



Research > COMPOSING WITH PROCESS: PERSPECTIVES ON GENERATIVE AND SYSTEMS MUSIC

Generative music is a term used to describe music which has been composed using a set of rules or system. This series of nine episodes explores generative approaches (including algorithmic, system-based, formalised and procedural) to composition and performance primarily in the context of experimental technologies and music practices of the latter part of the twentieth century and examines the use of determinacy and indeterminacy in music and how these relate to issues around control, automation and artistic intention.

Each episode in the series is accompanied by an additional programme featuring exclusive or unpublished sound pieces by leading sound artists and composers working in the field.

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COMPOSING WITH PROCESS: PERSPECTIVES ON GENERATIVE AND SYSTEMS MUSIC #7.1

Approaches to change

Episode seventh in the series looks at how several notable composers working with generative systems conceive of, control and implement change in their works. Change plays a central role in music. Music develops into different phases, has a temporal structure of one sort or another, even a sustained waveform changes in some respect throughout its duration. Based upon interviews and drawing from previously unpublished materials the show examines notions of repetition, anticipation and predictability, the interplay of change at distinct altitudes within the work, and the role of automation and human agency to invoke change.

01. Transcript

Welcome the seventh episode of COMPOSING WITH PROCESS. Computational processes allow the composer – and also the performer and listener – to engage with levels of change in music, and their interplay, in a new way. In this episode we aim to explore how artists working with generative systems conceive of, control and implement change in their works. And how our understanding of the relationship between music and ‘change’ – or ‘music as change’ – is itself addressed by composers using generative techniques.

Change plays a central role in music. It is impossible to imagine any music that does not change over time. Music develops into different phases... has a temporal structure of one sort or another... even a sustained waveform changes in some respect throughout its duration. But, when we talk of change in music, what is it that we are actually drawing attention to? What is change in music? What could music be without change? Is there such a thing?

As listeners we identify and quantify change in a complex manner. Here are four pieces of music. How could we describe or identify the change in each?

First, an excerpt from the live version ‘Mizu No Nai Umi’ by Jim O'Rourke. This at first seems rather static, but as we listen we become aware of longer evolving changes. If we skip though the piece we notice a slow perpetual change in tone.

Next, the second example, an excerpt from the piece ‘tick tick’ by Raymond Scott from the CD *Soothing Sounds for Baby. Volume 1*. This features a repetitively sequenced “tick tick”. At first we are only aware of this pattern, then as we listen another pattern appears – the slower modulation of what appears to be a low pass filter. Our attention then switches to follow this level of activity.

The third piece is the track ‘Apocalypse Now & Then’ by Anthony Pateras and Robin Fox from the CD *Flux Compendium*. This could be described as rather chaotic. Where is the change, activity, repetition and order in this work? Although there is a sustained level of activity and dynamic range throughout the piece, it is nonetheless divided into discernable sections.

Finally, consider this piece, titled ‘Noise – Multicultural nO!se @ -17.5 dB RMS (Black, Brown, Pink And White nO!se + Mix)’ by Russell Haswell from his *Acid Noise Synthesis* CD. One minute of black noise, one minute of brown, then pink, then white noise, then a mix of these. Here we might first identify four points of change, the switch from each colour of noise and to the mix. But what about the noise itself, isn't this the audible result of lots of random voltage changes?

The very material of music, sound, is itself the result of rapid fluctuations in air pressure. Therefore sound itself is the result of change. The sine wave for example sounds rather constant, yet if we were to look at this sound on an



[Raymond Scott]

oscilloscope we would see a waveshape, any point on this waveshape is different from the preceding and following point. Each point is a point of change. These form a repeating pattern that we encounter as a constant pitch.

If sound itself is the result of change, perhaps music too – in some fundamental way – is also a manifestation of an underlying or constant change. Every moment of music is a moment of change. But to interpret change in music in this way tells us very little; it gives no detail as to how we construct, perceive or understand change across multiple levels within a given piece.

We could divide a musical structure into parallel strata each with a distinct behavior and degree of change. Consider the piece 'Twin Bleebs' by Mika Vainio, which featured on the very first episode in this series. When we listen to the piece we hear two pulses weaving in and out of phase with one another to produce a series of timing relationships that are under constant change. But we could also quite easily say that the music in some way is the same throughout. The structure at one level does not change, while at another it does.

