' because it is *not* 'dark'. Moreover, he argued that among the two poles of a binary opposition, one side is always prioritized. In other words, binary oppositions are inherently – although often covertly – hierarchical. A deconstructive reading of texts then serves to reveal the hidden values through which the hierarchy is constructed. The aim is not to reverse the hierarchy; rather, a deconstructive reading serves to destabilize the binary and denaturalize the values that it engenders.[4] If we regard linearity and circularity as binary oppositions, then a discussion of one should naturally involve the other. Focusing on linearity rather than circularity, then, might reveal a hidden system of values through which hierarchy in the linearity/circularity binary is constructed.

Therefore, this chapter uncovers the roots of linear thinking in the West. To do this requires a revealing of what has tried hard to conceal itself. Linearity is so ingrained in Western thinking, that its particularity has become almost invisible. In his renowned book *White* (2017), Richard Dyer argues that the representation of whiteness as a social and cultural norm for long has rendered it invisible as a racial category in the West.[5] Whereas non-white identities were conceived as racially marked, white people were 'just people.' The same thing can be said of linearity in the West. The use of the linear timeline, for example in history books and sheet music, has made it almost impossible to conceive of time differently. Nevertheless, many cultures around the world do so; whether circular, spatial or otherwise. Rather than conceiving of time as an objective aspect of nature, Espen Hammer (2011) argues that the experience of time should be understood as a social and cultural phenomenon. According to Hammer, the "[h]uman experience [...] is inherently structured on the basis of actual, historically mediated, practices of relating to time" (p. 14). A phenomenological understanding of time, he states, should draw attention to "social practices whereby we employ temporal categories" (p. 13). In other words, by analyzing social practices and associated technologies whereby temporal categories are

[4] See for example Howells (1999), p. 33 and 61.

[5] Perhaps the biggest shift caused by the Black Lives Matter protests following the death of George Floyd in 2020 is that it has raised an awareness about whiteness in the public perception.

employed, linear time in the West can be made visible. In the following, I will first make linearity visible through the 'invention' of Western linear time in the Enlightenment, to show that it is fundamentally entangled with issues of Eurocentrism and power. Linear values of the Enlightenment such as rationality and progress, then, are shown to have spilled over into music theory. Returning to Butler's framing of circularity at the end, I show that the positivity of his framing is actually based on linear values. It seems that, by focussing on circularity only, Butler has been unable to escape his own linear view.

1.1. Western linear time

Although various historical periods could be identified as having laid the foundations for linear thinking in the West,[6] my focus here will be on the Enlightenment because of its peculiar relationship with technology. The Enlightenment was a period of vast philosophical and scientific activity in Europe in the 17th and 18th century, and is generally considered the cradle of modernity. Notable Enlightenment thinkers regarded rationality and reason as the means towards the improvement of the human species. For example, René Descartes' famous expression 'I think, therefore I am' symbolized a dualism of body and mind that continues to exist in the West to this day. Meanwhile, scientists were enthusiastically trying to describe nature in mathematical terms. They established taxonomies and formulas to explain the laws of nature – and eventually to control it. One thing that marks the technologies of modernity is that they did not simply reveal new possibilities in nature, but rather sought to control and master nature itself. As Bernard Stiegler (1998), states, "[t]echnics become modern when metaphysics expresses and completes itself as the project of calculative reason with a view to the mastery and possession of nature" (p. 10). Thus, modern technics increasingly shaped the conditions of existence, while exerting themselves as universal truths.

[6] For example, Christianity also played an important role in the Western imagination of the future (Mignolo, 2012; Collins, 2004; McKenzie, 1973). As McKenzie (1973) states, "[b]y emphasizing the Crucifixion and the anticipated climactic Return of Jesus as unique and unrepeatable events in historical time, the view of time as cyclic repetition gave way to the view of it as linear progression" (p. 78).

One of those supposedly universal truths was linear time. Enlightenment philosopher Immanuel Kant is often credited with inventing the idea of linear time based on the past, present and future. Kant introduced the notion of time as an *a priori* category, i.e. an objective aspect of nature that precedes the human experience. This allowed time to be imagined as an empty framework in which humans exist. The future, which until then had not been prominent, suddenly opened up as an empty canvas for progress and utopian possibility. The introduction of the clock allowed objective linear time to become an integral part of Western life. Before then, the experience of time had been structured by the rhythms of nature. As Marshall McLuhan (1964) states, the clock made it possible to "fix time as something that happens between two points" (p. 135). Time was now turned into a mechanical phenomenon. As McLuhan states, "[b]y the nineteenth century [the clock] had provided a technology of cohesion inseparable from industry and transport, enabling an entire metropolis to act as an automaton" (p. 138). The clock turned time into a currency of human labor, and laid the foundations for economies of scale.[7] Earl McKenzie (1973) summarizes the experience of time in the West as follows;

> [P]resent day people in the western world – and particularly Euro-Americans – view time as a fixed ever-present part of the natural environment. It is an expensive material to be measured, carefully cut up into the tiniest pieces, and is to be sold for the highest price, and bought at the cheapest market. It can be earned, saved and lost, and it must never be wasted. Linearity is stressed: time should be carefully scheduled and there should be "one thing at a time." (p. 80)

Thus, as a modern technic, clock time increasingly shaped the conditions around which life unfolded in the West, and exerted itself as if it were a law of nature.

Kant's linear time, however, also had far reaching implications outside of the West. Following Kant, philosopher Georg Hegel developed a notion of global history that was based on the idea of unilinear development. For Hegel, history meant the realization of progress. He regarded Europe, as Mogobe Ramose (1999) states, as "the topmost end of the imaginary ladder of "civilization" (p. 24). In locating the ultimate end point of progress in Europe, Hegel

[7] The implementation of the clock also played an important role in colonialism and slavery. See Nanni (2017) for an extensive discussion of the role of time and clocks in the colonial expansion of the British empire.

formulated global history in spatial terms; the further away a country was removed from Europe, the further it was removed from civilization, and the further back it was in time. Other parts of the world could now be regarded as lagging behind, or existing in the past. As Timothy Brook (2009) states, "[t]he history of globalization has hitherto been structured mainly as the narrative of Europe's expansion around the globe, beginning in the long sixteenth century [...] the transformation of the world into Europe's periphery" (p. 381). This idea has shaped the image of Africa in the Western perception, and it continues to pose a challenge to scholars both inside and outside the West.

Temporal technologies played an important role in the project of modernity; this includes its darker side of colonialism and slavery. Therefore, decolonization is in many ways connected to issues of history and time. Mignolo (2012a) argues that coloniality itself has been constitutive of modernity. This idea finds resonance in the field of Afrofuturism, with a focus on black subjectivity. For example, Kodwo Eshun (2003) suggests, following Toni Morrison, that,

> [t]he African subjects that experienced capture, theft, abduction, mutilation, and slavery were the first moderns. They underwent real conditions of existential homelessness, alienation, dislocation, and dehumanization that philosophers like Nietzsche would later define as quintessentially modern. (p. 288)

By remixing, rejecting and repurposing Western notions of the past, present and future, Afrofuturist scholars and artists seek to liberate black subjects from the shackles of the colonized timeline. I will return to the use of nonlinear temporalities as a tool for decolonization and resistance later on in the fourth chapter.

1.2. Music and linearity

The Enlightenment was also instrumental to the conceptualization of music in the West. Although ideas about music had existed long before, Paul Lang (1967) states that "[t]he Enlightenment gave us all our modern theories and concepts of music; it codified tonality, it created the system of harmony by recognizing the dualism of major and minor, and above all, it created musical logic" (p. 108). The term 'music theory' already reveals a particularly modern disposition. As Paul Théberge (2006) explains, music theory "separates the tools and practices *of*

music [...] as distinct from the discourses of knowledge *about* music" (p. 283). Music theory has both a descriptive and a normative function; the Western pitch system is a prime example of this dual function. As a tonal system, the Western pitch system identifies twelve notes within the octave. Although it presents itself as a sort of natural law of music, the Western pitch system does not represent a 'truth' of tonality in any way. As Khyam Allami (2019) states, "[e]ssentially, it was a practical solution to a very specific musical problem, for a specific set of musical instruments, in a specific genre of music" (para. 21). Nevertheless, the pitch system continues to condition the practice, training and knowledge of music to this day. The descriptive function of music theory as a tool for analysis, thus hides its normativity behind a veil of supposed universality.

Like the Western pitch system, the introduction of music notation conditioned the practice and training of music in the West. Sheet music, as a musical and social technology, conceived of music linearly, mimicking the left-to-right scanning of reading and the linear timeline. This layout implies that the musical piece moves in one direction, and marks a clear distinction between the beginning, middle and end of a musical composition. A definition of musical linearity as it is understood in the West, can be found in the work of Heinrich Schenker ([1935] 1979);

> The *goal* and the course to the goal are primary. Content comes afterward: without a goal there can be no content [...] A person stretches forth his hand and indicates a direction with his finger. Immediately another person understands this sign. The same gesture-language exists in music: every linear progression is comparable to a pointing of the finger – its direction and goal are clearly indicated to the ear. (p. 5)

Thus, according to Schenker, goal-directedness forms a prerequisite for meaning and substance in musical composition. This shows that linearity does not simply serve as a description of musical composition; rather, it is presented as one of its prime values.

Schenker is one of music theory's main figures. In the early 20th century he set out to formulate a music theory that explained the works of great German composers such as Bach and Beethoven, while also serving as a basis for the analysis of *all* music. To this day, Schenker's music theory "is the only named music theory routinely required across top music theory

graduate programs" (Ewell, 2021, p. 325). However, it has recently been brought into a new light as his works include a problematic, racist dimension. In 'Music Theory and the White Racial Frame' (2021), Philip Ewell argues that music theory as an institution has been marked by a persistent whiteness. Like Kant and Hegel, Schenker made no secret of his belief that people, and more specifically white and black people, were fundamentally unequal. For example, he states that it was "out of the question that the incapable ever become able; that which applies to individuals surely must apply to nations and peoples as well" (Schenker cited in Ewell, 2021, p, 327). According to Ewell, a color-blind discourse in the institution of music theory has reinforced its whiteness; contemporary music theorists have routinely omitted or ignored the racist content of Schenker's theories. Schenker himself, however, regarded his musical precepts as an integral part of a unified worldview; this problematizes a strict separation between his racist views and his music theory under the guise of a historical zeitgeist.

The supposed universality of music theories such as Schenker's is contradictory, as evidenced by his reference to nature. Schenker compares the linear progression to nature, stating that "[e]very linear progression shows the eternal shape of life – birth to death. The linear progression begins, lives its own existence in the passing tones, ceases when it has reached its goal – all as organic as life itself" (p. 43). Simultaneously, he argues that "[g]enius alone transmits nature to us through his art" and that "[i]n no respect does "the people" exert influence upon nature or upon the genius" (p. 106). This asymmetrical notion of nature, which includes the genius but not 'the people,' reflects a fundamental problem encountered by the music theorists of the Enlightenment. As Lang (1967) states, it was a characteristic effort of the Enlightenment to "bring reason and nature into some sort of unison" (p. 100). On the one hand, music theorists sought to conceive of music as a rational science. On the other hand, they also realized that it was an artform that implicated the body through emotional and psychological effects. They finally salvaged music's rationality through a 'return to nature,' "provided that "nature" meant not physics and mathematics but the response of the human spirit to artistically manipulated acoustic phenomena" (p. 100). This finally resulted in the axiomatics of the Enlightenment music theorists, which Lang describes as such: that "[m]usic should, like the other sciences, be the source of enjoyment to the thinking mind" (p. 100). It is this problem of modernity's universalism that renders its technologies suspect; while pretending to speak for all, they reinforce the power of some at the expense of others.

Music notation allowed the Western pitch system to become the norm within and increasingly outside the West. Martin Scherzinger (2021) states that "[c]olonial orders of pitch [...] generated the very idea of *non*pure pitch said to be found elsewhere (Arabia, India, Japan, Siam, Africa, etc.) on the basis of a long-standing assumption of technology and expertise as civilizational gifts from Europeans to non-Europeans" (p. 399). Thus, Eurocentrism also came to shape the analysis and study of musical practices around the world. Sheet music also allowed the commodification and exportation of Western music. In separating the composer from the performer, the music score gradually placed all economic and moral ownership rights with the composer as the individual creator of the work. Meanwhile, as Théberge (2006) states, performers were given "no special rights or privileges with regards to the sounds that they made, to their interpretations of the musical score" (p. 290). Music notation represented a split between the body and the mind; the music score awarded the composer as embodying the rational side of the equation, while depriving the performer of any form of ownership.

Music notation also separated the roles of the performer and the audience, and increasingly structured the reception of music. The temporality of the performance was now controlled by the music score; as Théberge (2006) states, "[t]he 'urgency', anticipation, and shared sense of time characteristic of performance was replaced by a detached set of quasi-mathematical calculations and operations executed with little reference to 'real-time' modes of action" (p. 289). Improvisation decreased, and the audience was increasingly excluded from participation or interaction. As John Collins (2004) states, "by the mid nineteenth century almost nothing was left for the audience to do, except sit back passively and be overwhelmed by the immortal works of a great composer, re-created by dazzling virtuosos and all under the control of a professional conductor's baton" (p. 74). Like the clock, music notation increasingly controlled the experience of musical time.

