Conventional Non-computing and Unconventional Musical Signal Processing

Dr Zlatko Baracskai
University of the West of England
zlatko.baracskai@uwe.ac.uk

Abstract

As scepsis maintains its primacy in scientific enquiry giving birth to unconventional computing, one must poke at the new-born as well. By manipulating the terms convention and computing challenges are posed to their meaningfulness in the contemporary context. The main suspect is the concept of outcome as it necessitates thresholding which is an anthropomorphism and thus not more than a neurological phenomenon. Development of the philosophical argument leads to parallels with artistic endeavour that is procreated through technological advances. Consequently, the unconventional tools devoid of thresholding may pave the way for contemporary art which is free of the outcome threshold as well. This opens up cans of worms of which the one of audio signal processing is focused on. This chapter thus concludes with a pool of challenges that non-silicone systems might be able to tackle for the sake of unconventional music.

Dichotomies that yield computing and convention

Let us attempt to construct the idea of non-computing to balance the assumptions that the computing paradigm entrenches. The axioms of computation largely overlap with reductionism, which has been proven less useful in prediction of increasingly complex system behaviour. Evidence of truncating phenomena being highly predictive in controlled environments should thus not be carelessly extrapolated to cover complexities which are evidently beyond controlled and beyond fully observable circumstances. The judge between the ideologies of computable reality and steerable complexity is in the degree of overlap that is experimentally evident - the degree to which models of reality corresponds to it. The reality contains, and is therefore the superset of the models of reality. As such, the subset may not embrace the superset, it may indeed beautifully and accurately reflect the superset. The boundaries are by definition unknown to the subset. The superset-subset confusion permeates our culture, very notably in psychology as well, in the antagonism between the declared will and the prison of habits. The struggle vanishes a soon as the superset of the human mind is defined to have as its subset the declared will, and thus there may exist no actual antagonism - instead it is an internal affair of the mind whereby declaration is secondary. As the intent of computing is investigated the opposite polarity gains the contours of aimless reality, which is not therefore static - instead, a dynamic necessity for increasing complexity is observed - art thus. The inversion of un-conventionality may seem to need less attention; however it is interesting to seek the perspective which annihilates the dichotomy.

How could human activity be ontologically distinct from other biological species, or even the chemical self-organisation altogether? Laid bare, to try and escape from convention is a mammalian self-ranking attempt. The dream of convention and its opposite is a part of the hero-myth, the myth of overpowering a limitation. Whereas the limitations of cognition and of reality-models are by definition impossible to be surpassed - in-fact, that, and this very statements are necessarily bound to the context of a reality-model, and are its subset. Therefore, the urge for a mammalian to act differently within the pack is by all means conventional, it is a recurrence that some cultures label as art. Thus, the idea of conventional non-computing is, simply put, an alternative definition of what art is.

Truncating phenomena

The way we describe or experience things tends to slice things up, as distinguishing a thing from another is already a slice. This naturally occurring reductionist approach comes to imply that if one knows how each component is, then one shall know how the sum of the components is - a linear addition principle. There are many examples in biology where the reductionism and basic, strict causality fails to describe and predict certain complexities. As soon as the system gets sufficiently complex, because all the so-called 'elements' are interactive, it naturally becomes unpredictable beyond very short term. The collapse of predictability is thus inevitable. One of the underlying principles of non-computing is the delineation of phenomena truncation and attempts to avoid it. For example, consider the relationship between time and frequency. We hear frequency with the ear and we have a clock as a distinct and independent entity to observe time. For a human, it is obvious to separate the domains linked to these two entities. But if we start looking deeper into what it takes for something have a frequency, we will find that we cannot separate the time out of that concept. In order to advance non-computing finding ways to assume less separation with models of reality is crucial. Also, consider the following example: in art, especially music, we actually work with the overarching sensation, impression, soulful resonance and impact rather than the elements that constitute a piece of music. We require a piece of art to be wholesome, but true wholesomeness is lacking if we made it up of elements. Is it worthwhile to strive for art and technology devoid of deconstruction and construction? Are we attempting to change evolutionary courses? Well, non-reconstructed art is the whole of our environment, so this striving relates to recognition of continuous self-adaptation. Non-computing comes thus naturally when the environment remains non-truncated. The arithmetic problem of dividing 5 apples between two people should embrace all other circumstances. If this domain of counting and dividing isn't artificially isolated then the hungrier person might get three, or the one who commits to germinate the seeds and plant trees might get three, or a random passer-by might, or they might just eat an apple when inclined and leave it at that.

Truncation of domains and precision is necessary for measurement, while everything that is measured is actually altered by the measurement process. To measure without interfering is unattainable. There is an inevitable connection between all the phenomena. Evidently, the amount that the measuring device modifies what is being measured is often negligible. There is no real technical issue here, the issue is that the paradigm, our way of thinking induces the isolation between phenomena. So, we become convinced that a concept, or a rule are primary and the environment is their deviation. Whereas the evolutionary evidence necessitates the

environment to come first and give birth to the neurological products called concepts and rules. The 'truth', similarly a neurological product, is the absence of cognitive dissonance paired with comforting neurotransmitter balance. So, we inevitably consider that the simpler theory is truer than the complex one. What an axiom!? The question of parallel lines at infinity is a stretch of imagination, a law of nature is just a conceptual remnant of the hierarchical organisation of society. It would be more adequate to consider a very small time-space window where we observe regularities than to consider discovering laws of nature.