The American composer and music theorist James Tenney makes a related point. In an interview, referring to his piece 'Koan', he says:

'... the form of the piece is so simple and linear that it will become utterly predictable to a listener after a very short time. My feeling is that, as soon as that happens, the listener then becomes free to concentrate on more detailed aspects of the sound, because he knows that he is not going to be surprised by any formal or "dramatic" turns here or there... All there is to listen to [are] the microacoustical details.'¹

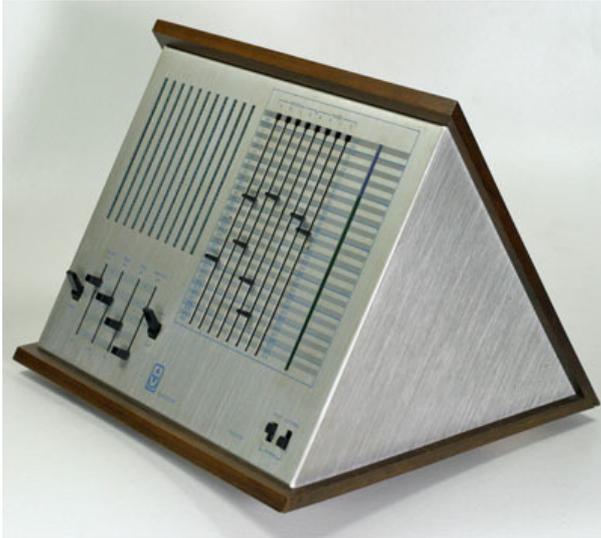
Perhaps we might consider the change here to be at a rudimentary level. But the change is one of changed perception. Tenney was influenced by phenomenology, a philosophical movement which he applied to music to repeatedly ask 'What is your experience of listening to this piece of music?'² Tenney's aim is that the linear structure present in 'Koan', will prompt the listener to confront the sound itself outside any emotional or dramatic intention to become aware not only of the material quality of sound, but also of the act of hearing itself.

Another artist who explores this phenomenon is Theo Burt. He suggests: 'What seemed like change when it was occurring very slowly may not seem like change when the same structure occurs over a shorter period of time. For example: slow random modulations may sound like a relatively static noise when sped up.' In Burt's 2012 series, which he refers to as 'Tiling sessions', emphasis is given to this perceptual shift. Here a computer system works in real time to tessellate sets of isometric tiles which are displayed on screen, each tile also produces a sound when laid.

The unusual thing about this system is that the shorter scale temporal structures are all dictated by a spatial logic – the system chooses the tile it feels will fit the 'best' and lays it. The definition of what is 'best' is set by a series of parameters, and by changing these parameters, the structures produced by the system vary wildly. The methods by which the program attempts to tessellate tiles are fairly simple, but very quickly produce really complex, unpredictable behaviours. Behaviours that, according to Burt, could not have been created manually.

In these sessions processes are defined that contain very long patterns. Within these patterns there are many shorter patterns. At first one is principally aware of the short patterns, but as the speed of the system is increased, the smaller patterns blur and longer structures become apparent. This has the strange effect of retrospectively changing one's knowledge of the structure of the piece.

Burt suggests: 'It is common to think of consciousness as somehow existing at a single point in time. But while we might be able to identify a moment of existence that we seem to be experiencing "now", we could also be said to still have an experiential grasp of the past. Experiencing sections of a composition, rather than individual moments. I think we have a tendency to try and find the longest patterns within material that we can. This is why constant change ends up feeling as static as no change.'



[Triadex Muse]

For Burt a key feature of change organization is the listener's sense of expectation and anticipation. Much of his work involves materials generated by processes, from which it is possible, at least partially, to understand the process from the materials alone. He suggests that when we understand, at least to a certain extent, what is happening in a process, we begin to anticipate what might happen at a future point.

In support of this claim Burt points out how, in some forms of house music there is a convention to add change at the end of specific intervals. As listeners our sense of anticipation is stronger as those intervals are reached. He compares this to the experience of listening to chaotic noise music. This led Burt to question how such specific intervals might be destabilized.

In his piece for the Automatics Group entitled "Castles in the Sky" divided into 775 pieces of equal duration and reassembled in order of detected pitch, ascending'. Burt takes a familiar framework and formally reorders its intended arrangement of anticipation and excitement. Here the work is divided into 775 pieces and a pitch detection algorithm is applied to each. Once the primary pitch of each piece is determined they are reordered from lowest to highest pitch. The result is that previously disconnected, yet sonically similar, parts are joined together; groups of gaps, stabs, fills and kicks override the verse and chorus structures. This procedure radically disrupts the seamless yet highly constructed flow of the piece, confronting our expectations of change and progression.

In 2012 Florian Hecker produced a series of short pieces for CD with the Triadex Muse. This is a very rare and rather unusual machine developed by Edward Fredkin and Marvin Minsky patented in 1971, described by the inventors as a 'relatively simple apparatus which nonetheless automatically generates relatively pleasing music'. The Muse was a response to an increased interest in methods for generating music synthetically whereby the details of note sequences were provided by the machine. The Muse aimed to provide a simple and robust alternative to the large scale computer systems needed to run such programmes.