1.3. Temporality and electronic music technology

Electronic music technologies have gradually eroded music theory's normative pressure. Digital audio software offers many ways in which music theory and training can be omitted. This is especially a merit of MIDI, a digital protocol that allows for information exchange and direct communication between electronic hardware instruments and software. As Michael D'Errico (2016) states, MIDI merges "the previously disparate tools of music instruments and personal

computers" (p. 31). It allows users to 'play' instruments virtually; to draw complex musical parts without the physical skill required to actually play them (Figure 4). As Joanna Demers (2020) states,

> With only a basic conversancy of [a DAW] a musician can edit [...] sounds to vary pitch, timbre, attack, or quality of the entrance of a sound, and duration. Rhythmic patterns are also easily constructed and sequenced. Such tools have contributed to a new status quo, one at odds with standards of musicianship from only fifty years ago, whereby conventional trappings, such as the ability to read notation, are no longer requisite for an aesthetically or commercially successful career. (ch. 1)

The decreased requirement for knowledge of and training in music theory has made electronic music production more accessible. It seems that musical skills have largely been replaced by computational skills. As D'Errico (2016) argues, the interfaces of digital audio software are increasingly shaped by the technical skills and design aesthetics of computer programmers. This explains why music theory seems to have lost its relevance in the study of digital music production practices.

However, digital audio interfaces continue to display clear traces of Western music theory. As Théberge (2006) states, "the twelve-notes-to-the-octave scale and traditional seven-white-five-black configuration of the piano keyboard continues to exert a considerable pressure toward conformity in the design of musical instruments and technologies" (p. 285). Figures 4 and 5 show how the keyboard layout is used in the operationalization of MIDI in Logic Pro (2020) and Ableton Live (2021) respectively. Despite the endless possibilities of digital software, then, the discrete notes of the keyboard continue to shape music in the digital age. As Scherzinger (2021) states,

> What is striking is the capacious stability of the keyboard interface design in technologies no longer controlled by criteria oriented to the task of integrating equidistant mechanical components with the tactility range of digiti extending from human hands. No longer situated at the crossroads of technics and flesh—a once productive mélange of key, code, signal, hammer, hand, finger, and ear—musical tonality today is nonetheless still held in

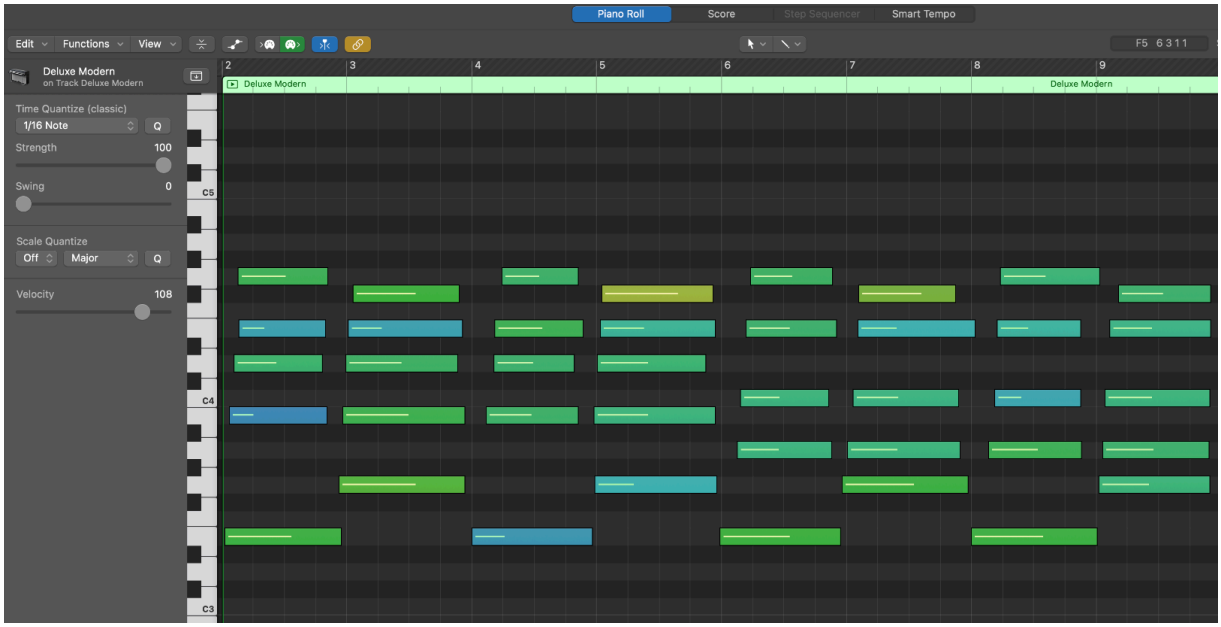

Figure 4. MIDI using a traditional piano keyboard layout in Logic Pro.

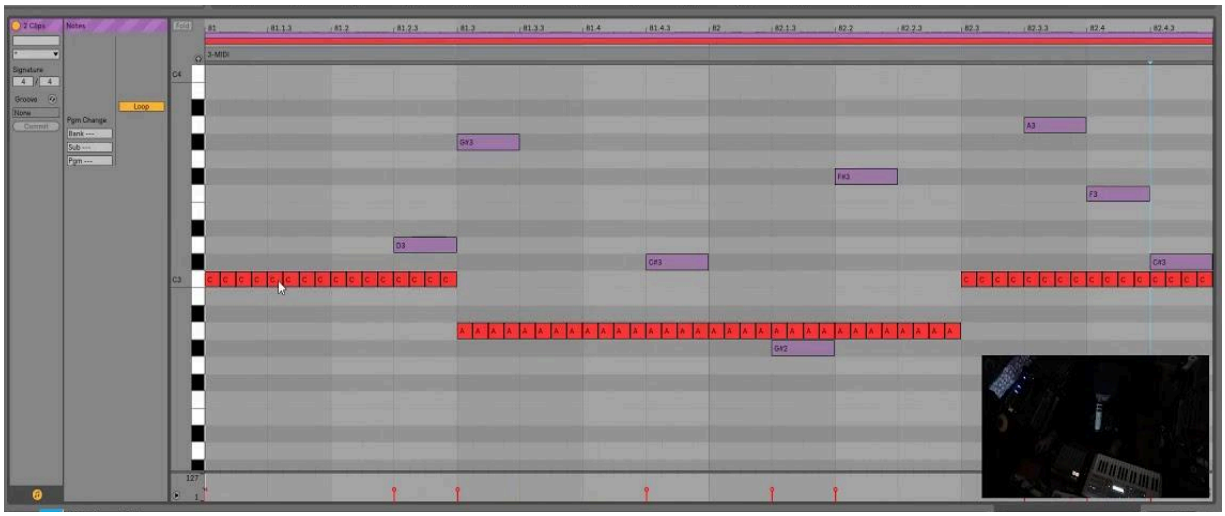

Figure 5. MIDI using a traditional piano keyboard layout in Ableton Live.

> the arms of its code. From the pitch lattices grounding global popular music to the sound designs of commercial ambience; from the programs underwriting MIDI audio beeps, alarms, recorded voices, autotune, and ringtones to software applications for iPhones and iPads that enable users to create sound compositions, auditory experience today is increasingly marked by a subset of discrete tones that fit on a standardized modular grid. It is as if the piano's coded key template has become immortalized as the archetypal digital representation scheme for musical form in our times; commercial economies of scale have made of it a kind of Platonic object. (pp. 409-410)

The same counts for the linear layout of music notation. As Goodman (2008) states, "[a]s with European musical notation's inheritance from written text, digital audio software sequencers have inherited the habit of left-to-right visual scanning" (p. 257). In Logic Pro, a 'score' option even makes it possible to view the MIDI recording in a music notation layout (see Figure 6). Goodman also states that "[t]he timeline constitutes the spatialization of the clock into a horizontal time" (2008, p. 257). The digital audio interface, then, merges clock time, the Western pitch system and music notation into a 'new' digital tool for music production.

However, the spatialization of time in the digital interface also created new temporal possibilities. As Goodman (2008) states, "[a] temporal sequence of sounds suddenly occupies an area of the computer screen" (p. 257), which made it possible to edit sounds in a nonlinear fashion, and to copy, reorder and repeat at will. The introduction of the loop-based interface in the early 2000s presented a larger shift, trading in the linear format for a modular one. Ableton Live was the first DAW to include a loop-based interface that afforded the real-time arrangement of loops. Ableton Live's *Session View* is geared specifically towards live electronic performance. It does not involve a linear timeline. Instead, the grid is organized around 'clips', representing different looped patterns for a single instrument. The loop-based interface's inclusion of contingency and improvisation has afforded new forms of liveness in digital audio software.

In his discussion of live electronic and DJ performance, Butler (2014) introduces a number of new concepts to characterize the shifts that loop-based technologies have made possible. For example, he uses the term 'provisional work' to describe the musical work of the live electronic performer as a combination of pre-arranged components and improvisational

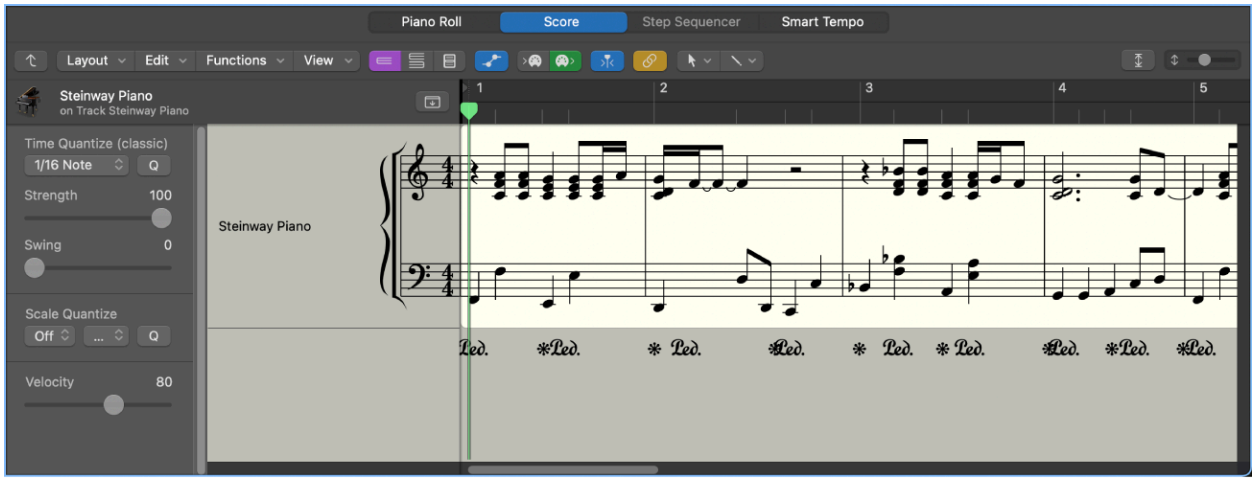

Figure 6. A visualization of MIDI in a traditional music notation layout using the 'score' option in Logic Pro.

recombination. By placing the word 'provisional' before 'work,' Butler implies that the 'work' without it is fixed.The same wordplay appears in his notion of the 'performing audience,' which he uses to describe how audiences in live electronic music are able to participate in the musical act through dance and other forms of interaction. Again, by placing 'performing' before 'audience,' Butler implies that the audience without it is passive or receiving only. Butler plays with binary oppositions; he takes existing notions from the traditional music theoretical paradigm, and recombines them to show that electronic music technologies have deconstructed them. However, Butler does not interrogate the hierarchical values on which these binary oppositions are built in the first place. Even in Butler's 'new' concepts the notions of the musical work, the performer and the audience are not neutral. By repurposing these terms, Butler is also reinforcing them as a foundational lens through which electronic music should be viewed.

Similarly, Butler's framing of circularity is also not as neutral as he claims it to be. In the last chapter of his book, Butler sets out to establish a 'positive' framing of circularity, acknowledging that its framing in academia has been largely negative. He argues that the conflation of cycles with geometric circles has cast them as "static, timeless, and devoid of clear points of origin" (2014, p. 10). In response, then, Butler "intend[s] to uncover the kinetic properties of musical cycles, revealing the ways in which they possess clearly perceptible points of origin, movement toward goals, and distinct phases with particular qualities" (2014, p. 10). This statement brings to mind Schenker's description of musical linearity, which stated that "[t]he *goal* and the course to the goal are primary" ([1935] 1979, p. 5). By emphasizing "clearly

perceptible points of origin, movement toward goals, and distinct phases with particular qualities" (2014, p. 10), it seems that Butler *validates* circularity on the basis of linear values. In other words, the 'positivity' of Butler's framing of circularity relies on the extent to which it displays linear characteristics.

Butler limited the scope of his research by focusing on circularity only. From a post-structuralist perspective, this approach is suspect from the outset. A positive or neutral framing of circularity is possible only by deconstructing the linearity/circularity binary as whole. This means firstly to uproot the hidden values and hierarchies that the binary engenders, and secondly to establish a new ontological basis which is not rooted in division. This chapter has shown how the West has persistently prioritized linear concepts of time and music. This casts the negative framing of circularity as an inevitable consequence. Kant's linear time and the clock continue to appear in the interfaces of digital audio software. Although the loop-based interface represents a break with linearity, it seems that linear values continue to operate on a deeper level. The next chapter therefore proposes a reframing of circularity in electronic music studies based on an African temporal and musical ontology.

