TOWARDS USEFUL AESTHETIC EVALUATIONS OF LIVE CODING

Renick Bell

Tama Art University
Department, Tokyo, Japan
renick@gmail.com

ABSTRACT

Initial thoughts are presented towards developing a useful system for the aesthetic evaluation of live coding. A sampling of ontological issues from music in general and related genres such as jazz, DJing, and electronic music is given, followed by a similar cursory examination of programming. Factors in live coding itself are presented and parallels are drawn with those previously noted, such as the controversial matter of the existence and nature of works. After summarizing Dewey's "Art as Experience", which makes the interaction between artists and audiences through works centralr, Dewey's system is clarified and slightly revised on account of the work of other philosophers. This revised system is discussed in relation to the practice of live coding. Some sample applications of the revised system on particular live coding factors are carried out. The utility of that system is assessed and future research directions are put forward.

1. INTRODUCTION

Aesthetic evaluation serves a variety of purposes. Saito points out in many examples how aesthetic experience leads to action [22]. It can inform published criticism and provide one means of appreciating artwork. Some apply it to the creative process, in which the creator is the first audience of the work. The creator can use the evaluation to adjust the work for maximum aesthetic effect. In the relatively new field of live coding, there is still a lot of opportunity for the improvement of aesthetic effect. This paper particularly focuses on that goal.

2. ONTOLOGICAL CONSIDERATIONS

According to McLean, "the nature... of live coding is still not well established" [19]. After clarify what live coding is and consists of, such information can be used to evaluate live coding activity. Before coming to conclusions about live coding, it is worthwhile to undertake a cursory examination of particularly two particularly relevant areas: music and computer programming. With that background, the nature of live coding will be clearer.

2.1. Ontology of Music

There is a large body of literature on the nature of music; consequently this section only mentions some of the many relevant points for consideration. These points are necessary to list as they directly connect to aesthetic evaluations of the music.

The social aspects of music are increasingly recognized. Leppert describes music as a phenomenon with the potential for social subversion and listening to music as a path to knowledge [18]. Attali holds music to be a precursor of a new mode of economic production [2].

However, while features like the social nature of music seem to invite greater agreement, there may be pessimism regarding finding agreement on other aspects of music. Predelli provides a detailed account of the debate about the nature of musical works and concludes with giving up on "unveiling interesting ontological features"[21].

It is still not clear how much is shared by different musical genres; Kania suggests they may differ extensively [16]. Without coming to a conclusion on this point, it will be valuable to examine some genres which are relevant to live coding: DJs, electronic music, jazz, and improvised music more generally. Jazz shares with live coding the aspects of performance and improvisation. DJ music, particularly with the advent of software-based DJing, also shares potential for improvisation and a more technological bent. In addition, some live coding involves danceable music. Live coding fits within the larger category of electronic music and thus possesses characteristics belonging to the category.

Jazz can be said to at least sometimes consist of things such as the work being performed, the improvised portions of the music versus the precomposed parts, the abstract contents of the improvisation (motifs, harmonic structures, rhythm patterns, and so on), and the usage of stock riffs and other ready-mades [23]. Beyond the abstract portion of a performance, things such as the composition of the band, whether the instruments are amplified or not, and the timbral treatment of the composition possess significance.

This catalog of components itself is contentious. Kania takes the position works do not exist in jazz [16]. The existence of compositions like John Coltrane's "Naima" and Thelonious Monk's "Epistrophy" (non-vocal compositions frequently performed by people other than the composers) would seem to show that not to be the case. Works exist in the account by Alperson [1]. Further, Derek Bailey writes about "works" along with "tunes" and "songs" [3]. This issue will be set aside temporarily.

Cataloging features of DJ performances yields things

such as the recordings played and how the recordings are mixed. The use of vinyl and turntables, CDJs, or software-based mixing is a factor in aesthetic evaluation for some. The manipulation beyond simple playback, such as additional scratching done by the DJ or filters and other effects applied to the DJ's mix, also plays a role.

Existing between the output of the mixer and the audience, the sound system the recordings are played on can affect perceptions of the event. Another environmental concern is the venue: nightclub, basement, gallery, beach, or somewhere else. Seemingly extra-musical factors such as the DJ's physical gestures and sometimes voice can color impressions. Social factors may have increased importance in DJ performances. The DJ's intention, whether to make the audience dance, display curatorial skills, create a new piece from existing recordings, or other intention could be seen in contrast or harmony with the audience's intentions, such as to dance, to hear the recordings themselves, or to hear the mixing.

