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The Now of Computer Experimentation

1. The contemporary now

What do we mean when we say that something is contemporary, like “contemporary art”? An immediate response would be that contemporary art happens in the present — happens now. But what is this present, and what constitutes the “contemporary contemporary” as my colleague Jacob Lund would put it? When and where does the contemporary begin and end? And what does this have to do with computation and computer experimentation?

First I should explain more about the contemporary or the contemporary condition — here referred to as contemporaneity. The distinctiveness of contemporaneity is the way it refers to the temporal complexity that follows from the coming together of times — understood with Peter Osborne as the coming together of different, but equally “present” temporalities or “times”. As such, the term should not be understood merely as a periodizing category nor a straightforward understanding of “the contemporary” as the historical style of a period but rather as a designator of the changing temporal quality of the historical present, which is “a coming together not simply ‘in’ time, but of times”. Osborne continues:

“… we do not just live or exist together in time with our contemporaries — as if time itself is indifferent to this existing together — but rather the present is increasingly characterized by a coming together of different but equally “present” temporalities or “times,” a temporal unity in disjunction, or a disjunctive unity of present times.”

The passage describes the more complex and layered problem of different kinds of time existing simultaneously across different spaces, as part of really-existing global capitalism in which networked real-time technologies play an increasingly

significant role in producing our experience of time. The plurality of times today are not only existing at the same time, in parallel to each other, but they interconnect and are being brought to bear on the same present, a kind of planetary present even though of course it is unevenly distributed and shared — “a temporal unity in disjunction” as Osborne put it.

The contemporary is at once the time in which we live, and a particular relationship to time and to history, and maybe an experience of a loss of history, the crisis of historical agency, and the loss of a vision of the future and the perceived inability to conceive of another (better) world.

This is part of the problem of course: that the present is no longer conceived of as a point from which to imagine a qualitatively different future — in keeping with many other theorists dealing with ‘the crisis of time’ including Fredric Jameson who regards the cancellation of a futural moment as “a weakness in our imagination”. The associated lack of historical agency indicates our inability to act in the present: and rather than the dialectical/dynamics of now-time that Walter Benjamin once described — in his essay ‘On the Concept of History’ in which time is at a standstill ready to explode — instead all visions of past and future seem to have collapsed into “presentism”.

We are left to passively wait for a tomorrow that never arrives and is endlessly deferred. “It’s an avoidance of the now,” as the Invisible Committee claim. They continue:

“A mind that thinks in terms of the future is incapable of acting in the present. It doesn’t seek transformation; it avoids it. The current disaster is like a monstrous accumulation of all the deferrals of the past, to which are added those of each day and each moment, in a continuous time slide. But life is always decided now, and now, and now.” (2017, 17)

To put it in broad terms, we can perhaps agree that something has happened in our relation to time, how we exist in time, and the ways in which our conception of time relates to our conception of art and music. Thus, while being increasingly aware of being in the present, of the omnipresence of the

present, we are becoming attentive to other kinds of time and how these are interconnected at various scales of operation.

How time is managed and manipulated by informational machines is clearly an important component of how different experiences of time are brought together and how they are compressed, and it seems evident that our experiences are more and more aligned to the temporal operations of machines and planetary computation.

As a consequence, we seem to be living in an “expanded present”, a present in which several temporalities and times take part in what is perceived as present and as presence. This global contemporaneity means that networked informational technologies and ever more “social” media forms play a decisive role both in shaping art and culture and in the ways in which art and culture themselves function and create meaning. The Internet in particular has produced an extreme spatial and temporal compression marked by a perpetual sense of dislocation.

If this seems a bit abstract up to now, let’s take the example of live coding and the ways it unfolds different temporal registers.

2. The now of live coding

Live coding is clearly a practice of time. It seems commonsensical to say that live coding operates in, and expresses, the present but we might seek more detail on how live coding enacts a particular sense of the present in the coming together of different temporal registers. Live coding might offer some insight into our disjunctive experience of time where humans and machines run in — and out of — synchronous time, and where temporal complexity is actualized and made experienceable.

Real-time computation underpins this cultural logic, as well as the wider applications of “just-in-time” economic production, yet there is little attention to this in art history or criticism — aside from the real-time “systems aesthetics” of Jack Burnham from the late 1960s perhaps — to understand how this influences aesthetic practices outside of the register of

liveness.

There is also danger perhaps of privileging liveness here. In our soon to be published essay “The Crackle of Contemporaneity” — written with Ryan Nolan and Andrew Prior — we explore the idea of listening to contemporaneity. There is no time to go into detail but as may be apparent from the title, we make explicit reference to Mark Fisher’s essay “The Metaphysics of Crackle” (2013) to point to some of the material preconditions for temporal complexity, not least in registering the crackle of technology through which this particular experience of time is made possible at all.