2. Circularity Through African Philosophy

This chapter explores African temporal and musical ontologies to establish an African reframing of circularity. Firstly, I use John S. Mbiti's (1971) notions of actual time and potential time, to characterize African time as an experiential and fundamentally dynamic phenomenon. I also discuss the concept of *ubuntu*, which according to Mogobe Ramose (1999) underlies the holism of African thought. Secondly, I show that African time and the holistic worldview come to expression in the African time cycle – William Anku (2003) and John Collins (2004) offer extensive discussions of the African time cycle as a musical structuring principle in traditional African drumming. I show that the African temporal and musical ontologies urge a reevaluation of the way that scholars have framed rhythm and dance in electronic music studies.

The influence of African-American and Afrodiasporic culture on contemporary music production has been widely noted. In telling the history of electronic music, scholars inevitably stumble upon artistic and technological innovations coming from black (sub)cultural production. Nick Wiltsher (2016) even argues that blackness has served a measure of authenticity in discourses on electronic music. Only a few studies, however, reflect the 'blackness' of electronic music on the level of theory. For example, Alexander Weheliye (2005) argues that sound technologies have been central to the establishment of 'sonic Afro-Modernity' in the 20th century. Afrofuturist scholar Kodwo Eshun (2018) offers a vibrant overview of how electronic music technologies have fueled black futurist imaginations. In the musicological field, studies on rhythm, groove and dance have included African-American and, to a lesser extent, African perspectives (see for example Brøvig-hanssen et al., 2021). In his framing of circularity in live electronic music performance, however, Mark J. Butler (2014) argues *against* the inclusion of African or Afrodiasporic perspectives. According to Butler, the lack of a temporal dimension in African and Afrodiasporic studies makes them unsuitable for the study of 'exact' repetition in electronic music.[8] Thus, although electronic music scholars acknowledge the influence of African-American and Afrodiasporic culture on the styles and production practices of electronic music, there seems to be a struggle to reflect these on a structural, theoretical level.

[8] In an earlier work, Butler (2006) also argues that African-American music styles are not repetitive *enough* to be compared to electronic music.

The previous chapter has shown that the linearity of the Western framing of circularity operates on the ontological level. If we were to reframe circularity in a way that reflects the African-American and Afrodiasporic perspectives, then this should operate on the ontological level as well. While enslaved Africans were forced to adapt to a 'new' world after being shipped across the Atlantic, many aspects of their culture, beliefs and social customs survived. As Earl McKenzie (1973) states on the merging of African and European culture in the Caribbean,

> It is difficult – and in some cases probably impossible – to trace the historical rate, patterns and degrees of acculturation into the European ways of seeing things. [...] The survival of philosophical concepts are probably the most difficult of all features of this process to identify and isolate. Yet they could be the most crucial of all inheritances, since they are part of the theoretical foundations of the society. (p. 83)

Thus, the engagement with African philosophy, and its temporal and musical ontologies, helps to illuminate the temporal and musical foundations of the African-American and Afrodiasporic perspectives.

African philosophy has established itself fairly recently, as it first appeared in written literature in the first half of the 20th century. One of the central issues in African philosophy has been its epistemological relationship with Western philosophy. As Kwasi Wiredu (2008) states, "[a] principal driving force in postcolonial African philosophy has been a quest for self-definition" (p. 1). This firstly has to do with their different interpretations of the meaning of philosophy. According to Fidelis U. Okafor (1997), "[a] feature of African philosophy that makes it quite different from its Western counterpart right from its beginning is that philosophy was not conceived and did not develop as a separate discipline in isolation from life, but was embodied in particular forms of practice and beliefs" (p. 253). Paul Houtondji introduced the term 'ethnophilosophy' to describe how African philosophy "engages in the interpretation of the world-view or the unveiling of the thought system and the way of thinking of a particular community or the whole of a cultural region" (Okafor 259). This understanding of African philosophy as representing the ideas, worldviews and logics embedded in African practices and beliefs underpins the African temporal and musical ontologies discussed in this chapter.

2.1. African time

Temporality plays a central role in African philosophy. In *African Religions & Philosophy* (1971), John S. Mbiti introduces a notion of African time that has formed the basis of continued discussion on the topic. Mbiti argues that for Africans "time is simply a composition of events which have occurred, those which are taking place now and those which are immediately to occur" (1971, p. 17). In other words, African time is experiential. In order for time to be considered real, it has to be experienced.[9] Consequently, only the past and the present are considered real time. Mbiti describes "what is present and what is past" using the notion of 'actual time' (1971, p. 17). That which cannot be experienced, on the other hand, falls in the category of 'no-time.' This includes the unforeseeable future. As Mbiti states, "events which lie in it have not taken place, they have not been realized and cannot, therefore, constitute time" (1971, p. 17). This distinguishes African time from Western linear time, in which the future plays an important role. But, as Mbiti states, "[w]hat is certain to occur, or what falls within the rhythm of natural phenomena, is in the category of inevitable or *potential time*" (1971, p. 17). Thus, potential time distinguishes itself from the far future by having a direct relevance to the present. The two dimensions of actual time and potential time inform the African notion of time as a dynamic, experiential phenomenon.

The previous chapter established that time in the West is experienced as an empty, mathematical framework within which humans exist and to which they should adhere. In the African context, humans do not exist *in* time. Rather, time is created or produced through human action. This has led to common misconceptions by Westerners of Africans having no time-awareness or always being late. But, as Mbiti states, "these are judgments based on ignorance of what time means to African peoples. Those who are seen sitting down, are actually *not wasting* time, but either waiting for time to happen or in the process of 'producing' time" (1971, p. 19). Similarly, Mbiti describes Africans as having a different attitude towards the future than Westerners;

> In traditional African thought there is no concept of history moving ''forward'' towards a future climax, or towards the end of the world. Since the future does not exist beyond a few months, the future cannot be expected to usher in a golden age [...] The notion of a

[9] This is similar to Bergson's (2004) argument that true time resides in the flux of time, not in the instrumental experience of time based on goal-oriented events.

> messianic hope, or a final destruction of the world, has no place in the traditional concept of history. So Africans have no ‘‘belief in progress,’’ the idea that the development of human activities and achievements move from a low to a higher degree. The people neither plan for a distant future nor ‘‘build castles in the air.’’ (1971, p. 23)

Mbiti’s statement that Africans have no belief in progress has been met with controversy, and understandably so. However, interpreting it negatively also runs the risk of reinforcing Hegel’s notion of progress as a measure of civilization and worthiness. Instead, the African notion of time could be embraced as an opportunity to critically examine the striving towards progress and the future in the West.

Thus, the African notion of time offers a departure from Western linear time based on the past, present and future. Instead of a single point between the past and the future, the present moment exists within the continuous tension between actual time and potential, between what is and what could be. This does not mean, however, that African time is circular. As Earl McKenzie (1973) states,

> In the African tradition [...] historical time is neither cyclic nor progressively linear. [...] The rhythm of individual life, the rhythm of natural events, and the rhythm of history are important aspects of African life. It is not surprising then [...] that rhythm is such an important aspect of African music. But African rhythm is a part of an ongoing (if backward) linearity. African eternity is not the mechanical monotony of the drone; and its linearity is not the axiomatically constructed and climactically charged kind which is such an important part of the tradition in western music. It is linear enough to be quite melodic, but rhythm is the essence of all its movement and directions. (82)

Thus, according to McKenzie, both linear and circular motions combine to form the natural rhythms of African time. He also describes African time as a ‘backward’ linearity. Instead of Western time moving ‘forward’ into the direction of the future, African time moves ‘backward’ from the present to the past. Importantly, neither linearity nor circularity is prioritized in African time; it is both linear and circular, both rhythm and melody.

McKenzie’s use of a musical analogy is not accidental. According to Mogobe Ramose (1999), the African conception of the universe is itself musical. Music and existence are not

considered as separate phenomena. Rather, they are part of a holistic worldview as captured in the concept of *ubuntu*. According to Ramose, the root of all African philosophy can be found in ubuntu, a term which refers to the "indivisible one-ness and whole-ness" of being (1999, p. 36). Ubuntu defines existence as a fundamentally dynamic phenomenon, a perpetual 'becoming' rather than 'being.' Moreover, as Ramose states, "it speaks directly against the fragmentation of be-ing" (1999, p. 41). This leads to a different meaning of music than in the Western context. According to Ramose, music represents the striving towards harmony, which is the movement of being itself. Consequently, the invitation of dance is "an ontological and epistemological imperative to be in tune" (1999, p. 43), to be in harmony with being. No distinction is made between the body and the mind, the rational and the emotional; rather, the striving towards harmony, according to Ramose, is both a rational and an emotional act.[10] Moreover, the invitation of music and dance cannot be declined. This, according to Ramose, explains the difference in attitude towards music between African and Western cultures. In the African context, "passive spectatorship on hearing the music of be-ing is understandable only as a necessary posture for the fragmentation of be-ing. It is a prior and necessary condition for the fragmentation of be-ing" (1999, p. 44). From an African perspective, the strict separation of the composer, performer and audience, and the way that they are set up in the West, represent a fundamental denial of what it means to be. As the concept of ubuntu makes clear, it is precisely these divisions that music in the African context seeks to overcome.

[10] This explains why there is no such thing as 'African music theory,' which would require a separation between the body and the mind, and between the theory and practice of music.

2.2. The African time cycle

To show how music overcomes division in the African context, I will now address the role of circularity in African music. African music is generally perceived as a circular concept; however, some scholars choose not to overemphasize this aspect. According to Martin Scherzinger (2021), it feeds into "routine oppositions between musical traditions construed as either contemplative or functional, abstract or embodied, formal or social, rhythmically or harmonically complex" (p. 407). In the same way, Kofi Agawu (2003) emphasizes that many African musics, especially those that are not based on the drum, do not follow this circular logic. My aim therefore is not to define African music on the basis of circularity; rather, I am interested in *how* circularity operates as a temporal and musical structuring principle.

According to William Anku (2000), there are four structural characteristics to traditional African drumming. First, it is "rigidly controlled by a *recurrent rhythm* often associated with the role of the *bell* pattern" (2000, para. 2). The bell provides a recognizable, consistent rhythm around which other instruments can assemble. Second, Anku argues that this recurrent rhythm translates as a time cycle because "African music is perceived essentially as a circular concept rather than linear" (2000, para. 3). This means that African music is not structured as a linear narrative from beginning to end; instead, it is a dynamic and open-ended phenomenon. A third characteristic is that the multiple instruments and events within the time cycle are unified "by a common recurring undercurrent of one *regulative beat* per cycle which is divided into four equidistant beats" (2000, para. 4). The regulative beat refers to a rhythmic phrase that not only spans the entirety of the time cycle, but that *defines* its length as well as its structural subdivision. In other words, it is rhythm that defines the time cycle. Lastly, the time cycle includes a background of concentric circular rhythms, which serve as the basis for a 'master drummer' to perform "intriguing, logically ordered rhythmic manipulations" (2000, para. 5). These four characteristics define the African time cycle as a musical structuring principle fundamentally controlled by rhythm, affording both continuity and improvisation.

The flexibility of the African time cycle can be understood as a result of its modular setup. As Anku states, "[t]he time cycle ultimately defines a set and this set rhythm is a structural module from which the entire performance is derived" (2000, para. 8). But the African time cycle is also internally complex. Whereas most Western music is based on a metric division of

four beats[11], traditional African time cycles contain 12 or 16 beats that are subdivided into smaller subcycles of 2, 3, 4 or 6 beats. This means that one instrument might be playing a rhythmic phrase that spans the entire cycle, while another instrument plays a shorter phrase which goes through multiple iterations throughout the entire cycle. Complex interactions arise from the overlap between irregular rhythmic cycles. This casts the African time cycle as a polyrhythmic and polymetric phenomenon. Moreover, the various lengths of the subcycles also mean that there is no single beginning or end to the cycle. Individual subcycles can have different starting points at which they enter or exit. Compared to Western music, then, the African time cycle emphasizes the complex entwinement of rhythms and instruments, and foregrounds the interactions and conversations that happen between them.

The African time cycle can be visualized using a circular diagram, although this has its limitations. Figure 7 contains the visualization of an African time cycle, which was created by John Collins (2004) using the *Time Unit Box System* (TUBS) in a circular shape. The TUBS system is an alternative notational system that was introduced to represent African music in separation from the Western notational system. The letters in the diagram represent different techniques of hitting the drum; the L refers to a low note resulting from hitting the drumhead in an open way, and the H refers to a high note resulting from the drum being struck and pressed at the same time. Collins himself notes that the circular diagram has its limitations for representing African music; most importantly because in practice "the music winds itself through time" (2004, p. 57). Therefore, both Collins and Anku argue that the circular diagram should be regarded as a single slice of a three-dimensional spiral.