A frequently discussed issue is the difference between recorded and live music. A recorded DJ mix may be evaluated differently from the same mix experienced live. While Bell finds DJing to be largely about the relationship between what is live and what is recorded [4], it is probably more likely that there is a rhizomatic linking among all of the factors (including but not limited to those above), as suggested by Deleuze and Guattari [11]. Such a view conforms to our common sense experience.

For example, the sound system affects the way the recordings are perceived, and particular recordings (for example, a strong ratio of bass to other frequencies) can influence the response of speakers. Recordings which are ill-matched to an audience's intentions in turn influence the DJ to change selections or otherwise adjust a performance. This rhizomatic structure of relationships probably holds true for jazz and other genres as well.

Like DJing, electronic music can be seen to have a wide distribution of creative agency across time, space, and people [5]. However, the broader field of electronic music may differ from that of DJs because the use of previously-recorded material is not a given. Paine and Drummond observe two approaches to what they term "computer-assisted music": control of pre-determined sound and the creation of sounds in real time. They acknowledge that these two approaches are sometimes undertaken simultaneously, and awareness of these two approaches is important for determining the authenticity of performances [20].

Other factors of electronic music, some common to the genres above, include things such as whether performers play hardware or software instruments and the degree of liveness: tape music versus an improvisation with a PD patch, for example. Audiences may react differently to a public presentation of tape music, which depending on the audience may or may not be considered studio recordings, than to live electronic music in which performers play synthesizers. The performance space again influences audience response. Performers pay particular attention to the number of speakers and their usage: static panning, dynamic panning, and even panning as a live performance. Like most genres, previous critical response to that work or related works may shift opinions.

Further investigating the nature of these and other genres is beyond the scope of this paper. This sampling serves to show that there are significant complexities and debate which create confusion about what exactly is being evaluated. The commonalities are also worth noting.

2.2. Ontology of Programming

Determining the nature of programming may be as difficult as doing so for music. A quick and naive survey might yield factors like choice of programming language and the programming paradigm the programmer operates under (imperative, functional, or another). A program may be compiled or interpreted, potentially changing its nature. Environmental factors like the compiler and libraries used and the underlying operating system modify our understanding of the nature of programs and programming as an activity.

There is debate about what a program even is [25]. The distributed agency in electronic music described by Born surely applies to programs as well. As in music, there is also a distribution of activity across time and in level of abstraction.

When examining the code, the notation, including symbols and syntax, is elementary. Programming languages come with their own syntax, which may or may not be adapted by the performer. Similarly, the symbols employed in the notation and their origins are important. The volume of notation – concise or verbose – is related to how malleable the code is. That notation expresses abstractions and or algorithms, and programmers pair the notation with coding style, such as formatting and use of white space. Different languages allow differing degrees of freedom on these issues. A more complete discussion of the nature of notation can be found in Green [15].

Eden and Turner ask many other questions, such as whether programs are abstract or concrete, how modularity relates to abstraction and compositionality, and what abstraction actually is. For them, the relationship between source code and a running program remains an open issue, as does the nature of algorithms [25].

Van Leeuwen provides a list of perspectives for philosophizing about informatics: information, computing, communication, cognition, design, and behavior. This list suggests the difficulty of developing a comprehensive philosophical account of programming [26].

2.3. A Brief Look at the Nature of Live Coding

Collins presents two definitions of live coding [8]:

1. "Live computer music and visual performance can now involve interactive control of algorithmic processes. In normal practice, the interface for such activity is determined before the concert. In a new

discipline of live coding or on-the-fly programming the control structures of the algorithms themselves are malleable at run-time" [27]

2. "Digital content (music and/ or visuals predominantly) is created through computer programming as a performance" [6]

A fragmentary list of factors in live coding can be drawn from the fields above. Aspects of live coding taken from programming include programming language and libraries. The distributed agency trait mentioned by Born is typically encountered, though it is possible, if rare, that the performer is the author of the language and the programming environment. The existence of both solo and ensemble live coding is shared by jazz and electronic music, and even tag-team DJing. Ready-mades in the form of either software libraries, modules, or pre-written short fragments of code exist. It may or may not be useful to compare the use of code developed by others to sampling in hip-hop and other electronic music. The origins of the code are distributed across time, given that there are programming language libraries developed by the performer, pre-performance code developed by the performer, and in-performance code developed by the performer. While code in traditional programming is less frequently meant to be seen by others, it becomes a focal point for live coding performances. Consideration could be given to how Van Leeuwen's list of perspectives applies to live coding.