“The crackle… reminds us of the technological means by which this capturing of time was made possible” (Fisher 2013, 49).

Fisher discussed the crackle of vinyl records, explored as a reminder — or remainder — of the presence of the recording and production apparatus and argued against the symptomatic privileging of live performance and its claim for authenticity over recorded and sampled forms.

In changing rules at runtime, live coding seems at first to actualize the experience of time, exposing the real-time dynamics of now-time that we appear to have lost. Maybe that claim goes too far but I would like to suggest that live coding is deeply implicated in these operational dynamics of what constitutes the present — the contested liveness of live coding — in ways that reflect the intensity and disjunctive experience of time more widely.

Central to this ability to operate both in and out of time is a challenge to the dominance of deterministic clock-time as the means through which time and temporality are commonly understood. It is clear that machine-time operates at a different register, as for instance, in the way that system time indicates the computer system’s notion of the passing of time. It is worth pointing out here, as you are no doubt aware, that the time according to the computer’s system clock is the number of seconds that have elapsed since 1 January 1970. This is the so-called Unix epoch (or epoch time) that provides a timestamp in seconds, milliseconds and microseconds that can be converted

into human-readable dates.

Clearly it would also be a mistake to simply refer to the date-time of the computer screen and read off the figures, assuming this to be ‘real’, perfectly synchronized global time, as this is evidently only served up to us by a mathematical logic that fabricates ‘real-time’ for vested interests. Indeed, to computational devices, there is no such thing as real-time, but only massively generalized prediction and inevitable delay — what Ernst refers to as the ‘delayed present’— even if measured in milliseconds and hardly discernible to the human sensory apparatus.

In his essay “The Computer as Time-Critical Medium,” Wolfgang Ernst clarifies the ontological importance of time to the computer for it to operate and for it to establish networks — from the scheduler to determine time for computations to the network protocol for packet-switching. He also points to key issues of programmability, feedback and recursion at the level of programming languages as well as the temporal gap between the computer and programmer that is crucial for an understanding of the practice of live coding. The precision of the technical detail is crucially important for Ernst’s argument — as, for instance, the flip-flop time of binary switching and the specifics of the clock signal to emphasize that “time counts” as he puts it.

For the practice of live coding, timing is clearly paramount and we might add that time has been considered to be a key issue for music and composition at the expense of its more technical and mathematical foundations — although not for this audience of course. The point here is that a practice like live coding is not based on musical narrative structures alone but also on signals, counting and calculation that together compose at multiple registers and scales. And although there has been a tendency to unduly privilege the agency of the live coder- programmer-performer in analysis, other operative agents are clearly part of the performance and the way in which time is produced and manipulated.

Sound synthesis makes a good example, and Ernst refers to live coding explicitly, and the SuperCollider programming

environment in particular, by quoting Julian Rohrhuber and Adrian Ward, asking whether “an algorithm for sound synthesis refer[s] to a sonic event or to the machine that created it?” Put simply, algorithms matter and express agency: they are performed and perform.

The phenomena of the “algo-rave” resonates with this in another direction, as a description of an event in which people dance to music generated from algorithms: they perform and are performed. Aside from the improvisory techniques and idiosyncrasies of the live coding performer, it is clear that the algorithms employed are not fixed entities and perform in time in ways that cannot be simply predicted. They are emergent and reactive entities, open to constant tweaking and updates in real-time. Indeed live coding is an expression of this tweaking of algorithms and offers performative potential beyond formal logic. It is not simply the programmer that becomes operative in a live coding performance but a whole suite of performative and technical processes that involve the intricacies of calculation, storage, transmission and processing in time.

This additional aspect is what Shintaro Miyazaki has drawn attention to with his wordplay “algorhythmics”, referring on the one hand to a finite sequence of step by step instructions (algorithm), a procedure for solving a problem, and on the other a temporal ordering of infinite movement of matter, bodies and signals (rhythm). The concept helps to conceptualise how algorithms produce measurable temporal effects, and how they are generated by micro-temporal performative operations at a range of scales — both perceptible and imperceptible to the human sensorium.

“Understanding computation means doing epistemic reverse-engineering of their inbound and outbound processes, signals and rhythms”, Miyazaki explains. He is taking the idea of “epistemological reverse engineering” from the media archaeology of Ernst, to account for the active contribution of machines to knowledge production, and how an archaeology of knowledge thereby extends, beyond the the perception of the human sensory apparatus, to informatics and the nondiscursive realm of micro-temporality, technical infrastructures and computer programs. It is in this way that media itself can be

understood as active “archaeologists” of knowledge.