The African time cycle involves the participation of various actors – not just musicians. Dancers are also integral participants in the time cycle. As Collins states, "[i]t is always feet movement that determines the main onbeat in African music" (2004, p. 61). The feet of the dancers, then, have their own patterns; they enter into conversation with the drums and provide a stable foundation to the cycle as a whole. The movement of the dancers' feet is not heard in the same way that drum strokes are. Contrary to Western music, in which the onbeat serves as an

[11] Here, 'beat' refers to an individual instance of the underlying pulse, not the rhythmic phrase described earlier.

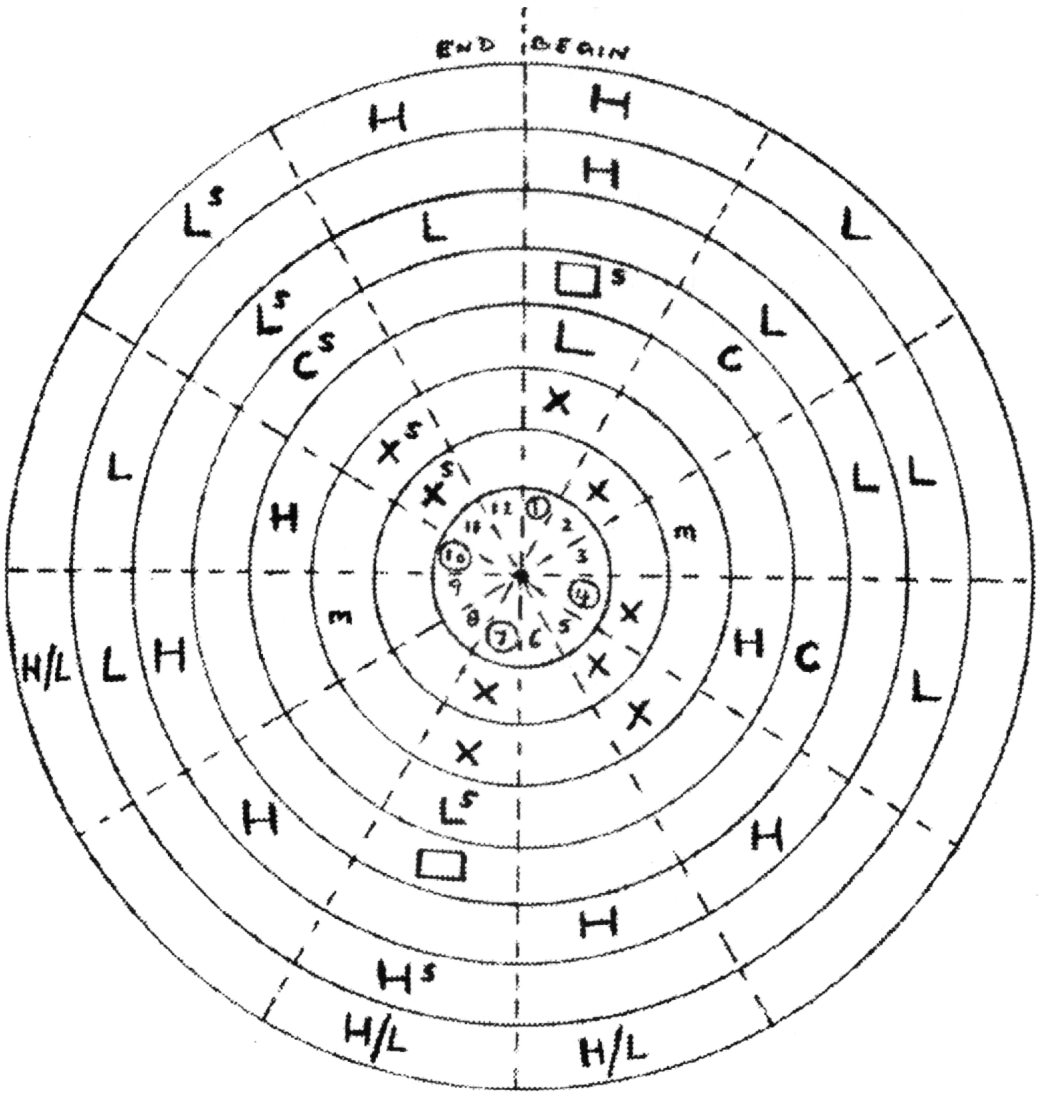

Figure 7. A visualization of the time cycle of the adowa beat, drawn as a circular diagram by John Collins (2004) using the TUBS notation system (p. 58). The TUBS diagram is specifically created to represent music based on the drum. The letters represent different techniques of hitting the drum. The numbers in the middle represent the beats of the cycle; this cycle is 12 beats in length. The encircled numbers are the on-beats that subdivide the cycle – in this case, into sets of three.

explicit musical anchor, the onbeat in African music can also be emphasized through silence and movement.[12] It should now become clear that the African time cycle is not so much a *description* of African musical practice, as it is an active means of communication between different participants entering into interaction, conversation and improvisation.

As such, the African time cycle is the concrete expression of the holistic worldview contained in the concept of ubuntu. It brings various rhythms, instruments, musicians and dancers into a dynamic alignment. Also, there is no obvious hierarchy; all participants contribute to the movement of the cycle. As Collins (2004) states, "African music is of a polyphonic, equivocal and communal nature, and so puts only a modest emphasis on the individual prowess of the composers and player" (p. 82). According to Collins, the interplay within the cycle creates something that is bigger than the sum of its parts; a kind of "cosmic togetherness" appears in "the collective pulse of the beat that no one actually plays" (p. 128). Therefore, the unity of the time cycle is not a case of rigid enforcement; it embodies the striving towards alignment not as a means towards a goal, but rather as an end in itself.

Consequently, the time cycle also does not move through time towards a goal, but rather produces or creates time itself. As such, it is the concrete expression of Mbiti's (1971) actual time and potential time embodied in circular motion. According to Mbiti, time exists within the continuous tension between actual time and potential time. Collins uses a similar notion, that of 'accumulated time,' to describe how this potentiality comes to expression in the African time cycle. As Collins states, accumulated time is "something that is built up and not used up, something that increases and is not spent" (2004, p. 126). Also, he continues, it "does not so much as move forward, but rather provides a series of consecutive rooms for ongoing human actions" (p. 126). Here, Collins' accumulated time is directly linked to Mbiti's potential time. Every iteration of the time cycle implies the inevitable occurrence of the next; the time cycle thus exists within the continuous motion between what is and "[w]hat is certain to occur, or what falls within the rhythm of natural phenomena" (Mbiti, 1971, p. 17). It alternatingly represents actual time and potential time as it moves through the natural cycles of the beat. Collins, then, argues that a singular cycle represents the "now" of accumulated time (2004, p. 127). This is how the complex mingling between music and being comes to expression in the African time cycle. It

[12] This balancing relationship between sound and silence is already contained within the drum itself; in the technique of drumming, the unheard upstroke of the hand is just as important as the downstroke.

shows that time and music are not understood as separate phenomena in the African context; rather, the time cycle represents a measure of temporality that emerges from the musical act itself.

2.3. Circularity and electronic music studies

Butler (2014) argues that the African and Afrodiasporic perspectives lack a temporal dimension. Through a discussion of African time and the African time cycle, I hope to have demonstrated that this is not the case. Instead, in combining musical and temporal circularity in a single framework, the African time cycle offers a productive starting point for the analysis of circularity in the digital audio interface. But first I want to address some implications of the African holistic ontology for existing analyses of rhythm and repetition in electronic music studies.

In the first chapter I discussed Butler's (2014) notions of the 'provisional work' and the 'performing audience' which he uses to describe new shifts as a result of loop-based music technologies. Looking at these terms again through an African lens, it becomes clear that they reinforce a fragmentational logic. The 'work' in African music was always provisional; contingency, movement and improvisation are internal to the work itself. This also affects the status of ownership in African music, as no individual owner can be identified. In the same way, the notion of the 'performing audience' has little meaning in the African context. Dance and improvisation are integral to the African time cycle; they are not so much a response to it as they are part of its creation. The boundary between the performer and the audience in the African context is by definition blurred. No one is performing *for* anyone; rather, the purpose of music and dance is contained within the act itself. Rather than representing entirely new configurations, Butler's terms appear as reconciliations of what Western music theory separated in the first place.

This demonstrates firstly the extent to which underlying assumptions and worldviews color the outcome of electronic music scholarship. Butler's terms are meaningful only when regarded through a Western lens, and this rules them out of having universal validity. The African perspective, on the other hand, reveals something meaningful about the West; that fragmentation and division, while not representing 'natural' phenomena, form the foundations of the Western worldview. This also begs the question to what extent Butler's shifts should be regarded as technology-driven innovations. Whereas the Western perspective shows them as

disruptions of an earlier state, the African perspective casts them as technological materializations of a musical logic that has existed long before. Dance, participation, improvisation and contingency are all contained within the African time cycle; circularity as a musical structuring principle functions both with or without technology. If, like Butler, we choose to regard circularity as a musical technology itself, and not as a feature *of* technology, then it would be only fair to credit its invention to the African musical tradition instead of to the loop-based technologies coming from the West.

Another implication of the African perspective regards the framing of rhythm and dance in electronic music studies. Electronic music scholars have routinely framed them in terms of pleasure (see for example Neill, 2002; Witek, 2017 and Brøvig-hanssen et al., 2021). These studies emphasize the psychology of dancing to repetitive rhythm, and use the notion of 'entrainment' to describe how the engagement of the body through rhythmic repetition leads to pleasurable experiences. This stands in a longer tradition of studies equating musical repetition with pleasure and ecstasy. Although this approach might productively explain the *experience* of dance, it is also proof of a narrow framing. From the African perspective, music and dance represent the ontological striving towards harmony; their meanings are in no way limited to pleasure. In fact, African music traditionally performs a wide range of functions, from accompanying weddings and funerals, to serving as a tool for communication and the transmission of knowledge. As Collins (1992) states, the musician should not be regarded simply an entertainer;

> The African master musician is in tune not only with the music, but also with society at large. He leads through balance and cooperation. He can heat people up into states of possession or cool them down by focussing on inner silence. Music is a microcosm of the whole society. (pp. 7-8)

This bestows upon the musician a certain influence and responsibility, which some electronic music scholars have interpreted in exoticized terms. For example, Scott Hutson (1999) and Graham St John (2017) have likened the role of the DJ or electronic performer to that of a 'technoshaman.' This exoticization is problematic in and of itself, as it reinforces Western stereotypes of non-Western cultures and traditions. But also, interpreting rhythm and dance as

forms of escapism and transcendence places them in opposition to normality and regards them as removed from daily life. A holistic framing, instead, urges an understanding of music and dance as integral parts of the fabric of existence itself.

This chapter has shown that perspective matters. The African view offers a framing of circularity that is fundamentally different from the Western one. It is based on a holistic worldview and speaks directly against the fragmentations performed by Western music theory and the Enlightenment. Choosing an African ontological starting point, then, might lead to different insights and outcomes in the study of electronic music. So far, the Western perspective has been prioritized in electronic music studies. This has led to a marveling at the novel innovations of loop-based electronic music technology, such as the blurring of boundaries between performers and audiences, and the inclusion of contingency in the musical work. From the African perspective, however, these configurations are the norm rather than the exception. Butler's (2014) argument that the African and Afrodiasporic perspectives lack a temporal dimension is proof of a limited theoretical scope. Moreover, it reveals his position in "the colonial matrix of power" (Mignolo, 2012a, p. xvi). By engaging with African philosophy, this chapter has established a framing of circularity as a musical and temporal structuring principle. The following chapter puts this African framing to practice in the analysis of the loop-based interfaces of Ableton Live and Logic Pro.

3. Modular Constellations in *Session View* and *Live Loops*

This chapter analyzes Ableton Live's *Session View* and Logic Pro's *Live Loops* through an African lens. First, I use Michael D'Errico's (2016) notion of 'interface aesthetics' as a methodological approach to draw attention to the use of geometric shapes and structures in the loop-based interfaces. Then, I analyze how these shapes and structures construct specific temporal and musical affordances in the interfaces. Thirdly, I compare their specific operationalizations of circularity to the African notion of time and the African time cycle. I show that *Session View* and *Live Loops* both disintegrate the unity of the time cycle, revealing a fragementational logic based on a compromise with the linear arrangement paradigm.

Methodologically, interface analysis has become increasingly important in the study of music production in the digital age. Florian Cramer (2011) defines the interface as "anything acting as a common boundary or link between machine components - whether on software or hardware level - or between human operators and the human-designed machines" (p. 118). From this perspective, digital audio software can be regarded as serving as an interface between various human and nonhuman components. For example, it is often used as a central tool to connect various MIDI controllers, external plug-ins and other hardware instruments as well. My focus will be on digital audio software as a human-to-software interface. The Graphical User Interface (GUI) of the DAW, which is represented on the screen, has also been analyzed by other scholars (D'Errico, 2016; Macchiusi, 2017). D'Errico uses the term 'computational thinking' to describe how the skills and design aesthetics of computer programmers shape the DAW's interface, and increasingly encourage users to "think through the lens of designers: crafting entire systems rather than individual "works" (p. 24). Consequently, D'Errico argues that music producers "are not only creative agents, but must also balance aesthetic preferences with the affordances and constraints of audio software" (p. ii). This situates music producers not merely as *users* of audio interfaces, but increasingly as designers and programmers in their own right. D'Errico emphasizes the importance of aesthetics in the interface. He uses the notion of 'interface aesthetics' to describe "how humans - respectively computer users - perceive the world via the organisational and sensory structures programmed into the device" (p. 119). This includes for example colors, shapes, symbols and the composition of elements on the screen. At the same time, he states, interface aesthetics refers to "a scholarly method [...] in which the technical

structures of software are analyzed hermeneutically and semiotically in order to reveal social, cultural, and ideological structures embedded within aesthetic design" (p. 15). This approach informs my analysis in this chapter. By looking at the use of geometric shapes and structures in the representation of time in the interface, I seek to uncover the temporal and musical values embedded in *Session View* and *Live Loops*.