Fixed representations of fluent reality

As the evolving cognition begins to dissect and categorise phenomena, to then conceptualise the thresholds, the negation is born. There is no such thing as negation in reality, only things that exist do actually exist and the degree of opposition is question of perception. Negation is thus a child of classification; an object may not be of a certain class. Negation between actual objects is meaningless. As the classification mechanism precedes the understanding of processes and transformations it seems to suffocate them as we tend to define processes in terms of their final stage, and other classifiable attributes. So, it is least surprising that human cognition is lost in the mazes of achievement, even when we know to live for the process and forget the goal - which is necessarily an imagined state. We can't block out the goal, no single idea can be actually blocked, because pairing it with an obstruction necessitates its recall. So, the imagined states can only cease to develop, there is no cognitive power capable of stopping the imagining, and therefore it is rather autonomous in relation to the momentary awareness. Thus, the computation tightly relates to achievement, to classification, to a condition, of which the symbolic value is more significant than its actuality. And so, we praise the symbols trying to fix the fluidity, to frame the actuality. Granted, our spatio-temporal bubble offers quite some experimental reliability, but the extraction of rules, rather than observation of regularities and the subordination of reality to concepts seem mere acts of insecure psychology, gasping for air, grasping a snail.

So, the framework of our investigations altogether is rather small compared to what we assume is the duration of history before us and the potentially infinite future. It seems pure mammalian self-inflation in a ranking struggle, cognition controlling the environment, this subset struggling to be its own superset. Well, there seems no reason why it all couldn't be a Klein bottle, indeed there may be a measurable field of intent that cognition can tap into while physical sensors are still failing. However, if we keep to what can be shown, instead of allowing for the possibility of what cannot be shown, then the discussed subset-superset relationship does bear limitations. Like a droplet of water which can reflect much of the environment. The droplet is a subset of the whole environment, and so it seems to reflect almost the whole environment, but likely not all of it, and likely not itself as the source of this reflection. It could all be a scale-free, morpho-resonant self-similarity, we cannot show that this is not the case, but we can show that the detail is progressively lost in cascading reflections.

The of sub-set <-> super-set relationship is not sufficiently clear in our scientific ideology. We have a similar failure in our psychology - the awareness is the subset of the mind and it is pushing for the control of the whole mind, and the whole self. So, there is a struggle between sets whereby the subset is frustrated. If a person is not able to emotionally attach to its

environment, then there is no outcome of a thinking process either. The outcome of a thinking process – the conclusion – is brought by the pull of an emotional catharsis. It is an emotional drive that actually pushes us into rationality, into achievement, an emotional drive that is concluded with neurological rewards, which are tightly linked with the sense of social ranking. It has been shown that the declared reasons for our behaviour come after the behaviour. Most of our reasons are justifications for what we do due to deeper drives. A thinking process is unfolding imagination which the momentary awareness can steer as it runs on parallel threads, while the awareness is hardly parallel at all, no matter how distracted it gets.

So, the starting point is the surfacing intuition, an idea arising from mostly autonomous imagination. The sense of confidence shall then condition the process of justification to substantiate it being right or wrong. Confidence can be chemically induced or reduced. And that is about it, it is a tail of what actually happens in a very peculiar neurological reverberation chamber, rather dissimilar in substrate and structure from the domain of actualities it absorbs. Could that reverberant field fully grasp the actualities, maybe, maybe not, let's say it is unknowable, while imaginable, and rather playful actually. However, it is worrying when academics follow suit with marketing and dwell in the convincing instead of the questioning attitude. Indeed, the necessity for cognitive ease takes primacy, except for the few suffering cognitive disease by default. The academic attitude necessitates equal investment into proving and disproving any hypothesis. One can produce arguments around the ideas, opposing arguments, but if there is a winning outcome to an antagonism which is not its own dissolution, then the outcome is an advertisement, and not so much the advertisement of a claim, it is the advertisement of author's ranking, the message is the medium, a scientific outcome is its author. So, we have a pyramid of authors, standing on each other's shoulders, what a splendid act. And most crucially, as these stacked minds grow in mammalian bodies, all pretension of universality is short-lived, mind is well evidenced to be embodied and the limitations are clear. What lies beyond the limitations cannot be made clear. The self-inflation wishes that everything should be knowable, while substantiated knowledge readily highlights the unknowable. The supposedly profound questions like why does life exist, are mere inconsistencies in mapping structures to distant domains. If we would strictly disregard perception induce and mind-made concepts then the causation itself might be overthrown, it seems physics equations wouldn't mind a time-reversal.

Without memory and content

Cognitive scientists seem to have established that there is no memory nor content in the brain. There are neurons; they are born, they regenerate and die out after a while. Other cells seem actively supplying and supporting neurons, but the cognition seems to rest on the network of neurons. So, there is no empty space to be filled with something. The skill-set which we describe as memory can be explained through the idea of increasingly detailed ability to react to the environment. The pool of potential responses grows through interaction with the environment and the imagined scenarios. Similarly, the ability to decide between options based on reasoning is a skill. As there is no meaning without context, the thinking process can be described to have short term memory, but this can also be explained with the idea of currently excited configurations. The simplifying reflection of the environment in the mind can accelerate its unfolding beyond the pace of the reality. A resting mouse in the maze actually runs the mapped maze in the mind faster than on all four. What we often think of as

storage is but a crooked reverberation chamber where both the impressions and skills develop and decay in one's lifetime. Moving beyond the idea of failing storage, it might appear that we remember better when invoking the feeling of having remembered this in the future, more so than when invoking the emotion of discomfort of potential forgetting. There is no self which is separate from the process of recalling a memory, therefore the statement that I forgot something is actually meaningless.