A practice like live coding, and in particular its real-time operations, offers alternative epistemological perspectives and imaginaries on time and history. In his conference paper “... Else Loop Forever,” Ernst refers to the “halting problem” that underpins Turing computation and the problem of whether a computer program, given all possible inputs, will finish running or continue to run forever. This problem of decision, or *ending* as Ernst puts it, underscores broader notions of algorithmic time and the way the computer forever anticipates its own sense of never ending in an endless loop.

That there can be no happy ending as Ernst puts it allows him to elaborate on new temporal structures that are no longer aligned to traditional narrative structures or the terminal logic of the end of history. In keeping with the practice of live coding, Ernst argues human-computer interaction is idiosyncratic and rhythmical, quite different to the linear steps a computer follows when it executes an instruction in machine time.

This temporal complexity is further developed by referring back to Turing’s speculation on artificial intelligence and whether a finite-state machine can be aware of its “conscious” state at a given time and whether a sense of ending is necessary in order to be functional. It is clear that finite state machines are procedural, in that they operate linear sequences of discrete events in time like clockwork, but as Ernst reminds us: “There is no automatic procedure which can decide for any program, if it contains an endless loop or not.” Contrary to the traditional musical performance — with beginning, middle and end — Ernst points out that the computational musical recording can be replayed endlessly.

Making reference to Heidegger’s “being-in-time,” and the knowledge of the inevitable end of life that inscribes a temporal sense of what it means to be a human being, Ernst says: “Humans live with the implicit awareness that their death is already future in the past.” He explains how this deferral of ending is ontologically exacerbated with computation, unfolding the ending of being as a time-critical condition for both humans and machines alike. Leaving aside a deeper discussion of

Heidegger, the importance of this for live coding is the way in which it can be said to activate the present in all its complexity.

The way live coding performances manipulate time is key to this — live coding as the performance of the medium of time itself — where discrete events usually ordered into a sequence for a defined duration are instead open to nonlinearity and entropy. Thus perhaps we can not only acknowledge that time plays a crucial role in live coding in terms of the unfolding of time in its performance — as in a time-line or score — but also in demonstrating how time can be manipulated, and indeed produced, programmatically.

What is distinctive is how live coding plays with these dynamic qualities — or in more technical terms for interaction with a running system that is not stopped while waiting for new program statements — thus helping to establish how a processual practice like live coding operates its own particular kind of temporality that is unique to its technical form. It presents ways to conceptualize how software exists not only in lived time but is actually constitutive of it.

This also allows us to shift attention to both human time and machine time — across cultural and technical registers, or that of signs and signals — and to open up the tension between musical content and the poetics of the temporal processes in operation. I might go as far as to say that live coding allows for a better understanding of the coming together of different but equally present temporalities, and thereby how computation plays a critical role in our ordering and experience of the world, not only how we hear it but how it is open to transformation. But maybe that’s probably going too far.

What I am trying to stress in general here is the importance of a “time-critical analysis” that uses methods where media — and not just humans — become epistemologically active and allow us to perceive what is knowable or even unknowable. What unfolds, within the operations of algorithms too, is a reordering of time itself that no longer can be considered to develop in a particular order or through a sequence of actions — thus leaving analysis subject to those same conditions.

In addition to how computation begins to undo some of our assumptions about how and what knowledge is produced, alongside the critique of the anthropocentrism of Western thinking, we might also briefly mention other points of slippage of epistemic authority related to the ways in which space and time are understood.

This is where we might briefly draw in the work of Karen Barad — pertinent to this event — to refer to how “entanglements” of matter and meaning account for various other confusions and contingencies that make strict definitions between past and future unreliable. In arguing that states, events, and processes are constantly renegotiated without recourse to any pre-existing notion of space and time, she is referring to both Heisenberg’s “uncertainty principle” (that confirms the trade-off between knowing more or less about position and momentum), and to Niels Bohr’s “complementarity principle” (as a means to understand how individual things have complementary properties which cannot be observed or measured at all at the same time).

In short, Barad challenges the “epistemological and ontological inseparability of the apparatus from the objects and the subjects it helps to produce; and produces new understandings of materiality, discursivity, agency, causality, space, and time.”

It follows that there is not only the realization that there are uncertainties over space and time but also that apparatuses do not simply change in time but materialize through time (this is what Barad calls a “mutated time-space regime”). Temporality under these conditions becomes a more open process, less deterministic, or straightforwardly causal in activating the movement from cause to effect; also more performative, and open ended in the production of meanings. Live coding arguably provides one way to identify these more-than-human entanglements and perhaps begins to draw together human and machine registers of time in ways that are not reducible to either.

3. Now-time now

The present becomes even harder to grasp when it becomes deeply entangled with machine-time and mutations of space-

time. So how do we conceive of now-time now, in the context of so-called real-time, understood as the perceived non-delayed correspondence between actions and their effects, between incoming data and its computation?