To systematically analyze the two interfaces, I used a combination of sources. Firstly, my analysis builds on personal experience. As a music producer myself, I have familiarity with both DAWs. However, this experience is primarily based on the linear arrangement views. To gain familiarity with the interfaces and not depend on a single perspective, I used a number of YouTube videos as a secondary source. These videos are made by YouTubers for an intended audience of novice or intermediate users. By emphasizing certain functionalities and expressing personal preferences and opinions, these YouTubers suggest specific uses for the loop-based interfaces, which in turn reflect biases and assumptions embedded in the interface designs. My aim, however, is not to analyze individual use practices of the software. Instead, my focus is on the underlying logic and the structuring principles which make circularity operable in the loop-based interfaces. Lastly, I consulted the user manuals of Ableton Live and Logic Pro to examine how they represent the usability and functionality of the interfaces. Although my focus is on the loop-based interface, I will inevitably touch upon the traditional linear arrangement views of the programs as well. The aim, however, is not to perform a comparative analysis of the loop-based and the linear arrangement view. Rather, I aim to uncover aesthetic and structural tendencies in the way that the two loop-based interfaces interpret circularity and make it operable.

Ableton Live was the first digital audio software to introduce an interface geared specifically towards live electronic performance. Contrary to other DAWs, Ableton Live's default view is the nonlinear *Session View.* In the user manual, three uses are mentioned that *Session View* is specifically created for. The first is playing live or DJing, when "the order of pieces, the length of each piece and the order of parts within each piece is generally not known in advance" (Hughes et al., 2022, p. 131). The second is in theatre, when "sound has to react to what happens on stage" (Hughes et al., 2022, p. 131). And thirdly, they state, "[w]hen working along with a piece of music or a film score, it can be more efficient and inspirational to start with an improvisation, which is later refined into the final product" (Hughes et al., 2022, p. 131). This

firstly implies that the functionality of *Session View* is not limited to music only; rather, it affords interactions with other, visual media forms. And secondly, all three uses involve the need for liveness and real-time response; this is what separates *Session View* from the traditional *Arrangement View*.

Almost twenty years after the launch of Ableton Live's *Session View*, Logic Pro introduced its own loop-based interface called *Live Loops*. Like *Session View*, *Live Loops* allows for real-time, nonlinear arrangement. However, there seems to be slightly less emphasis on live performance; as stated in the manual, "Live Loops makes it easy to improvise and create music like a DJ or electronic music producer. With Live Loops, you can play, arrange, and record new musical ideas in real time" (Apple, 2022, p. 54). The usefulness of *Live Loops* as a compositional tool seems to be confirmed by a number of YouTubers. For example, a YouTuber posting under the name Why Logic Pro Rules is a rock musician who uses *Live Loops* as a scratchpad for capturing ideas on the fly.[13] Another popular YouTuber states that *Live Loops* does not work very intuitively for use in live performance.[14] It seems, then, that the interfaces of *Session View* and *Live Loops* suggest, invite and allow different ways of working. It should be noted that Ableton Live and Logic Pro are not the only DAWs that afford loop-based and nonlinear processes. For example, FL Studio is a DAW known for its useful integration of the step sequencer. What separates the loop-based interfaces of Ableton Live and Logic Pro is their intention to be used in live performance, which, as will become clear, involves a specific kind of temporality in the interface.

3.1. Modular grid

The first similarity between *Session View* and *Live Loops* is that they are both based on a rectangular grid. Their rectangular grids are made up of two axes. One axis contains a separation between different instruments, for example a drum kit, bass or synth. This is what D'Errico (2016) calls the 'instrumental lineage' of the DAW, which is based on the remediation[15] of

[13] Why Logic Pro Rules. (2022, April 28). *Why Live Loops Rule (Even If You're Not a Beatmaker)*. [Video]. YouTube. https://www.youtube.com/watch?v=WKpM8mFgITU

[14] Nathan James Larsen. (2022, July 10). *How to Use Live Loops LIVE in Logic Pro X!* [Video]. https://www.youtube.com/watch?v=VAloccRb7q0

[15] D'Errico (2016) explains that the term 'remediation' was introduced by Jay Bolter and Richard Grusin to describe how new media platforms "appropriat[e] the techniques, forms and social significance of other media and attempts to rival or refashion them in the name of the real." (65)

pre-existing analog instruments and hardware (p. 36). Each instrument has its own 'track.' The separation of instruments on separate tracks mimics the layout of the mixing board in the analog studio. In *Session View* the instrument tracks are represented on the horizontal axis (Figure 8). In *Live Loops*, they are represented on the vertical axis (Figure 9). The other axis in both interfaces represents multiple looped recordings or patterns associated with a single instrument. These loops act as different 'options' and provide the building blocks for live, improvisational arrangement. Their position in the grid does not predetermine their order; as stated in the user manual of Ableton Live, they "can be played at any time and in any order" (Hughes et al., 2022, p. 132). If we compare the grid of the loop-based interface to the linear arrangement view, it is as if the axis of 'loops' has replaced the temporal axis. In the linear view, the other axis divides time into equally spaced intervals which are controlled by the project's tempo (Figure 10 and 11). This axis represents the 'empty' temporal canvas on which musical creation can occur. In the loop-based interface, the empty canvas is made up of empty slots; these have no length or duration before information is recorded into it. Compared to the linear arrangement view, then, the second axis in the loop-based interfaces is composed of possible events rather than time.

To understand the meaning of the 'options' in the interface, I will briefly discuss the notion of modularity. As an interface strategy often associated with new media objects, modularity represents the breaking up of a complex system into smaller, largely independent elements. Baldwin and Clark (2000) explain the concept of modularity as follows;

> When the complexity of one of the elements crosses a certain threshold, that complexity can be isolated by defining a separate *abstraction* that has a simple *interface*. The abstraction *hides* the complexity of the element; the *interface* indicates how the element interacts with the larger system. (p. 64)

Modularity thus forms an interpretation of a complex system; it decides what elements should be discerned in the system, and establishes meaningful relations between them. The modular grid in both interfaces, then, represents a specific *interpretation* of a musical system based on circular structures. The separation of the two axes determines what is meaningful in the musical system. Moreover, the rectangular layout shapes how we perceive the relationships between the loops in the system; the first layer of division is that of different instruments, while the second layer

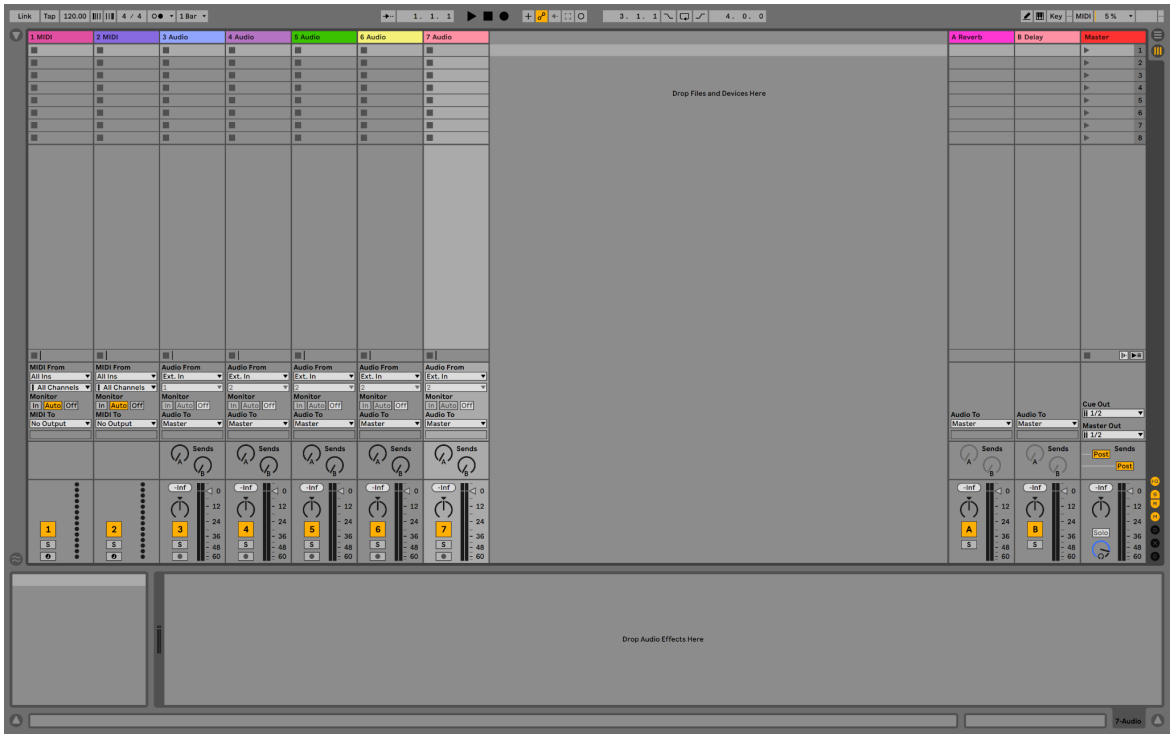

Figure 8. The horizontal axis in Ableton Live's *Session View* contains separate instrument tracks. The vertical axis contains slots for different loops, patterns or recordings associated with a single instrument.

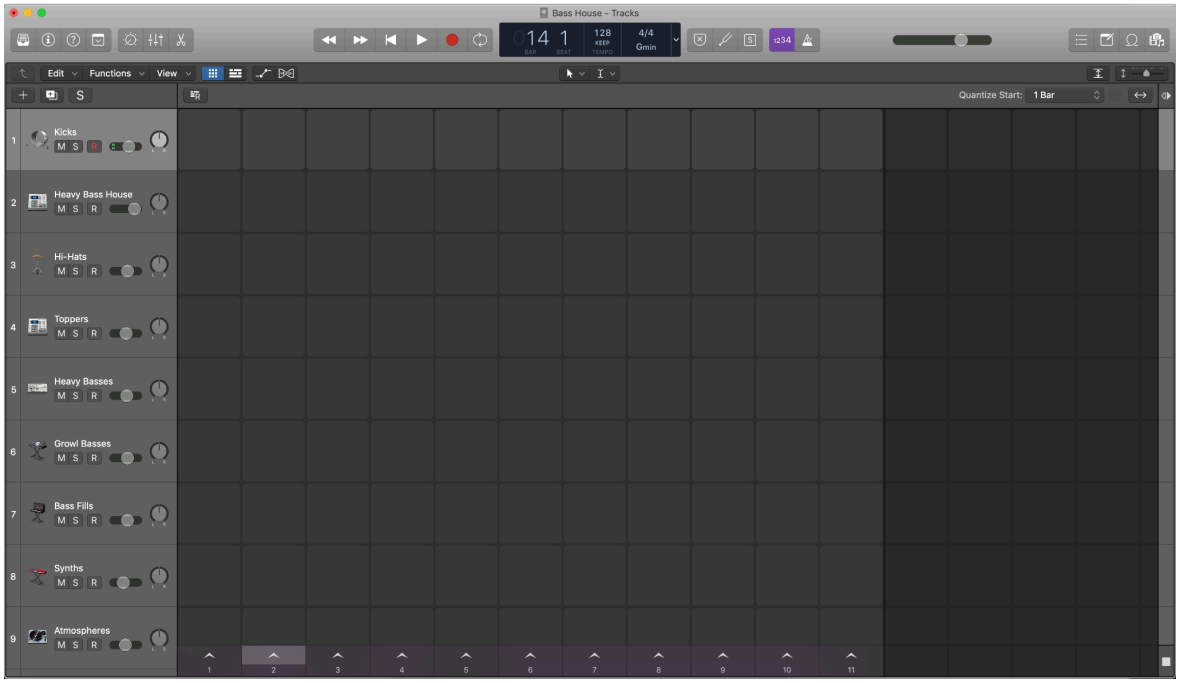

Figure 9. The vertical axis on the left in *Live Loops* contains separate instrument tracks. The horizontal axis contains slots for different loops, patterns or recordings associated with a single instrument.