Our computer programs, procedures, algorithms typically rely on the necessity of an empty space which by its nature requires the filling of it, its manipulation and the like. The metaphor of containment is indeed found at the deepest levels of cognition. Yet it seems that all the explanatory power of the concept of memory could be accounted for by a concept of ever-increasing physical detail that resembles the diffuse field around what is currently actual. With so much growth around us, being a product of growth, and having direct experience of it we opt for the 'law' of conservation of energy and matter, while they are product of abstraction, while they cannot be directly experienced, and would strictly speaking abolish growth for circulation. Descriptions and abstractions are the product of direct experience, a subset of it, they are merely self-inflating when they pretend superiority to what is real.

Can the neural activity be considered computation, the brain a computer? Surely, it can be considered many things. Crooked mapping is the key to playful behaviour and thinking. But what is real about cognition, what seems to escape multiple good metaphorical descriptions? What is real? Probably the most crucially real thing is that all display of cognition and likely the whole of it depends on the livelihood of the organism. Other than that, certain skills are unquestionable. But the 'cognitive tools' of memory and reasoning might be replaced by another equally useful description. The way we construct and understand language seems to be based on the relationship of deep metaphors and not on formal logic operations. What the self-inflation praises as intelligence is the subset of the self-adaptability of the whole environment. How could un-intelligent matter give birth to intelligence while obeying the matter and energy conservation laws? And how could the growing detail result in increasing reflection of the environment in a bubble that it contains?

We can thus assume that neural intelligence is a subset of environmental intelligence, while the procedural intelligence is the subset of our neural skills, which is then implemented and accelerated in silicone. In considering agency, a similar structure seems natural - decreasing agency with procedural intelligence. If we consider the reflective bubble to be free then the environment that gave it birth is likely even more free. Growth oriented worldview seems castrated by our paradigm of humans having momentary freedom and prediction skill paired with controls that guide the body to perform actions. A behaviour is a product of growth, not of momentary choice - the performing of a momentary choice is just one of the behaviours. If the tree of behaviour suffers a lesion, then most of it gets damaged, it may easily cease to be the time-reversing reverberant tail, in how it accelerates beyond the pace of the environment at full potential. The unfolding of actualities might be informed by an accelerated domain that informs it, and it might not. What we describe as causality might be a force pushing into the present from the past, and it might be a force pulling into the future - it seems physics could be adopted for the latter assumption and still bear all its predictive capacity.

Unnecessary extrapolation

The ideas that a model is superior to reality, that a subset can rule the superset and that regularities are laws keep coming up. Historically many models have predicted outcomes that were subsequently experimentally proven. Nevertheless, many sufficiently well-functioning models could be built using concepts which oppose common sense. Let us briefly address the concepts of infinity and of everything. We have a sense that if something works on a small scale then it should work on a large scale as well. Increasingly precise tools brought evidence that basic relationships tend to break down at extremes. So, we have theoretical physicists who name phenomena as existent when an abstraction suggests it. It resembles crooked mapping and the fascination with it. Rightly so, the play that arises from dressing up situations in elsewhere borrowed terms is the most fascinating (and fascination producing) mechanism. It is akin to a child who extrapolates a simple learned relationship to other elements in their cognition, like when the gustatory neurology becomes the underlying mechanism for moral judgement, when drawings become family members, when the understanding of all apples in a basket invites the imagination of all the apples in the world.

Strict delineation between real things and concepts seems trivial but we tend to mess it up. To reject the monopolisation of activities by concepts let us discuss systems that do not delineate or truncate phenomena, and that do not attempt to reach an externalized goal that is measured by truncating phenomena. No accomplishment thus, no computing and result verification, just the somewhat circular philosophical or artistic activity. The issue is not a lacking of the real in comparison to the ideal, the issue is the assumption of ideal controlling the real. The paradigm of achievement has obviously yielded amazing technology, but it also seems responsible for global mental discontent and restlessness. We thus attempt to gain perspective and release the sense of necessity. The thought of release is just a potential trigger, the release needs to happen in the deep limbic drives of mammalian ranking.

In some areas of computation there is lesser presence of the idea of achievement. In analogue computation, one might produce a circuit that closely resembles a complex interaction within the environment, then there are operators which would turn the dials until the electronic circuit starts to operate in a desired way. This could be considered another instance of a detailed reflection in an accelerated domain, just like our very cognition. It is crucial that the desired outcome is not distinct in terms of truncated dimensions and values expressed in different units. There is a wholesome assessment of a worthwhile process and a wondrous new condition. Akin to a piece of art which is not necessarily complete when the relationships between elements is measured to match the target, instead, there is birth of an entity which seemingly blocks further intervention. When a measurable outcome is not the goal, then we can talk about non-computing. It is not aimless idleness; it is direct intervention without success or failure lurking in what is about to happen.

Externalization of achievement

Achievement is typically externalized in space and time, it's just a label attached to a condition or potential condition; therefore, it is real only in its existence as a neural representation. Striving for achievement is thus striving for a neural representation, which can evidently bypass the condition and its objective assessment altogether. Similar to how a supposedly

objective statistical assessment allows us to produce any desired message. The direct intervention, however, does not have such a short-cut, it only has distractions, it cannot be more than itself, it can't be done in a better way as the ideal domain falls short of the actuality. Like when we dance, there is likely no desired outcome, we are unlikely dancing to get to the end of it. Once it is clear that the current condition is the superset to the imagined outcome it becomes clear that the sacrifice of the superset for the benefit of the subset is senseless, the whole striving beyond what is makes little sense. Instead, knowingly intervening in the current condition is the key, it is psychologically healthier than living for the forthcoming. As our language is rather fluent and self-referential, the state of occupation with the current condition may be called an achievement, but as that occupation cannot be further improved from what it is, maybe better call it non-failure. Achievement seems to imply a possible gradation of success, gradation of reality, but the term is only meaningful to delineate non-current conditions.