Concerns over the increased automation and standardization of lived experience resonate with an older philosophy of time in which the model of ‘common time’ (or ‘vulgar time’), as measurable by clocks for instance, and ‘scientific time’ associated with mathematics and physics — or, we might add, computer science — is seen as reductive. But arguably, this seems somewhat dated when highly complex human- and machine-time regimes have become thoroughly entangled, and our concern is that it seems impossible to talk about presence or the present without thinking of the ways in which computation creates the illusion of it—for example, through real-time web and communication forms such as instant messaging, which involve a compression of time that creates the illusion of what Ernst calls “pseudo-co-presence”, or in the ways that blockchain technologies reconceptualize the distribution of assets across space-time.

Furthermore, the determinism of the clock or the timestamp of blockchain are symptomatic of the ways in which different kinds of time exist contemporaneously across different space-times, and as part of global capitalism wherein real-time computation reproduces both our experience of time and our seeming disconnection from it. So how to now understand our ways of being in and out of time, and of being able or unable to grasp or shape it? To what extent is the anticipation of what came before or what comes next indicates the deferral of politics altogether?

Indeed what kind of politics is possible under contemporary conditions, which according to some are already a “post-contemporary” state in which what is experienced as present was actually defined by algorithmic calculations in the immediate past, meaning that the future has always already been pre-empted — and here I refer to Armen Avanessian and Suhail Malik’s essay “The Time Complex”?

So how might we begin to reconcile this predictive capacity and

our seeming inability to imagine a qualitatively different future?

For the historical materialism of Benjamin, the dialectical convergence of past and present is what provides the politics. In his words, a ‘leap in the open air of history is a dialectical one’, the awareness of which will “make the continuum of history explode” in such a way as to allow its recomposition. Now-time is time filled with creative possibilities (rather than mere probabilities):

“History is the subject of a structure whose site is not homogeneous empty time, but time filled by the presence of the now [*Jetztzeit*]” (Benjamin 1992, 252–53).

There remain some important connections to technology that can be developed from this reference to Benjamin and his philosophy of history. In the opening passage of Benjamin’s essay, historical materialism is introduced as the chess-playing automaton that wins every time, and through which artificial intelligence (or machine learning) appears superior to human intelligence.
Yet the autonomy of the machine is revealed to be fake, and the illusion is achieved through trick mirrors and magnets that move the chess pieces, guided by a small person hidden in the mechanism. The dynamic of history is evidently fake too, as for Benjamin the unfulfilled time of the present can only be activated by political struggle.

The illusion of real-time operates in a similar manner, it seems. Although the expression ‘real-time’ refers to the effect of information being delivered apparently as it happens, in computing it serves to describe the actual time elapsed in the performance of a computation by a computer, in which the operation appears to be immediate and able to correspond instantaneously to the operations of an external process. The illusion here conceals the fact that humans and machines are entangled in multiple renderings of now-time that distract us from knowledge of contemporary socio-technical conditions.

So how might contemporary conditions still be ready to explode? What we might conclude — after Barad — is the reverse: that subjects and objects operate within “mutated

time-space regimes” and are no longer developmental in their temporality but rather more caught in an implosion of forces — an explosion in reverse — and as such appear to limit possibilities for change.

A fuller understanding (or “diffractive reading”) of how the present is rendered might allow us to challenge and extend our understanding of change and action in ways that would have implications for computer experimentation and its effects. This might indicate modes of uncertainty in processes that otherwise restrict our ability to imagine rupture in the omnipresent present, that is, begin to reinstall a sense of now-time that is radically present (ready to explode).

END

The talk incorporates fragments from collaborative writing:

Geoff Cox and Jacob Lund, *The Contemporary Condition: Introductory Thoughts on Contemporaneity and Contemporary Art*, Berlin: Sternberg Press, 2016.
Geoff Cox, Ryan Nolan, Andrew Prior, “The Crackle of Contemporaneity”, in *Futures of the Contemporary: Contemporaneity, Untimeliness, and Artistic Research*, Paulo de Assis and Michael Schwab, eds. Leuven: Orpheus Institute Series – Leuven University Press, 2019, pp. 97-114.
Geoff Cox and Jacob Lund, “Time.now”, for *Uncertain Archives*, Nanna Bonde Thylstrup, Kristin Veel, Catherine D’Ignazio, and Annie Ring, eds., forthcoming MIT Press 2020.
Alan Blackwell, Emma Cocker, Geoff Cox, Thor Magnusson, Alex McLean, “Time Criticality”, draft chapter for forthcoming book, *Live Coding: A User’s Manual* (unpublished), 2019.