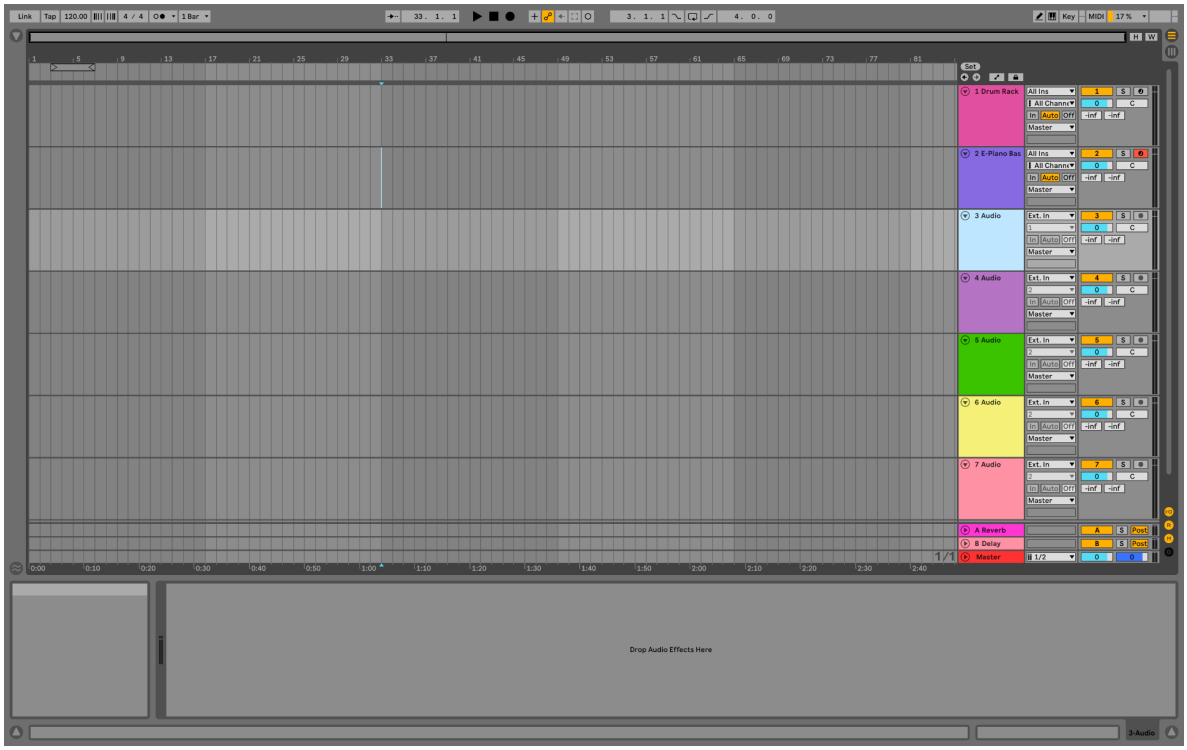

Figure 10. The *Arrangement View* in Ableton Live is divided by a discrete, equally spaced grid, which represents the metric division of the project into 'beats'.

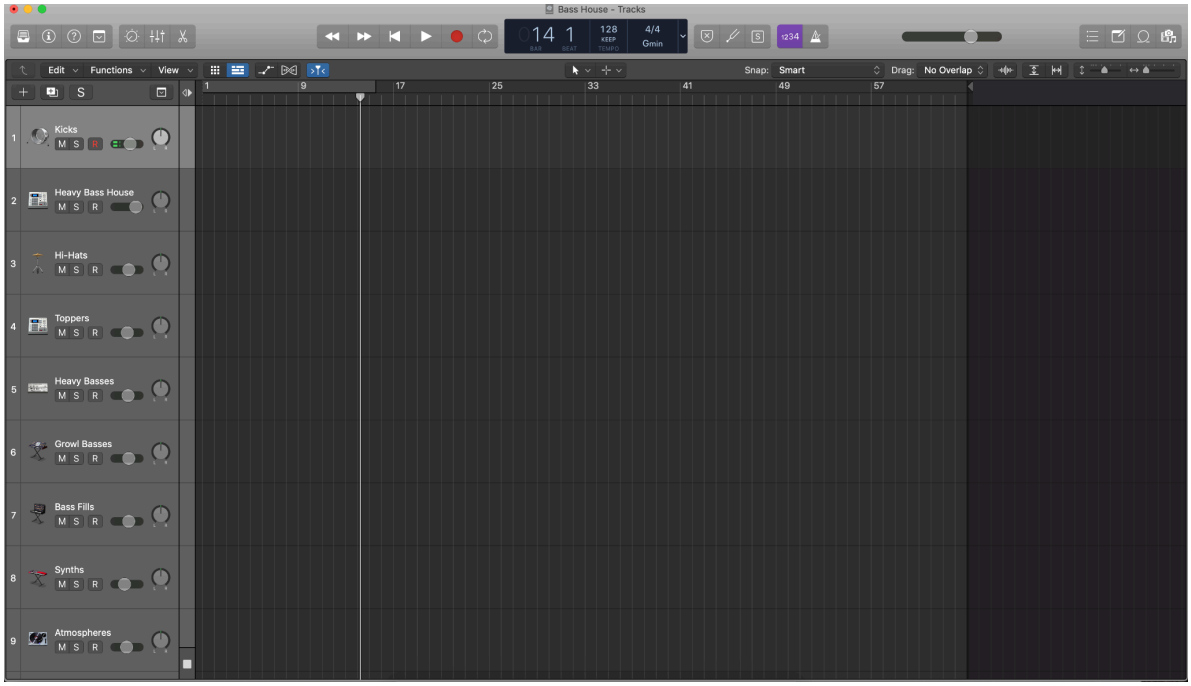

Figure 11. The *Tracks View* in Logic Pro is divided by a discrete, equally spaced grid, which represents the metric division of the project into 'beats.'

shows loops from the same instrument in a row. This interpretation of the loop-based system in a rectangular grid is not the only possible one; however, it is a strategy that both loop-based interfaces have adopted.

Although the interfaces are technically quite similar, they do show different aesthetic strategies. This is primarily related to the representation of the modular units in both. The loops in *Session View* are called *clips*, a term which reflects an audiovisual orientation. For example, Merriam-Webster (n.d) defines a clip as "a section of filmed, videotaped, or recorded material." The clips in *Session View* are visualized as a sort of slot, which matches the flat, gray, minimalistic aesthetic of Ableton Live reminiscent of the functional design of computer hardware. The content of a clip is not visualized in the macro-view; it can only be seen linearly when opened in the micro-editing frame (Figure 12). *Live Loops* on the other hand takes a more visually striking approach (Figure 13). The modular units in *Live Loops* are called *cells*. The image of a circular string within the cell gives the impression of a DNA-like shape. Also, the biological connotation frames the individual cell as a part of a larger organism. Whereas the computer hardware aesthetic of *Session View* reveals a more classic interpretation as a functional device, the biological connotation of *Live Loops* presents an aesthetic departure from the physicality of hardware.

Contrary to the clip, the cell visualizes the content of the loop in the macro-view, represented circularly either as an audio signal or MIDI pattern. Consequently, the cell invites the user to engage with sound on the basis of eyesight. The sonic and temporal content of the loop becomes spatial. Moreover, the information contained within the cell is represented as having a circular shape; the beginning and end of the recording literally meet. This circular representation adopts and literally bends the visualization of audio in the linear view; as such, it integrates both a traditional linear and a new circular orientation. Compared to the basic design of clips in *Session View*, the cells in *Live Loops* represent musical circularity as a spatial phenomenon.

Furthermore, the loop-based views themselves can be considered a module within the larger framework of the software programs as well. Both *Session View* and *Live Loops* allow users to jump back and forth between the linear and loop-based arrangement views. For example, users can record their 'real-time' performances into the linear grid. Conversely, pieces of music from the linear view can be imported into the loop-based view to become operable as loops. However, the relationship between the loop-based interface and the linear view is constructed

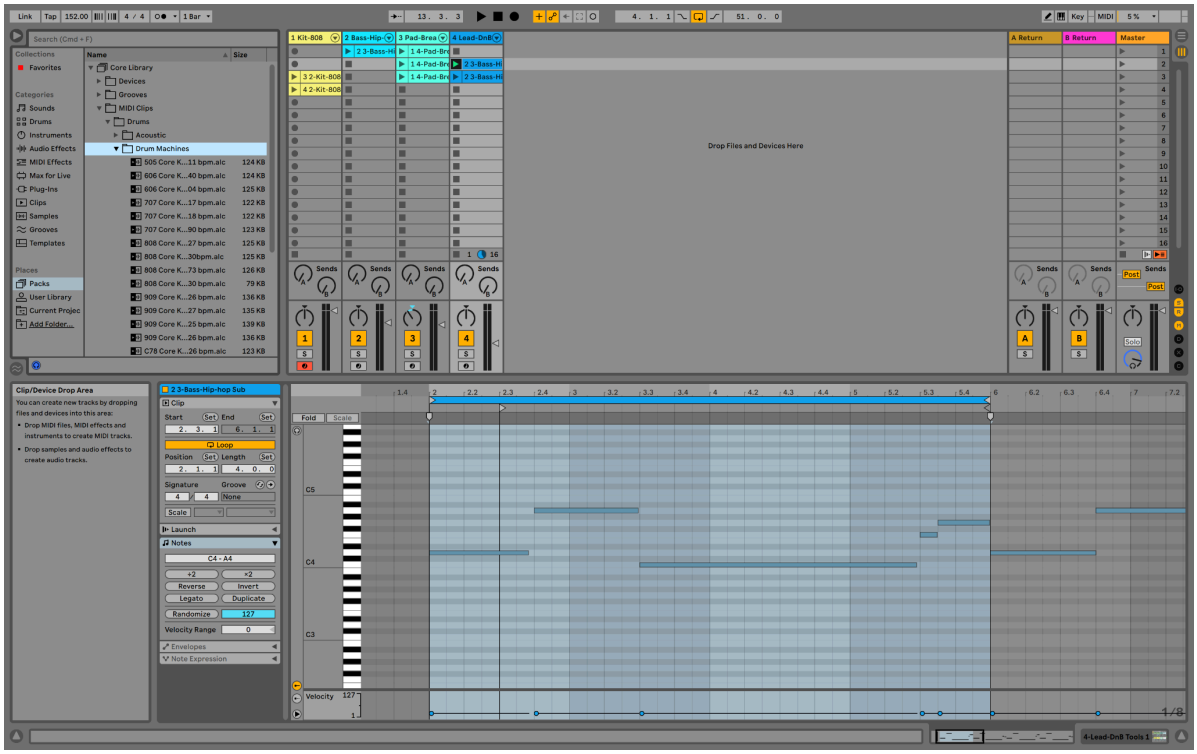

Figure 12. The content of a clip in the *Session View* is only visible as a linear audio signal or MIDI pattern in the micro-editing window, which is at the bottom of the screen.

Figure 13. The content of a cell in *Live Loops* is visible in the macro-view as a circular audio signal or MIDI pattern.

differently in Ableton Live and Logic Pro. In Ableton Live, the user is either in the loop-based view or in the linear arrangement view; although communication is possible between both, it is not possible to show them on the screen simultaneously. In *Live Loops* it is possible to use the loop-based view in conjunction with the linear view. A 'Divider column' at the right of the *Live Loops* grid contains different controls to move in and out of the linear and loop-based interface per instrument track (Figure 14). The vertical axis containing the instrument tracks in *Live Loops* forms a direct extension of the linear view; this makes the two views directly compatible. It is this affordance that could explain the accessibility of *Live Loops* as a compositional tool; a closer connection is established between nonlinear and linear arrangement. Moreover, the proximity to the linear layout makes *Live Loops* familiar; the layout of the rectangular grid in the loop-based view shows resemblances to the linear paradigm. Although both *Session View* and *Live Loops* make circularity operable through a rectangular grid, the proximity of *Live Loops* to the linear view reveals the continuation of a linear compositional logic.

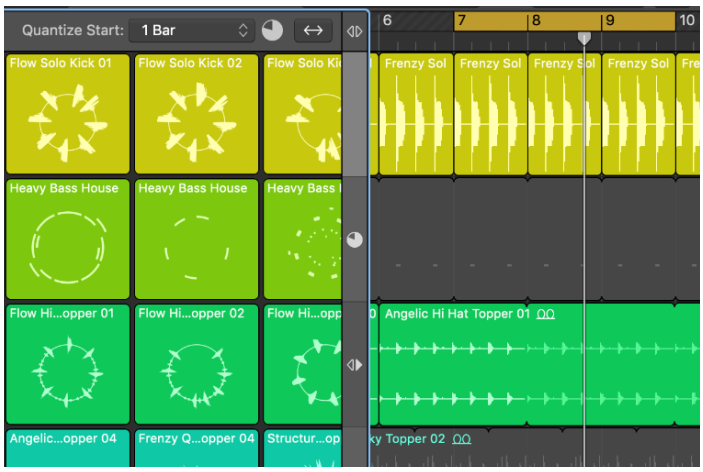

Figure 14. The Divider column in *Live Loops* allows the user to view the loop-based and linear grid simultaneously, including different controls that indicate the activity of a track in either the loop-based or the linear view.