The patent states that considerable effort has been expended in analyzing various types of music and in attempting to determine the requisites for pleasing music. These requisites have then been incorporated into the music composing program in keeping with various statistical methods and approaches. The present invention utilizes an understanding or appreciation that a very high degree of randomness is not necessary but rather it is preferable to generate logical sequences of notes or musical sounds having a very long period of repetition.

The sound synthesis capabilities of the Muse are quite limited, and Hecker's exploration of the machine focuses on its note generating procedures which follow a complex logic as opposed to random method. This produces a certain amount and kind of change which, as mentioned in the patent, have long periods of repetition. The change here is at the level of clusters of notes which repeat with little or no perceived change.

Track 18, which we will hear in a moment, is six and a half minutes long, and contains shorter divisions. For example at 18 to 34 seconds a rather more dramatic change occurs; at 1 minute 27 seconds a pitch change; again at 4 minutes 5 seconds there is a noticeable change. Here such changes are brought about manually by the operator, in this case Hecker, as, in his own words 'a matter of intuition or curiosity' – the consequences of his real time manipulation and exploration of the device's note generating capabilities. Here we observe automation simultaneously producing change at one level and repetition at another; manual control takes over at this other level to provide, non-automated, lengthier levels of change and progression.

The 'Generator' pieces by Keith Fullerton Whitman concern themselves with this issue. Here complex analogue patches are constructed that not only create repeating and evolving patterns, but also incur, in some cases with no human intervention, longer levels of change. When asked about real time control to incur change at this level Whitman says it exists somewhere between 'total and none' depending on the specific patch and the conditions surrounding its presentation. Here are excerpts of new pieces by Whitman that demonstrate this continuum between total and none.



[Peter Zinovieff]

Peter Zinovieff, a pioneer of computer music based in the UK, presented a groundbreaking work 'Partita for Unattended Computer' at Queen Elizabeth Hall, London in 1968. Here, a 19" rack including computer, sound generators, paper tape input and so on were presented onstage. An operator initiated the process and the computer then ran without any human intervention. For Zinovieff it was quite a task to simply prove that this was possible, which he did. The work used random number generators that were applied to voltages and tempo to produce stochastic music.

In another work the organization of events and their density is more formalized. For the score of 'December Hollow' Zinovieff constructed a diagram on two sides of a sheet of paper, each side had a triangular shape. One side of the paper was shaded with areas to represent different emotional states: surprise, tension, expectation, catharsis, neutrality, anxiety, dependence and boredom. For Zinovieff the ratio of these and their order is what 'makes' the composition. The ratio is determined by making folds and lines across the shaded areas. Thus intersecting areas of surprise, tension, expectation, catharsis, neutrality, anxiety, dependence and boredom. The other side of the diagram contained the following letters: A which stood for A, B for beautiful, C for composition, D for do, I for is, M for make or me, P for please, S for suppose or so, T for think or this. The abbreviation PMMABC for example stood for 'Please make me a beautiful composition' resigning choices about the exact details of what this means in musical terms to the computer.

Although Zinovieff's work is technically groundbreaking, we should not overlook the ideological and aesthetic radicalism of the work. Even today artists are criticized for merely 'pressing the space bar'. Yet, almost half a century earlier, Zinovieff had preempted this prejudice. His response was uncompromising and confronted the musical establishment and its core beliefs head on.

Unaware, at that time, of Zinovieff's unattended piece, this move was restated thirty years later by Peter Rehberg, who, at a performance in Sheffield in 1998 walked onstage, pressed a button and walked off stage. 'Actually', as Rehberg is eager to point out, 'it was two buttons, whatever it was to execute a SuperCollider patch in those days'.

Rehberg's performance was, to some extent, a critical response to intolerance he encountered on the free jazz festival circuit. Of this he says: 'I would constantly get harassed by jazz and other "serious music" types that what I was doing was not music. Being a total non-musician my flippant reply to them was always: "that's totally correct" which only made them more mad. I guess going on stage and setting something in motion was a way of proving that point.'

The SuperCollider patch was made by Farmers Manual; this loaded samples and randomly cut up and manipulated audio. The results, according to Rehberg were unpredictable. There were parameters that one could either change in real time, or just initialize and let the system run without human intervention. Rehberg performed the piece only two times, once in Lyon and once in Sheffield.

¹ From a phone conversation with Walter Zimmermann.

² James Tenney on 'Intention, Harmony and Phenomenology – A Different View of the Larger Picture'. Ciarán Maher, *MusicWorks Issue 77*, 2000, pp. 25.

02. Acknowledgements

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