Could we thus build and/or rewrite science without achievement? The pace it was built at likely necessitates the obsessive behaviour observed, so the real question is whether we need the levels achieved. Did the progress heal the frustration that triggered it? How about art? Is it free from being measured? Now that the technology is the main pillar of artistic production there might be hope that they help each other away from the outcome classification. Time-based art does have a deep root in shaping the ongoing rather than getting to a result, but even artefact-based art is necessarily shaping the ongoing moment of someone's observation. An activity that supports the obsessive verification of potential outcomes based on increasingly precise models, as a matter of safety is welcome. Indeed, if the hysteria of pending danger ceases and the evolution is considered more cunning than humans then what led to atomic warfare is similarly just a part of the game that we trust. The assumed psychological condition of selfishness, even the selfishness of the genes is just a projection of one's upbringing. Similarly, only a person who was (un)fortunate enough to have enough servants to stop him from doing any life sustenance could come up with the idea that being human equals thinking. Maybe someone's longing for conserving the social configuration of thinkers and workers, lawmakers and lawbreakers, helped the clinging to the idea of necessary conservation of energy and matter. If there is a sense of purpose at lower levels of biological organisation, then all our blood-cells are likely convinced that they are running around for their own sake. Once we truncate phenomena, we can establish them to be antagonistic, symbiotic or independent - in fact any and all of those, based on the chosen or unavoidable perspective, or more playfully.

Subsets of evolutionary intelligence

We tend to think that by design (which is a subset of evolution) we may outsmart the evolution. Now that we have evolutionary algorithms and neural networks, we call them intelligent to match our inflated self-image, whereas instead we could better start calling ourselves merely adaptive, and do away with the myth of intelligence. Human intelligence is the subset of evolutionary intelligence, which seems not more than a thoroughly self-adaptive occurrence with increasing detail. We are brought up to assume that we are superior to a piece of rock, a plant or an animal, and among the humans there is people who are supposedly more clever than others. That is all self-inflation, mammalian ranking struggle.

It seems that thinking altogether is a 'secondary sexual property', a characteristic that was evolutionarily selected because it helped procreation, indeed while it disadvantages other survival mechanisms. In our mating selection and in competition, the thinking individuals procreated, but in terms of the quality of survival the mind that cannot stop thinking makes a monotonous life. However, there is a self-defeating outcome of the thinking process which may improve perception and reflection. It seems that thinking is just not the pinnacle of evolution, just a peculiar time-reversing and self-inflating reverberation.

As the self-adaptiveness yields the acceleration of self-adaptation in reflective bubbles the question arises whether there is anything substantially new in human cognition. Once that accelerated neural domain yields a further accelerated digital computing domain, is there a qualitative jump? If the accelerated digital computing domain yields an infinitesimal quantum computing domain, would that be a jump? It certainly will without observing the larger perspective. So even if we have to keep the term intelligence, there should be no fear of artificial intelligence, more so of artificial greed. Fear seems to be a mechanism that sustains an individual, but no individual is sustained for too long, some species take longer to perish, but the evolution is very much sustained, more than anything, and from the perspective of the subset, which we are, there is no way of knowing the boundary of that entity, and indeed whether the anthropomorphisms of entity and boundary can make any sense of it. The fact that a large network of adaptive cells (both computational and neurological) form a configuration that is increasingly adaptive and can perform learning and prediction seems just another reflection, this time a bottom-up reflection.

Art and Agency

We are brought up to think ourselves free and responsible. Now, the idea of responsibility is born when the social cohesion is failing. Self-adaptive systems, to include tribes, rely on immediacy of inter-connectedness. It seems that a naturally occurring mechanism will become verbalised only if it starts failing. Such is all our discourse of morality, just a sign of failing social inter-connectedness. Also, emotions get to have labels only once they are missing, so it is inevitably awkward to claim having a certain emotion. Legislation is a symptomatic intervention, nature does much better when organising complexity, if we may poetically personify nature at all. Naturifying a person might be a better way around.

Freedom from something is a clear concept, but absolute freedom is more problematic. Human agency can be rather well described and contained; absolute freedom is but a lovely poetic longing. The cognitive processes are inhibitory, they modulate limbic drives, so their freedom from limbic drives would annihilate them altogether. There seems to be a configuration of a source and a constraint, a certain pushing, from the past to the future, which is the basic premise our world-view rests on - an antagonism. But we might just be able to build the whole field of physics in a symmetrically opposite way, such that everything is actually pulled, from the future. Only the controlled environment experiments suggest a one-way control mechanism, if we instead assume that not a single configuration can be repeated and therefore there is no way of knowing what could have happened otherwise, then we could conceive of a universe where instead of from the pool probabilities we calculate form the inevitability of the currently apparent situation. In fact, there is a good clue that

statistically defined pushing universe is an odd idea, as the calculated likelihood of current organic organisation of matter is pretty-much zero.