3.2. Relative time

The disappearance of a linear timeline in the loop-based interfaces causes the representation of time to be scattered across the interface. In the linear view, the temporal axis contains a discrete grid that directly corresponds with the tempo set in the dashboard (Figure 10 and 11). The temporal spacing of the grid is set using a calculative value, namely 'beats per minute' (bpm). As an objective measure of time to which the musical recording is expected to adhere, the grid or metronome is a form of clock time; it defines the temporality of the system in absolute terms. In the loop-based view, this grid is no longer visible. Instead, small pie chart icons across the interface are used to represent different 'times'. For example, in *Session View* a small circle right above the track's mixer controls shows the passing of time while a clip on the track is playing (Figure 15), and in Live Loops similar circles are used. For example, a small circle on the top right of the frame represents the largest common cycle of the entire project, while a similar circle is used to represent the progression of the loop on a single track (Figure 14). Thus, in the loop-based interface, time is broken down into multiple times and circles.

This leads to a construction of time in the interface that is based on relativity. This is firstly because the time progression within a circle is relative to the duration of a loop. The completion of the circle in the case of a longer loop will move slower than in the case of a shorter one. Thus, the circle does not represent an absolute duration; rather, it depends on the duration of the loop that is playing. Secondly, there may be many different times running simultaneously. Even though the circles graphically have the same size, they represent different durations and run at different speeds in relation to the other loops in circulation. A sort of constellation of circular times emerges, all representing different processes that are taking place simultaneously. Time is no longer monochronic, which means that only one thing can happen at a time. Time in the loop-based interface is polychronic; multiple processes can overlap and intermingle, and move in and out of the musical system. Thus, the use of various geometric circles scattered across the screen constructs time as a relation dependent on various different factors.

One of these factors that determines time in the musical system is the tempo. The tempo is essential to the musical system; arguably more so than in the linear view. Time in the interface is divided by a pulse that connects the entire system. This pulse is no longer visible as it was in the linear arrangement view; rather, it is indicated by the metronome. In both *Session View* and

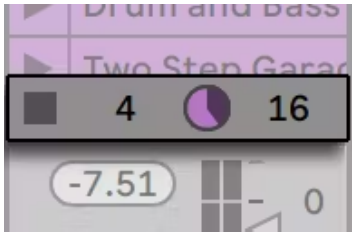

Figure 15. In *Session View,* a pie icon on the track represents the temporal movement of the activated loop. The number to the right of the circle represents the length of the loop measured in beats; the number on the left shows how many times the loop has been played since its initial launch.

Live Loops, the bpm is set before recording. It can be changed afterwards, but the recorded material will change along with it. It is the metronome, then, that controls the musical system. This becomes apparent when we look at the starting times of loops in the context of 'real-time' performance. Once a loop is activated, it does not start playing immediately. Instead, a specific setting determines when a loop will start playing to ensure that it is in sync with the rest of the loops. In *Live Loops* this setting is called 'Quantize Start' (see Figure 14, at the top left). As stated in the Logic Pro manual, "Quantize Start ensures that cells start at musically meaningful positions (beats or bars), so they are in sync with other cells and the project playhead position" (Apple, 2022, p. 656). In *Session View* this is controlled by the Quantization menu in the dashboard (Figure 16). The intentional staggering of starting times guarantees the continuity of the musical performance; a loop will always sound in sync with the rest of the loops. This automatic alignment is what is meant by the 'real-time' performance ability of loop-based interfaces. Ironically, 'real-time' then does not mean 'direct' or 'live.' Instead, it refers to a process in which the starting of a loop is intentionally staggered to maintain the continuity of the musical performance. This shows that the 'real-time'-ness of the loop-based interface is also based on relativity.

One way in which interlinkages can be established between different loops is through the creation of *scenes*. This term is used in both *Session View* and *Live Loops* to describe the grouping of loops from different instrument tracks, which can then be activated and controlled together (Figures 17 and 18). The scene thus performs as a sort of meta-module, allowing multiple loops to act as a single modular unit. The scene introduces a certain level of order within the distributed, rectangular grid. For example, the Ableton Live manual states that the

scene “can be very useful in organizing the live performance of a song with multiple parts” (Hughes et al., 2022, p. 134). Similarly, the Logic Pro manual states that “you can play cells in a scene together, like a section in a musical arrangement” (Apple, 2022, p. 679). In this way, the scene involves the *suggestion* of a temporal order. In both *Session View* and *Live Loops* the order of scenes is numbered by default. The scenes in *Live Loops* are automatically numbered; even when the individual scenes are reordered, the numbers will remain in the same place. Moreover, the linear succession of scenes is encouraged through an automatic Select Next Scene function in *Session View*; as stated in the Ableton Live manual, “[t]he scene below a launched scene will automatically be selected as the next to be launched unless the Select Next Scene on Launch option in the Launch Preferences is set to “Off.“” (Hughes et al., 2022, p. 134). The scene then introduces a linear compositional logic into the loop-based grid; the possible courses of action are narrowed down and placed into a suggested linear temporal order. Thus, although the grid is in principle unidirectional, the interfaces encourage the usage of scenes as a linear temporal sequence.

3.3. The African time cycle in the loop-based interface

Many similarities can be identified between the loop-based interface and the African notion of time. The modular units in the interfaces represent a sort of units of potential time, or what Collins (2004) calls “a series of consecutive rooms for ongoing human actions” (126). This breaking up of time into options is what allows contingency to become part of the musical system. The relative notion of time resulting from the use of various circles across the interface, is based on movement rather than absolute calculation. The circles visualize a continuous tension between actual time and potential time, establishing a user experience that is polychronic rather than monochronic; multiple processes are happening at the same time. Whereas the linear arrangement view represents Western time, based on a linear timeline divided by the clock, the loop-based interface comes closer to representing African time, based on potentiality, dynamism and relative movement.

However, in comparing the loop-based interface to the African time cycle, a number of differences come to the fore. Firstly, the individual clip or cell cannot be compared to the African time cycle, as it represents only a single musical cycle. The African time cycle involves the interweaving of multiple instruments, rhythmic patterns and sub-cycles, which does not happen

Figure 16. These settings, which are on the top left of the screen in Ableton Live, control the temporality of the project. The Quantization menu at the far right determines when a clip is launched after activation to ensure that the various loops are in sync.

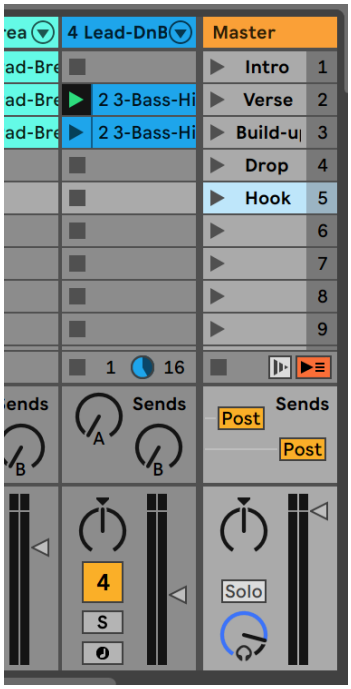

Figure 17. The vertical strip on the right in *Session View* contains the scenes, which allow clips on the same row to be activated and controlled as a group.

Figure 18. The horizontal strip on the bottom of the screen in *Live Loops* contains the scenes, which allow cells in the same vertical column to be activated and controlled as a group.

in the case of a single loop. It is rather the scene which invites closest comparison to the African time cycle. The scene, like the time cycle, represents the coming together of multiple sub-cycles, instruments and patterns in the form of a newly composed unit. The individual clip or cell then represents a sub-cycle of the time cycle; a smaller element of a bigger whole. As a result of the rectangular grid, the sub-cycles in the loop-based interfaces are arranged in a linear row. This stands in contrast with the circular TUBS diagram presented in the previous chapter. The circular diagram represents the unity and interconnections between subcycles, making rhythmic and temporal interrelations visible in a single glance. The rectangular grid, on the contrary, breaks down the unity of the time cycle and pulls it apart into isolated fragments. Consequently, the 'now' of the time cycle also becomes distributed across the interface. Collins argues that it is the unity of the time cycle that establishes its 'now'-ness. The layout of the rectangular grid in the loop-based interfaces, then, pulls apart this 'now'-ness, and reveals a fragmentation of the system into separated 'moments.' The meta-module of the scene comes closest to representing a shared moment of concurrence; however, the rectangular grid prevents the different moments from coming together as a singular, visual unit.

Consequently, the rectangular grid represents a particular operationalization of circularity in the interface. What it also shows, however, is that the modularity of the loop-based interface is already contained within the African time cycle. As Anku (2000) states, "[t]he time cycle ultimately defines a set and this set rhythm is a structural module from which the entire performance is derived" (para. 8). The African time cycle, thus, is already based on a modular logic. On the one hand, the time cycle itself functions as a module around which the musical act unfolds. On the other hand, the time cycle is internally composed of various modules, represented by the various sub-cycles which make up the time cycle as a whole. Although certain cycles might be more prominent than others, the time cycle is simultaneously composed of, and independent of, its individual parts. The modularity of the loop-based interface then maps onto the modularity of the African time cycle itself. From this perspective, it is not created by the interface as much as it translated into a tangible form. The rectangular grid introduces a number of affordances in relation to the African time cycle. For example, the separation of sub-cycles into separate units in the interface allows for a detailed view of the modules that make up the whole of the cycle. This allows the user to zoom in, as it were, on a single element within the cycle. At the same time, the rectangular grid does not allow a spatialized view of the

interrelations between them; the entwinement of rhythms is essential to the internal complexity and holism of the African time cycle. This could be regarded as one of the main limitations of the rectangular grid from the perspective of the African time cycle.

Although *Session View*, and *Live Loops* to a lesser extent, make a strict separation between the loop-based and the linear view, there is something that temporally connects them, which is the tempo. The tempo is an absolute time measure, calculated as beats per minute, that controls the temporality and coherence of the musical system and is indicated by the metronome. It is comparable to the beat of the African time cycle, which forms the structural foundation of intervals on the basis of which it is divided. In the case of the time cycle, however, it is rhythm that controls the beat. As explained by Anku (2000), it is the 'regulative beat' that defines the entire time cycle span. The other rhythms form around it. In the loop-based interface, the tempo is set before any music is played or recorded. The empty canvas of the interface thus comes pre divided. This pre division is not a rhythm controlled time; it is an absolute time or clock time to which the musical system is expected to adhere. Although the pulse is essential to the coherence of the time cycle, the pre division of time prevents rhythm from fundamentally controlling the temporality system. This could be regarded as another limitation of *Session View* and *Live Loops*, as well as an inheritance of Western clock time as controlling the musical experience.

These limitations indicate that the layout of the loop-based view is still partially shaped by the structural organization of the linear view. Especially the ability to use the loop-based and linear views in conjunction in L*ive Loops* shows that the rectangular grid forms an extension of the linear grid instead of a fundamental departure from it. This is perhaps not surprising, because it supports the usability of the new loop-based features within the familiar interface paradigm. As D'Errico (2016) states, "[h]istorically, the design and development of music production software has strived to strike a balance between the simulation of existing musical interfaces and techniques on the one hand, and the introduction of new creative possibilities on the other" (p. 35). The setup of the loop-based and linear views, then, can be regarded as a first attempt at affording the coming together of different musical worldviews or modalities. In Ableton Live, they are visually separated, in Logic Pro they are brought closer together. However, as Scherzinger (2021) states, "intercultural encounters are always-already subject to processes of domination [...] there is no hybridity without loss" (p. 4). The 'loss' from an African perspective, then, is the inability to see interrelations as a result of the fragmentational logic of the rectangular

grid, and the enforcement of clock time through the project's tempo. Using an African perspective in the analysis of *Session View* and *Live Loops* has shown that their operationalization of circularity is partially shaped by convenience, a prioritization of the detail over the whole, and a linear compositional logic inherited from the linear arrangement paradigm. The next chapter takes these limitations as sources of inspiration for imagining an African DAW.

4. Imagining the African DAW

Following up from the analysis in the previous chapter, this chapter explores the possibilities for imagining an African DAW. First, I draw inspiration from decolonization studies and Afrofuturism to show how speculative writing can serve as a chronopolitical device. Secondly, I formulate two solutions to the limitations discovered in the analysis of *Session View* and *Live Loops*; a circular grid and a responsive time division. I show that the African music tradition and technology are not in opposition, and that African musical knowledge can serve as a source of technological innovation in the digital audio interface.

The terms 'design' and 'decolonization' have increasingly found overlap in academia. For example, coloniality has been conceived of as a form of design. Mignolo (2012b) states that "global designs have been the hegemonic project for managing the planet" (p. 21) Other scholars have analyzed how race and class exclusions have historically materialized in the form of design. This discussion has been taken up in media studies as well; social media platforms and software are shown to engender and reinforce racial biases.[16] Understanding design as a form of coloniality and discrimination, also casts architecture and media objects as a site of decolonization and resistance. Recently, design thinking, an approach to problem-solving coming from the fields of design and engineering, has gained popularity in the humanities as a way to develop human-centered solutions to societal problems. The flexibility and networkedness of software provides an opportunity to rethink social and cultural structures and enable new forms of inclusion and collectivity.