Live coding does seem to point to new modes of production. The increasing popularity of live coding unrelated to music but for education, mentioned by Gaspar and Langevin among others, seems to confirm this [13].

Aspects related to sound include synthesis engines and sound output devices, like speaker systems or headphones. Applying external effects on top of the central content is a factor it shares with DJing, though it is uncertain if the aesthetic consequences are the same.

Aspects which could be considered as environmental include the source-code editor and the interpreter. The interpreter may take on increased importance in live coding compared to its role in traditional programming. Other environmental factors include the traditional projection: its contents, size, and quality. The performance space and the performer's non-programming actions in the space also have importance. Regarding those non-programming actions, there may or may not be a difference between a DJ aggressively turning a knob and a live coder aggressively typing on a keyboard.

The issue of works seems to be particularly thorny. With regards to pre-performance preparation, the contents of performances, and audio or audio-visual documentation of such performances, it may be contentious when deciding if live coding has "works" that are interpreted in the manner of classical or jazz music or some other structure. The debate which Kania is engaged in would seem to become even more complicated here. For some [16, 7], instantiability appears to be key to calling something a "work". Kania further assigns the creator's intention that something be reinstantiated at a future date as a criteria for calling something an art-work. From this viewpoint, some code could be seen as a "work" by some, while other code might not be identified as a "work" (though Kania stresses that such a distinction should not be interpreted as lessening the value of a performance). Compelling alternative viewpoints exist [14, 9, 5], and one alternative view will be presented later in this paper.

As this paper intends to initiate an investigation rather than solve all outstanding issues, a comprehensive exposition of ontological issues is held off for a future paper. It is hoped that the factors described above are enough to identify directions in which a useful approach to aesthetic evaluation could be found.

3. DEWEY'S AESTHETIC SYSTEM

This paper explores John Dewey's Art as Experience [12] as a start or example for a system for useful aesthetic evaluations. Leddy justifies interest in Dewey's theory:

> It is a mark of the endurance and power of Dewey's aesthetic theory that it has been so frequently criticized and defended from so many different angles. [17]

A brief examination of Dewey's position follows that, though discarding much, should provide a starting point. Among other reasons for choosing Dewey as an example system, Dewey's emphasis on temporality particularly suits time-based art, and his insistence on experience being embedded in an environment seems complementary to the complex nature of live coding described above.

Dewey says "Art denotes a process of doing or making." [12] For Dewey, "art" means how something is done. It describes the character and quality of an activity. It is an engagement with intention that makes it art. An external product is a potential art experience depending on its audience. The art is the experience of that product. Consequentially, for Dewey it is preferable to think of art as an experience and a painting or performance as a tool through which that experience can be realized. Sawyer finds this distinction between "the work of art", in which "work" can particularly be thought of in the sense of the verb or action, and the "art product" to be key [23]. Note that "work" is used in a different sense from that of Kania above.

There exists a "triadic relation" in which the creator produces something for an audience which perceives it. What the creator has produced creates a link between the creator and the audience, though sometimes the creator and the audience are the same. That is, the creator can be seen as the first audience member.

For Dewey, experience also means an interaction with an environment that is unavoidably human in every case and creates a feedback loop in which actions and reactions affect one another. These experiences are always composed of both physical and mental aspects. Experiencing the world means transforming it "through the human context", and equally being transformed.

He argues for an atomic view of experience, in which the "mutual adaptation of the self and the object emerges" and concludes ideally with a feeling of harmony.

Leddy explains that this leads to art being different on each perception of a creator's output, with a potentially infinite number of experiences. In this way, Dewey emphasizes the temporal nature of all art: art results from experience that unfolds over time. Providing that experience with rhythm gives it aesthetic value [17].