Instead of computing likelihood in terms of past becoming future, we could attempt to produce models which compute inevitability which is anchored in the inevitable present. The idea of investigating the past is actually a pull to the future. The awareness itself, the time-inverting reverberation chamber is the very pull. On top of that, inverting the past-future antagonism is yet another perspective, we could see it all to be a symbiotic relationship as well, without any pushing and pulling. Slightly tougher to come up with seems the paradigm that would make them independent.

Does then the human agency include the choice of computing and non-computing? Would either make a difference? Again, making a difference assumes that there may be a different outcome and therefore an identical situation at least twice. One may pick their axioms as they like, but thanks to the increasingly precise truncation, it seems that all thing accounted for, there are never identical configurations of the universe. Another self-defeating solution to the dilemma.

The non-achievement of conventional non-computing

It seems that we are promoting a rebellious, and hasted, superficial attempt of subverting established assumptions. However, our postmodern situation is defined by all subversion fortifying the system. Indeed, the attempt is to take a broader perspective and provoke deeper investigation and argumentation, but only to the extent the process is seen to be valuable, there is little hope for an outcome. So, the argumentation generally goes into ways of obliterating antagonism, and that is technically not an issue, only narrow perspectives may sustain a conflict, the good and bad - is it quite bad that dinosaurs went extinct? It depends who we are asking, and it even more so depends on whether we are asking. Sense-making process is a neurological phenomenon, a beautiful game of crooked mapping. There is no outcome and it seems to be within our domain of agency to play it or not, but it may not be, which dilemma may not be solved, only played with.

Non-computing is not supposed to take us anywhere or produce an outcome, nomen est omen. It is not supposed to truncate things or phenomena, then define goals based on the truncation processes and then further truncate to verify whether a goal is achieved. What non-computing is really important for, is the research of and toying with fluent systems that evolve as they are, systems that tend to move away from a fixed representation. The fixed representation is a self-defeating idea, even a gentle historical zooming out will reveal how impermanent ideas are, as well as the reality that they reflect. Everything that it makes itself obsolete highlights its completeness. Similarly with politics; once the politics really advance, they should become totally obsolete because there is no political decisions to be made. It becomes an adaptive system which serves all people proportionally and automatically. There is nothing more intelligent than self-adaptation of densely interconnected systems, that inevitably produce accelerated reflective bubbles, as it seems. There is no real agency, cleverness, nothing mystical, no emerging phenomena, no jump to the next organisational level. It is just an internally adaptive configuration which shows that what is needed are cells (bubbles), dense interconnection and a feedback-style recursion.

Competing with each other without cheating seems a downhill struggle. Would making a neuron more 'clever' improve the network or are the properties of networks more crucial? Both the growing interconnection between people and their individual mental decline pushes the collective intelligence and adaptability. The global reaction to a pandemic in the 21st century is tremendous display of adaptiveness of unprecedented scale and pace. The collective intelligence is crucially advanced through decreasing individual intelligence and there is no awareness that has to guide this as a matter of implementing a design. It is just what it is – evolution. The way we as humans poetically and emotionally get attached to the idea that there is a crucial agency in 'me' is cute. If the greatest heroes and the greatest villains were coincidentally absent or obstructed none of the historical processes, they contributed to would take notice. And that is an assumption that suggests that multiple outcomes are possible. This was already tackled, so let it all gently self-defeat.

Musical signals

The origin of music seems rooted in the mammalian signalling and vocalisation. A good distinction between organisms communicating and emitting signals might be that the former allows for false signalling. Music is then a domain that doesn't allow for lying, pretension is thus a transparent signal, like all others. Could we claim that the signalling excludes discrete dimensions? Certainly, the quantisation is in the eye of the beholder, and since a few centuries of the composer as well. It is an excellent parallel showing how approaching pitch undulations as connected elements (notes) establishes a paradigm making us seek beautiful undulations by picking discrete pitches at discrete times. Indeed, systemic exploration goes further than the intuitive journeys do. The challenge of unconventional musical signal processing is thus to use the expansion caused by systemic distinction and extrapolation and ultimately avoid these tools to free the articulation and the interpretation from the discontinuous.

The arts are thus signals and not communication devices. The signals are thus tools and not the media of art. Let us examine the paths towards non-truncated adaptive tools, like a voice seems to be. The goal is to come up with ways of producing tools for art that have the property of adaptive growing rather than fixed truncating phenomena. Historically, leaps in art came about when artists pushed their tools, but art may be regressing, it might be time for tools to pull artists.

Here the idea of blurring distinctions returns because making distinctions is confining the options. The combinatorial thinking built on discrete elements does not have to be in conflict with the intuition. It is part of the intuition that grows the intuition. Intuitive exploration is more limited than systemic exploration, and building a system for exploration is part of that intuition. Again, it is the 'subset-superset' relationship.

Can we create a system that evolves a symphony or a logical clause? It happened already; it is an evolutionary outcome we currently witness. The method of producing technology that mimics what is grown already is part of the same exact growing process. Indeed, what is impossible is to make tools that do not evolve. So, can we make systems that adapt and grow by themselves without the truncation-based intervention? In developing these technologies,

the current method is to jump out of the interaction – analyse it, compute, decide what the desired outcome should be and produce a variant of it – and then throw it back in. Therefore, the process is reduced to jumping 'in' and 'out'.