In recent years, the decolonization of the DAW has become a topic of interest at audio conferences around the world. Perhaps most interestingly, it has led to the development of actual, decolonized audio applications. In 2021, Iraqi composer and researcher Khyam Allami developed three decolonized music applications, *Comma, Leimma* and *Apotome* as part of a larger research project on microtonality and the DAW. The applications draw inspiration from Arabic music and allow users to create and play with microtonal scales. His research project represents the first significant effort in the decolonization of the DAW. The applications were developed in collaboration with a team of software developers using Ableton Live's *Max For Life* extension. *Max For Life* is an add-on product that "allows users to extend and customize

[16] See for example Hamilton (2020) for a historical overview of critical race and digital studies.

Live by creating instruments, audio effects, and MIDI devices" (Hughes et al., 2022, p. 633). Allami's project is proof of the potential of *Max For Life* for imagining and developing new functionalities and affordances. As a particularly malleable technology, digital audio software like Ableton Live provide the possibility of transcultural experimentation and exchange. But, as Scherzinger (2021) states, "intercultural encounters are always-already subject to processes of domination" (p. 399). A more radical approach to the decolonization of the DAW, then, would be to start with a blank slate.

Unfortunately, the development of an African DAW does not fall within the scope of this thesis. However, this does not mean that an African DAW cannot be imagined. The fields of Afrofuturism and Africanfuturism have embraced the power of speculation, both in art and in academic writing. Moreover, science fiction writing from a black perspective has been conceived as a chronopolitical act. As stated earlier, Eshun (2003) argues that "[t]he African subjects that experienced capture, theft, abduction, mutilation, and slavery were the first moderns" (p. 288). African-Americans have been deprived of their histories beyond the history of enslavement. This renders the global histories told in Western history books forever suspect. Also, as a consequence of Hegel's global history, African ideas and practices in the Western perception appear to be stuck in the past. Like the telling of history, the imagination of the future is a form of power. According to Eshun (2003), futurist imaginations "operat[e] predictively as much as retrospectively" (p. 289). Science fiction, then, can be regarded as a chronopolitical tool for resistance against modernity's conceptions of progress and the future.[17] As Eshun states, "[b]y creating temporal complications and anachronistic episodes that disturb the linear time of progress, [black futurist imaginations] adjust the temporal logics that condemned black subjects to prehistory" (2003, p. 297). My imagining of an African DAW, then, should be regarded as a chronopolitical act that pushes the boundaries of the temporality of electronic music studies itself. In the following, I will discuss two features of a speculative African DAW.

4.1. Circular grid

One of the limitations that arose from the analysis was the fragmentational view of the sub-cycles shaped by the rectangular grid. But the rectangular grid of *Session View* and *Live*

[17] Eshun states that science fiction "was never concerned with the future, but rather with engineering feedback between its preferred future and its becoming present" (2003, p. 290).

Loops is only one of many options for the operationalization of circularity in the interface. What if we would imagine an interface based on the circular diagram as the one created by Collins (2004) (Figure 7)? The same elements of the rectangular grid would be part of the *circular grid*; however, their arrangement as part of one overall cycle would highlight internal relations and complexities in the musical system. Instead of using rectangular blocks to represent loops, sub-cycles would become visualized as *rings*. These rings can be micro-edited on different levels, to include the possibility of having different meters in the musical system. For example, a drum pattern with a length of 12 beats can be shown to be composed of three iterations of one loop with the length of four beats. Another pattern could include a length of three beats, which would then go through four iterations throughout the entire cycle. As a form of polymetric modularity, the rings of the circular grid would allow for different levels of detail between the main cycle and the subcycles.

The first implication of the circular grid is that it prioritizes interrelation over separation. Instead of separating loops as separate processes, they visually become part of a whole in the circular grid. The unity of the African time cycle would be maintained both in a musical and a temporal sense. Additionally, the 'now'-ness of the musical cycle is maintained by visualizing simultaneity and concurrence in one glance. To wind the circular grid through time, the interface could be opened up by introducing a third dimension. Instead of moving up and down, or left and right, in a rectangular grid, the user could navigate front and back through a three-dimensional space. Every ring, then, represents a potential moment of occurrence, an event or room through which action can unfold.

The second implication is that the circular grid could facilitate new forms of 'real-time' collaboration. Various online platforms have sought to facilitate online collaboration between producers and musicians via cloud-based software. For example, Soundtrap, Bandlab and Soundslates are online DAWs which allow multiple collaborators to work in a single project. One of the main challenges facing the development of online collaborative DAWs is the issue of latency. No matter how intangible the internet might seem, the transmission of data still requires the bridging of geographical distance. If you have ever tried singing a song together through a video calling service, then you probably know that the time difference between sender and receiver makes it practically impossible. This has led cloud-based DAWs to offer asynchronous collaboration environments. As Stickland et al. (2021) state, "asynchronous environments are

typified by collaborators who contribute to a DAW project in isolation, saving and uploading these changes to an updated version of the project in cloud storage" (p. 412). The asynchronous environment lacks the liveness of collaboration in the studio; it cannot afford . real-time collaboration in the traditional sense. The previous chapter showed that the 'real-time'-ness of the loop-based interface relies on a relative notion of time and an intentional staggering of starting times. Thus, this involves a temporal buffer between the activation of a loop and its actual sounding. This temporal buffer could form the solution to the problem of latency in real-time collaboration.

Through the circular grid, a *relative liveness* can be established between multiple collaborators using different systems, for example in different geographical locations. All collaborators would see the same 'now' in the circular grid; the 'now' of the circular grid is the 'now' in both locations. They can play new parts, or start new loops, and the system will ensure that it is played in sync with the rest of the cycle. This would allow performers on different sides of the world to create and perform in 'real-time' together. The African DAW would make it possible for live collaborators to transcend spatial distance and traverse time. This is important because from an African perspective, music is not meant to be a solitary practice. Dialogue and interaction are essential. The circular grid of the African DAW, then, would introduce true contingency and a sense of 'now' in the collaborative process and performance of digital music.

4.2. Responsive time division

Another limitation that arose in the analysis of *Session View* and *Live Loops* is the strict enforcement of a calculative grid. A mechanical clock continues to structure the musical system in the loop-based interface. The regulative beat defines the time cycle span, and the rest of the rhythms unfold around it. What if we imagined a grid that would respond to rhythm, instead of the other way around? A responsive grid that takes rhythm as its starting point would have two implications. Firstly, it would require music to be recorded *before* the setting of the project's tempo. A *responsive grid* function could then calibrate the grid to map onto the piece of recorded music. This approach would invite the user to physically play a rhythmic phrase using a hardware MIDI device, instead of visually drawing in a MIDI pattern. In this way, the human

feel no longer comes *after* technology; instead, it dictates it.[18] The 'Tap Tempo' function in Ableton Live currently comes closest to affording a responsive time division. By physically tapping in a tempo, using either the mouse click or a computer key, users can set the tempo of the project (Hughes et al., 2022, p. 172); the metronome will calibrate to the spacing of the physical taps. However, this tapping continues to reinforce clock time. This time, it is the user who informs the clock what to do. The responsive grid, on the other hand, would respond to actual musical playing; this would allow rhythm to control temporality in the African DAW.

Another possibility regarding a responsive grid is that the time division no longer has to be equally spaced. Slight deviations in timing are what make up African *swing* – the human feel that my father struggled to create in the early days of sequencers and drum computers. These micro-rhythmic deviations are no longer deviations in the flexible grid; rather, they become the structural norm of the musical system. This would allow the user to quantize their recordings to the imperfectly spaced time division, and in doing so maintain the groove of the entire system. Ableton Live has a function that moves into the direction of a flexible grid. The 'Groove' function makes it possible for the user to modify the "timing and "feel"" of a clip (Hughes et al., 2022, p. 229). This goes as follows. First, the user chooses from a library of existing Grooves. Then, they apply the 'imperfect' timing of this Groove to their own recorded material. But users can also extract Grooves from existing audio or MIDI recordings. This means that you can copy the exact timing of an existing song and apply it to your own track. However, the Groove function only applies to the audio signal or MIDI notes; it does not affect the grid or the metronome. The responsive grid of the African DAW, then, would loosen the grip of clock time, making it possible for the human feel to control temporality.

[18] This is where the circular visualization based on relativity might pose a challenge; without a time division, the purely visual spatialization of an audio or MIDI recording does not have a temporal identity yet. How might we visualize circular, relative time at the point of emergence when the final parameters are not yet set?

Conclusion

Technology has historically been regarded in opposition to Africa, and Africa in opposition to technology. Hegel's global history branching out from a European center has caused African ideas and practices in the Western imagination to be stuck in the past. Loop-based electronic music technologies increasingly deconstruct Western linearity by operationalizing time as a circular, relative phenomenon. In doing so, they expose the fragmentational logic of Western thought, including divisions such as body/mind, theory/practice, composer/performer and performer/audience. Bending these divisions to fit the new configurations afforded by loop-based technologies does not erase their internal bias; instead, Western linear values based on notions of progress and rationality have simply moved to the background, now operating in silence as an ontological lens through which the world is viewed.

The holism of African philosophy erases the categories of music and time, and body and mind, as separate phenomena. As a musical structuring principle controlled by rhythm, the African time cycle wraps music and time, body and mind, and hands and feet into a dynamic, living and breathing cycle. The African time cycle already contains the modularity embedded in the loop-based interface, and contingency, dialogue and improvisation form integral aspects of the musical act. Through analysis it becomes apparent that the interpretation of circularity in *Session View* and *Live Loops* continues to be shaped by a linear, or rather rectangular, logic. This rectangular grid in turn imposes some of the fragmentations which have characterized the Western musical mind since the Enlightenment. This calls for the imagination of an African DAW, including a loop-based interface that takes circularity as a radical starting point. Using a circular grid and a responsive time division, the African DAW could liberate the musical cycle from the Western clock, and open it up for real-time collaboration across space and time.

Placing loop-based electronic music practices in an African genealogy offers one way of including Africa in the conversation of electronically produced music - a conversation which in the global digital landscape is not beholden to the West. Moreover, it urges a rethinking of the temporality of electronic music studies itself. From a Western perspective, the African reappropriation of musical circularity draws the roots of electronic music further back towards the past - moving in the opposite direction than the one Hegel envisioned. As such, it forms a "temporal complication or anachronistic episode" (Eshun 297), and this is precisely the point; in

actuality, the supposed temporal and spatial distance between African music and electronic music does not exist.

Digital audio interfaces have made it possible to 'capture' music in ways that were previously unimaginable. It is now possible to capture the *process* of a musical work, and even capture a live performance as it unfolds in time. This urges a rethinking of the meaning and function of music theory in the digital age. As Sinding-Larsen (2019) states,

> With the modern sound and music applications of the digital age [...] the distinction between notation (descriptive tools) and music has to some extent been abolished. Whatever can be formally described can automatically be played, and whatever can be played can automatically be described. (p. 215)

The externalization of musical knowledge in digital audio software, then, could be regarded as a new form of music theory – one that is theory and practice at the same time. Moreover, it is flexible and changeable; its norms and values are not set in stone. Ableton Live offers a prime example of a DAW that invites plurality and innovation. Consequently, digital audio software allows us to explore, experiment with and think through different musical and temporal lenses and worldviews, and see how they differ, intermingle and interact.

At the same time, the digital externalization of musical heritage also raises issues of power and ownership. According to Sinding-Larsen (2019), a "higher-order individuality" emerges from the externalized knowledge, compiled, captured and combined through digital technologies. This requires caution, because, as Scherzinger (2021) states, "intercultural encounters are always-already subject to processes of domination" (p. 399). Contrary to Western music, traditional African music and dance have always been collectively owned. This is also precisely its strength in the digital age. For example, African dance moves can spread freely on video-apps like TikTok. As Collins states (2004), it is the "poly-sidedness and capacity to juggle many variables" of African music "that helps Africans to successfully adapt to cultural change: which includes incorporating new ideas from the West" (p. 158). Perhaps, then, it is not despite but *through* technology that African and Afrodiasporic music have been able to survive the assault of the West. As social, cultural and historical ownership slowly disappears from view, inequalities of power can now operate in invisibility behind a veil of innovation.

The development of an explicitly African DAW would therefore offer a number of advantages. Firstly, it offers the opportunity to preserve African musical knowledge in separation from Western tools and technologies. Contrary to Western music theory, the DAW is not bound by the flat surface of paper and can represent the dynamism of African music as a living and breathing practice. But also, and perhaps more importantly, the African DAW would allow African music to develop on its own terms. In controlling the temporal and musical map, African musicians and scholars could use the African DAW for the exploration, contemplation and innovation of African musical knowledge.

Through this thesis, I hope to have shown that African music and technology are not in opposition. Moreover, I believe that it is time for a research field by the name of African music technology studies to emerge. Firstly, this research field could map out the history of African music technology – to tell the story of electronic music from an African perspective. While scholars like Weheliye (2005) and Eshun (2018) have written black histories of electronic music technologies from the African-American perspective, the African perspective on electronic music technology is still largely unexplored. Secondly, this field could explore the present of African music technology, by looking at the specific ways in which African musical thinking and doing is applied in the encounter with digital music technologies.[19] And lastly, this field could focus on the future of African music technology, by turning imagination into action in the development of new, and truly African technologies.

[19] A good example of this is Adu-Gilmore's 'Studio Improv as Compositional Process Through Case Studies of Ghanaian Hiplife and Afrobeats' (2015).

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