Dewey also argued that engaged craftsmen are artists, given their affection for the work. Leddy summarizes Dewey as rejecting the dualism of nature and spirit, favoring a connection between fine art and everyday life that has been lost in a contemporary society suffering from excessive categorization. Dewey seeks to do away with a distinction between "fine" and "useful" aspects of art, in which "fine" comes from the producer's experience in making it or the audience's experience engaging with it. Possessing utility is not a prohibitive factor in being "fine" [17].

For a more in-depth view of Dewey's aesthetics, Leddy's complete article is a good starting point.

A useful system for evaluation would avoid bickering about genre and category and proceed more directly with investigations of value that yield helpful hints for producers. For example, one controversy to avoid is distinguishing between "works" and "non-works". Dewey's system makes possible a simpler analysis.

A common criticism of Dewey noted by Leddy involves the atomic nature Dewey assigns to experience. In English a countable noun "experience" exists, but arguments for a discrete character to experience fall apart upon close inspection as details and links to the past come into view. For example, the experience of a concert extends back to or at least is colored by the expectations formed before the concert, the moment it was known that the concert would be held, the feelings already possessed about the performer, piece, venue, and so on. It also extends forward to looking at images from the concert or hearing recordings of it, reading reviews of it, etc. As those influences occur at a temporal distance from what may be assumed as the event and may occur simultaneously with or even part of other experiences, it becomes difficult to maintain a view of discrete experiences. It may be desirable to reject Dewey's atomic characterization of experience.

Deleuze and Guattari's rhizomatic structure is a concept through which the factors of an experience, including the art work, can be linked [11].

Dewey describes the aesthetic quality of experience as emotional, but resists identifying discrete emotional states. Equating that emotional quality with the term "affect", it may be useful to adopt some reasoning on affects in Spinoza [24] and Deleuze and Guattari [11] to flesh out the system. In describing Spinoza, Deleuze defines "affect" as a non-representational mode of thought distinct from ideas, which are representational. Perceptions are ideas, and a succession of ideas change one's power of acting. Affect is not derived from the static comparison of ideas but is the temporal transition of focus from one idea to another leading to an increase or decrease in the individual's power. This temporal transition seems very similar to Dewey's "experience". A particularly valuable example is given in the lecture. Music he does not like is described as decomposing his relations, while music that he does like is described as resonating with his relations. Such experience decreases or increases his power, respectively [10]. Saying that affective states vary according to a wide range of factors is different from saying that they are arbitrary, and such a statement is preferable to the tired "all art is subjective". However, a study of the nature, variation among, and precise causes for affects is beyond the scope of this paper.

3.1. A Revised Theory

Based on Dewey's work and including some revisions, this working version of an aesthetic system is provided.

An affect is a kind of emotional state.

An affectee is a person experiencing affects in an interaction with affectors.

An affector is a percept that stimulates affects in an affectee. It can be a physical object or an abstract thing. Perception of the affector is a key part of the experience of art. Experience involves a possibly infinite number of affectors arrayed in a network structure. Changing the perceived network of affectors changes the nature of the experience.

A work of art is an affector which in some way was created, organized, or manipulated by a person for the purpose of being an affector. In other words, a work is a stimulus created by an artist with the purpose of being used in experiences of affectors by affectees.

A person involved with the creation or arrangement of an affector is an artist.

An art experience is the experience of affects in an affectee as the result of the affectee's interaction with a network of affectors, with at least one of those affectors being a work of art. The art experience is the experience of those affectors either simultaneously or in sequence.

The value of an affector is related to the value of an art experience in which it is involved. The value of an art experience is determined by the affects experienced.

4. AESTHETIC EVALUATION OF LIVE CODING

Collins describes one direction for the aesthetic evaluation of live coding:

> The more profound the live coding, the more a performer must confront the running algorithm, and the more significant the intervention in the works, the deeper the coding act. In programming, small changes can have grand repercussions; it is not impossible to imagine changing a single character or connection to achieve substantial consequences

> (for instance, substituting one data array for another via similar names at a key juncture, moving from "for" to "fork" or "and" to "rand," making a single rewiring between waiting complex processes). [8]

It may be interesting to put this starting point through the revised "art as experience" system described above. "The profound", "significance", and "deepness" are affects, and a performer is an artist. "A running algorithm", an "intervention", "small changes", "a single character", "substantial consequence", "data arrays", functions, "rewirings", and processes and their complexity all are affectors joined in a network, many of which could be considered works under the broad definition above. Whether the audience perceives those things and how they perceive them determines the value of the affectors making up the experience and the experience itself.