Truncation and proximity

In music it is very clear that the truncation as the basic intuitive principle we have is not very useful in many ways. Melody is the kind of utterance that you can exaggerate with but cannot lie about. It is now thought that it consists of distinct pitches which come to exist at certain points in time. This truncation has actually redefined what melody is. Once it is truncated it becomes an instruction following exercise and utters the needed conformity for that activity. The structural coherence does not rely on each element, just like in biology. The temporal and spectral proximity of the elements is not the best way of describing music. The way we perceive rhythm has everything to do with establishing a framework or expectation, and it is a cyclic expectation and the linear arrangement does not reveal it. Similarly, the tones C and G are very near in terms of consonance but distant in pitch, while C and C-sharp are very near in terms of frequency, but musically they are rather dissonant and, in that sense, they are not near. The proximity assessment might need to be done manually and uniquely for different musical settings. The circle of fifths lends itself to something similar, as the proximity of pitches on the circle tells us more about the consonant relationship between them compared to the chromatic distance. Similarly, the location within a bar is more pertinent to rhythm than temporal distance. Traversing spaces at given pace my indeed display more than the concealed instruction following.

Unpronounceable functionality

An important concept that relates to the idea of adaptive growth is the one of unpronounceable functionality. We will most likely find that the amazing artists cannot explain why or how do they produce interpretations. All explanation of behaviour is it's justification. The majority of artists would not bother to try to explain at all. It just happens. An environment is sufficiently adaptive internally to develop and there is a sense of wholesomeness. Part of the non-computing idea is the needlessness for getting anywhere, and least so to the imagined states we call goals.

If at any point in life a human actually broadness the perspective and looks at what is going on around, it is a total miracle at all possible moments - the complexity of things, the amount of reflection the human can have while facing the environment. There is no reason to strive for things, but there are plenty of good justifications to do so, and the best is likely the mammalian ranking drive.

The purposefulness or the idea of achievement is the subset of 'play', it is a game we may choose to play. When children realize that everyone seems to be playing the game of achieving things, they join in, but then they can't stop it. Suddenly there has to be a purpose to things we do, otherwise all the emptiness felt attaches to the potential of aimlessness. But that fear of void has everything to do with the lack of engagement, it is a memory, and memories disappear as soon as there is something crucial happening right now.

In development the awareness of an adaptive processes, which seems to be the development of humans, what seems to happen is that it gets inspired by science. The best example is experimental-laboratory testing on mice. The ability, the neurological phenomenon of mapping the very complex environment is evident. Many simple organisms can find locations back again, they can attach certain sensation (e.g., they can find the food on its own) and it works very likely without any awareness or agency. It is a kind of automatic response to the environment, but it actually maps the environment. Then they mess it up and use a different map on a totally different environmental situation.

That seems to be the core of 'play' – taking a map and 'mashing' it up, reading it wrongly or in the wrong context. Suddenly, the mapping of the environment, traversing through the map, the reinforcing of the map when still and thinking about it is done, so it could be messed up more intensely. We have a sense of agency in this messing up activity. It is the trick of which science is a subset.

Abuser-friendly

We are stormed with things which are supposedly user friendly. In terms of digital tools that artist use and certain artist produce, but also certain people produce for artists, this is very limiting. But it does not matter how much an artist is limited, a good performer will play with everything. Are we to ease these limitations no matter the fact that they are very useful? Good tools for art-making are abuser-friendly.

Digital things are designed and the design presupposes the kind of usage that it promotes. There is no real way of pushing the limit. Analogue electronics are more abuse-friendly than digital. The way we can push these digital tools is just not very artistic. It is more akin to adjustment, it presupposes a given domain, and within that domain you are supposed to be very careful, craftful, do everything that has already be done but in your own way. Even though abuse cannot be designed for it can be facilitated. If there is a range of control, we can build in non-linear behaviour into the extremities of that range.

If an aesthetic position troubles someone, it means that they are really attracted to it. If one does not resonate with an aesthetic position, if it leaves one being indifferent. Besides that, the way a chaos could be described in simplest possible terms requires three things. The logistic map is presented as follows: (1) a growth factor; (2) an inverting non-linearity; and (3) feedback or recursion around those two. There is a potential for a stable orbit, an oscillating orbit, and for chaos. This principle is crucially possible to implement into what is limited domain of intervention. If this can be built into the behaviour of digital systems, then we are getting to this idea of allowing the system to explode. The challenge is for digital systems to explode meaningfully, not just cease operation.

Tools for non-achievement

Contextualized in terms of computing and tools for artist, intervention is crucial as much as the ability to intervene in an unpredictable way. Such a tool should not invite execution of plans, instead it should invite intervention. Execution of conventional strategies should be labelled as 'craft' and delineated from art, which to by definition has to challenge the

conventions. For example, if you create a tool for an artist, you are giving the artist the convention so he cannot be an artist unless the tool can break well, go beyond itself, beyond what it was designed to do. Designing such tools seems to defeat the design purpose. But the design principles are a subset of evolution, so a design is static in a short time window, it will evolve. In fact, we operate in a very narrow and limited framework, that is why we seem to be fixing things. That spasm about fixing things is really interesting to tackle artistically. Releasing the spasms is what the evolution pulls us to. In this case, it is more convenient to use the metaphor of pulling from the future rather than pushing from the past. While actually, both pushing and pulling are concepts, they are product of embodied thinking. Either model will never cover the full reality. Both of the models will reflect the reality to a given extent and therefore there is no reason to be a slave to these concepts, or keep looking for better ones. Staying away from the bondage of concepts will likely obscure antagonisms.

Transformations

In audio signal processing most of digital techniques are built on the analogue processing paradigm. There is a few things that are strictly possible in the digital domain, but the paradigm, the way of thinking about these signals has everything to do with analogue representations, the orthogonality of magnitude and time. Everything needed for processing audio is silicon, copper, capacitors, coil, and semiconductors. Similarly, hardware for digital computation is built up from logical gates. The crucial transformations in the digital domain are addition, multiplication, and delay. It seems that these three transformations are sufficient to build up all of the signal processing wisdom in this domain. Part of the motivation for un-computing is not to do the same thing that we can do digitally but make cheap tools that break well. We aim produce similar systems which are manipulable in novel ways and prone to defeating artistic conventions, and that aim is better understood as a direction than a goal. In fact, the paradigm of goal-centredness is best exposed when we observe that it is very difficult to express direction without specifying a goal. Paradigms are sticky like that, we can't discuss the given domain without invoking the paradigm, because the paradigm is not just a useful description (like colour blue for example), paradigm is a way of thinking. Evidently, most of the unusual things that we come up with in terms of transforming signal will

Rhythm and pitch

There is some reasoning behind claiming that the temporal and spectral proximity is not a useful way of organizing rhythm and pitch. In terms of transforming these domains, you could use either of these representations. In terms of transforming discrete events, it is quite tricky. Typically, the unconventional procedures and processes should be continuous, so we should question whether truncating and thresholding that continuum in order to regain the truncated representation provides a desired direct relationship. The tools which give the artist a direct relationship with the medium will provide this manipulation of boundaries, the artistic escape from convention. Within the digital domain, i.e., digitization process, one could actually produce an evolving self-adaptive system, but it wouldn't break well. There is a lot of ways to depart from the paradigm of control. The paradigm of agency of the artist is knowing what the art is, instead of being able to produce art. The knowledge can embrace craft, but cannot embrace art.

Simple audio processes

Let us consider the basic tools of audio signal processing. There have been experiments with audio transmission through biological tissue, through aloe vera leaves. We found non-linearity, a transfer characteristic (band pass characteristic), and the idea of simplifying the phase space which seems to be what coils and transformers do in analogue gear. Everything we do to an analogue signal decreases the fidelity technically, but perceptually it may actually increase it. That is the thing where the psycho-acoustic and the technical understanding of the signals seems to contradict.

Gain stage

First and foremost is the gain stage which may seem trivial, but historically it is clear that huge amount of effort was needed to invent signal amplifying valves and transistors to start with. What we are thus looking forward to is an unconventional variable gain stage which becomes a crucial building block for audio signal processing. Based on initial experiments it is likely that a biological tissue may be manipulated to amplify audio-rate signals and consequently the chemical basis of this transformation may be isolated to create a more reliable system, need be. In the digital domain a gain stage is simply multiplication, while addition is mixing, which is simply a junction in the analogue domain. In the unconventional domain, biological tissues and chemical reactions, these basic processes are a challenge, and even though the fidelity is unlikely to match available solutions, it is not fidelity we are after, instead we seek direct intervention and tools that break well.

Spectral attenuation

Spectral attenuation is another straightforward effect, a longer term for filtering really. Any transmission will produce some filtering and we may seek transmission substrates that are more radical and physically manipulable. We cannot escape the paradigm of the signal, magnitude over time, if we are to process an audio signal. There may be potential to capture and transform audio in different ways which may be interesting for future research. For now, we may remain bound and blessed by the elactro-acoustic transducer technologies.

Distortion

The distortion, as it is called in audio signal domain, is essentially a non-linearity which is ubiquitous and likely inescapable in unconventional substrates and configurations. The crucial property of such non-linearities is the appearance of new spectral components that are in some way related to the original signal. Simple cases produce harmonics and inter-modulation components while more complex systems may produce subharmonics and other spectral components that are more difficult to relate back to the original signal. Indeed, intermittent disturbances may interfere with the signals in unpredictable ways.

Delay

Basic delay will be an inescapable property of transmission. However, the typical delay times are hardly sufficient for musical processes. Filtering is typically achieved by the interference between the delayed and original signals, needed delays are then of the magnitudes comparable to signal period durations, typically less than a tenth of a millisecond. However, audio transformations that deal with the spatial impressions typically need much longer delays. It seems so far that the delay-type transformations are very tricky because the transmission mazes sufficiently long will induce detrimentally signal loss. Indeed, in the analogue domain, delay is already tricky and is typically done using electromagnetic transduction to and from tape or a semi-digital bucket-brigade-like capacitance maze. It may prove to be the toughest challenge to invent an unconventional audio-signal delay without resorting to transduction and discretisation. Although there are some extreme substrates that might provide a truly analogue delay (really low temperatures and extreme pressure conditions), it is our aim to invent cheap tools that artist attempt to break.

Complex audio processes

Following are the things that we typically build from basic building blocks – non-linearities, filtering, and delay. The list of complex audio processes is long and we shall consider only a subset here. Most interesting are processes that may have unconventional counterparts which are not designed using similar building blocks, but instead exhibit comparable behaviour inherently. In fact, that is the type of transformations we seek to find in tissue and chemistry.

Adaptive non-linearities

Let us consider the likely most widely used audio effect, the compressor. The purpose of a compressor is to reduce the dynamic range of a signal while maintaining the detail that is actually dependent on the dynamic range to start with. Historically, matched compressors and expanders were successfully used to improve the quality of magnetic tape-based audio reproduction. Consequently, studio engineers realised that a compressed dynamic range has potentially desirable characteristics in processing audio. In that context the matching expander becomes unnecessary and the domain of similar techniques explodes.