Live coding is experienced in many ways at many levels due to the assemblage of affectors. That network of affectors is partially listed out in the section on the nature of live coding above. Each experience has its aesthetic aspect. The exact experience depends on the affectee, though. Consider these cases, with "fan" meaning a fan of live coding in general rather than of a specific performer.

- non-programmer, non-musician, non-fan
- non-programmer, non-musician, fan
- non-programmer, musician, non-fan
- non-programmer, musician, fan
- programmer, non-musician, non-fan
- programmer, non-musician, fan
- programmer, musician, non-fan
- programmer, musician, fan

Each row could be seen as a category of affectee, but even members of one subset can have radically different experiences even if they are assumed to encounter the roughly the same set of affectors.

As a first example, consider the row of "non-programmer, musician, fan". Lack of programming knowledge may result in non-recognition of the control structures in use, how musical content is encoded, and even the mechanisms by which the performance is realized. On the other hand, they may not realize the poverty of control structures employed to realize the performance. Alternatively, the stimulation of trying to read code which one does not understand can create affects of novelty, mystery, and pleasure for some and alienation and frustration for others. Much of this depends on the live coding environment employed and any signals the performer gives to the audience, not to mention the previous experiences of affectees.

As a second example, consider the row of "programmer, musician, fan". While a programmer viewing a live coding performance in an unfamiliar programming language has experience of programming in general to draw upon, illiteracy in the language used creates a different experience than if the affectee is familiar with the language used in the affector. A programmer can perceive programming elegance or understand the challenge of operations that are attempted, which is something that a non-programmer is more likely to miss. Perception of those things stimulates affects in programmer-musician-fans that cause them to assign value to the performance.

Other considerations could be made in light of the revised system. A realization that different audiences will have different experiences and therefore different evaluations may mean a performer would like to make adjustments for particular audiences to maximize aesthetic impact. Focusing on the experience of using abstractions when programming may help to improve those abstractions. The programmer may realize the unwieldiness of particular programming methods, with those methods being one node in the affector network. That unwieldiness may cause musical output to become overly static. That slow rate of change, being another node in the network, may influence a practitioner to change programming methods to add dynamism to a performance. As another example, if a particular affector is to come into play for an audience, the audience must be able to perceive it; The programmer may need to make special effort to make the existence of an affector perceivable for a particular audience.

5. CONCLUSION

Some aspects of the nature of live coding were described. A more comprehensive review of these factors and their similarity to and difference from that of other genres or related activities should be carried out. Either interesting features will present themselves or it can more conclusively be determined, like Predelli, to end that line of inquiry.

Dewey's aesthetics were briefly outlined, and some weak points were highlighted. A revised version was presented. This system should see a more rigorous presentation and more applications to examples to reveal its merit or lack. Alternative proposals should also be made.

The system was briefly used for some example applications to live coding. It should be applied to more aspects of live coding, including more concrete examples. Alternative systems should also be applied to live coding both as a domain and to specific examples.

The intention was to produce a tool which is useful to creators. Allowing for a broad range of affectors, it is thought to be useful to examine and compare experiences, reflecting on why particular experiences are felt to be valuable and how experiences could be made more valuable. Practitioners should investigate the effects of the interplay of various networks of affectors on various audiences, using insights to further develop new affectors or effectively polish existing ones. It is hoped that the example evaluations in the previous sections demonstrate the utility of such evaluations.

6. ACKNOWLEDGEMENTS

Thanks to Hilary Bell, Norio Nishijima, John Pekowski, and the reviewers for valuable suggestions. Thanks also goes to Yoshiharu Hamada, Akihiro Kubota, and Kunio Motoe for research support.

7. REFERENCES

[1] P. Alperson, "On musical improvisation," *The Journal of Aesthetics and Art Criticism*, vol. 43, no. 1, p. 1729, 1984.

[2] J. Attali, *Noise: the political economy of music*. Manchester University Press, 1985, vol. 16.