A simple way of approaching this is to consider the original signal of relatively high frequency, then another signal of a much lower frequency should be derived, which describes the dynamics of the original signal, so-called envelope following. The envelope follower will then be inverted and used to control the variable gain stage. So, we are splitting the original signal to derive the envelope which is unipolar, and then a low-pass filter will produce a slow correlate to this fast signal. Also, there are more interesting envelope followers, such as an instantaneous or working with 90° phase shift with quadrature processing, etc. Other than building a compressor from such components we find that certain substrates perform reduction of the dynamic range inherently, and that is where the primary interest resides. Nevertheless, the aim is facilitation of intervention which can be assessed once such systems are available for artistic exploration.

What is thus proposed here is that we find unconventional substrates and configurations which have this behaviour. Instead of defining goals and measuring the achievement of those

goals, we are just continuously playing because that play is the goal in itself and it fulfils itself in every possible moment. Also, the unconventional audio signal processing is not about mimicking, it is about trying to describe what we have and what is perceptually significant in a way that we can find similar behaviour or processes elsewhere. If those processes are laid out bare without pushing them to conform to the expectation, then this may become a fruitful artistic domain. As we seek rudimentary transformations, the aim is the most manipulable one and it allows the limits to be challenged and allows for unpredictable manipulation unconventional artistry.

Frequency and pitch shifting

It is not beyond inconceivable that unconventional configurations can produce frequency or pitch shifting. In the audio signal processing domain, we distinguish frequency shifting from pitch shifting as follows. The main difference is that the frequency shifting does not maintain harmonic relationship of the spectral components. It could be described as adding a given frequency to every existing spectral component. The harmonic relationship would be preserved only if the frequency of every spectral component is multiplied with a certain value, which is how we can describe pitch-shifting. Both of these techniques are not trivial in conventional audio signal processing, nevertheless they can be built from the basic building blocks described.

In terms of frequency manipulation, it might be worth extending the discussion to briefly cover the radio transmission techniques of amplitude modulation (AM) and frequency modulation (FM). Curiously, the decoding for an AM is envelope following, and for an FM it is frequency following. All these techniques might have an unconventional solution, likely lower fidelity transfer and hopefully more artistic intervention potential. The concept of regularity of a signal is something that we could latched onto, unconventional systems may have specific response to regularity. Separating regularity from irregularity, or noise detection is not a frequent audio processing tool, nevertheless it can be used very creatively.

In this context FM appears in two distinct ways; in audio synthesis we use it to describe the way signals are generated, while in processing signals, we are better off calling it phase modulation as we modulate the phase of the reproduction mechanism, or indeed the delay time to achieve a similar frequency modulation effect. As it seems difficult to produce an unconventional analogue audio signal delay, we might be asking too much with added modulation by a different signal, i.e., control the transmission property of the substrate at a sufficient rate. However, the range of delay times that we would need to produce phase modulation type effects is small. It is thus probably less challenging than to make a fixed one second delay for audible frequencies.

Quadrature processing

A 90° phase shift is a key transformation that opens a large can of quadrature processing worms. When discussing delay, we assume an absolute shift in time of the whole signal. When a phase shift is discussed, it is about a time shift which is relative to the frequency. It actually seems slightly more feasible than the absolute delay because the order of magnitudes that

covers audible signals might, by physical necessity have a different behaviour in unconventional substrates.

Gates and Triggers

Analogue audio signal processing relies heavily on discretisation of continuous signals. By definition upward polarity change of a signal is a trigger and many processors detect and use these cues as a trigger for starting a certain function. Gates are further detailed by having an off-trigger when a signal falls back to zero or negative values. This type of process is slightly more difficult to imagine as being an inherent property of substrates, nevertheless, chemical reactions do seem to have similar thresholding embedded. Integrating triggers, or counting them would be another useful building block that we hope to discover as an inherent property of unconventional biological and chemical systems.

Transient processing

Transient processing is a high-level audio signal processing technique which we might find in unconventional substrates and systems. It transforms transients such that audible onsets are meaningfully modulated. The basic transient processor has two dials – one for the attack time and one for the delay time. An acoustic event, a percussive one, would have a build-up of energy and a subsequent decay. Such an envelope could be described by approximating an attack time and release or decay time. Typically, what the transient processing algorithm does, is that it allows us to shorten the attack time or indeed extend it. The same process can be applied to the decay time. Each form of intervention here is contained in a particular substrate. The build-up of energy could be halted before a certain threshold. One could imagine slowly building energy up facing a threshold value, a limit, and once it crossed the limit it bursts out. That would actually produce a shorter attack time. Similarly, one could imagine substrates and unconventional configurations which would allow only for slower build-up of energy. It means that it would not start to decay as soon as the incoming signal would. It would progressively delay or integrate the incoming signal.

Conclusions

In this chapter challenges have been formulated in order to extend the domain of computing and goal-oriented processing. Many intentions match the progressive artistic stance and the abuse of tools surfaces as a valuable attitude. There is no philosophical conclusion posed as the conclusiveness of activities is being questioned altogether. Nevertheless, a practical line of developments is proposed by highlighting the audio signal processing techniques that might have an unconventional parallel. However, before we consider usable unconventional audio signal processing in terms of combining the elements, there should be increased attention for discovering properties of the potential core elements. In these unconventional domains there might be processes which would be what we normally consider configuration of basic building blocks. However, at this stage we need to investigate the very basics with increased alertness to identify transformations which could be considered higher level processing, which might be properties of simple systems.