[3] D. Bailey, *Improvisation: Its Nature and Practice in Music*. Da Capo Press, Aug. 1993, published: Paperback.

[4] P. Bell, "Interrogating the live: a DJ perspective," 2010.

[5] G. Born, "On musical mediation: ontology, technology and creativity," *Twentieth-Century Music*, vol. 2, no. 1, p. 736, 2005.

[6] A. R. Brown, "Code jamming," *M/C: a journal of media and culture*, vol. 9, no. 6, 2007.

[7] L. B. Brown, ""Feeling my way": Jazz improvisation and its vicissitudes-a plea for imperfection," *Journal of Aesthetics and Art Criticism*, p. 113123, 2000.

[8] N. Collins, "Live coding of consequence," *Leonardo*, vol. 44, no. 3, p. 207211, 2011.

[9] S. Davies, *Musical works and performances: A philosophical exploration*. Oxford University Press, USA, 2001.

[10] G. Deleuze, "Lecture transcripts on Spinoza's concept of affect," *http://www.webdeleuze.com/*, 1978. [Online]. Available: http://www.webdeleuze.com/php/texte.php?cle=14&groupe=Spinoza&langue=2

[11] G. Deleuze and F. Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*. Burns & Oates, 1987.

[12] J. Dewey, *Art as Experience*. Perigee Trade, Jul. 2005.

[13] A. Gaspar and S. Langevin, "Restoring coding with intention in introductory programming courses," in *Proceedings of the 8th ACM SIGITE Conference on Information Technology Education*, 2007, p. 9198.

[14] L. Goehr, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music*. Oxford University Press, USA, 1994.

[15] T. R. Green, "Cognitive dimensions of notations," in *Proceedings of the fifth conference of the British Computer Society, Human-Computer Interaction Specialist Group on People and computers V*. New York, NY, USA: Cambridge University Press, 1989, p. 443460. [Online]. Available: http://www.cl.cam.ac.uk/users/afb21/CognitiveDimensions/papers/Green1989.pdf

[16] A. Kania, "Pieces of music: The ontology of classical, rock, and jazz music," Ph.D. dissertation, 2005.

[17] T. Leddy, "Dewey aesthetics," in *The Stanford Encyclopedia of Philosophy*, fall 2012 ed., E. N. Zalta, Ed., 2012. [Online]. Available: http://plato.stanford.edu/archives/fall2012/entries/dewey-aesthetics/

[18] R. D. Leppert, "Music "pushed to the edge of existence" (Adorno, listening, and the question of hope)," *Cultural Critique*, vol. 60, no. 1, p. 92133, 2005.

[19] A. McLean and H. Reeve, "Live notation: Acoustic resonance?" in *Proceedings of the International Computer Music Conference*, 2012.

[20] G. Paine and J. Drummond, "Developing an ontology of new interfaces for realtime electronic music performance," *Proceedings of the Electroacoustic Music Studies (EMS)*, 2009.

[21] S. Predelli, "Has the ontology of music rested on a mistake?" *Literature & Aesthetics*, vol. 12, 2011.

[22] Y. Saito, *Everyday Aesthetics*. Oxford University Press, USA, Feb. 2010.

[23] R. K. Sawyer, "Improvisation and the creative process: Dewey, Collingwood, and the aesthetics of spontaneity," *The Journal of Aesthetics and Art Criticism*, vol. 58, no. 2, p. 149161, 2000.

[24] B. d. Spinoza, *Ethics (trans. RHM Elwes)*, Jul. 2007. [Online]. Available: http://www.gutenberg.org/ebooks/3800

[25] R. Turner and A. Eden, "The philosophy of computer science," in *The Stanford Encyclopedia of Philosophy*, winter 2011 ed., E. N. Zalta, Ed., 2011. [Online]. Available: http://plato.stanford.edu/archives/win2011/entries/computer-science/

[26] J. Van Leeuwen, "Toward a philosophy of information and computing sciences," *Netherlands Institute for Advanced Study Newsletter*, no. 42, pp. 22–25, 2009.

[27] A. Ward, J. Rohrhuber, F. Olofsson, A. McLean, D. Griffiths, N. Collins, and A. Alexander, "Live algorithm programming and a temporary organisation for its promotion," in *Proceedings of the README Software Art Conference*, 2004.