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Stream-Form and the loss of traditional virtuosity: thoughts and a method

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Introduction

This article is concerned with the performance practice of FUSIL+, a trio comprising Iñigo Ibaibarriaga (saxophone), Julio D'Escriván (laptop, controllers and visuals) and Monty Adkins (laptop and controllers). The trio is a development of Ibaibarriaga's and D'Escriván's duo FUSIL. The expansion of the group has highlighted issues of performance practice, notions of virtuosity and how musical form is considered. As a result of our collaboration we will contextualise our work alongside current research with new interfaces and improvisation with digital instruments. As our primary concern is with the music output rather than the advancement of technical means already well covered by such conferences as NIME[1], we will propose the notion of 'stream-form' as a means of organising and shaping musical materials.

On Virtuosity

A survey of many of the papers presented at previous NIME conferences demonstrates a primary concern for the creation of bespoke interfaces. Many of these are modeled on, or adapt, the affordances and constraints inherent in traditional instrument design and place an emphasis on physicality, tactility and gesture mapping. One of the issues the authors have with such new instruments, whilst admiring their inventiveness, is the fact that little or no performance practice develops around them. As audience members encounter a continual stream of new instruments that require their mappings and constraints to be decoded, the traditional signifiers of musical virtuosity and expressiveness are no longer always evident or relevant.

Although our notions of virtuosity are a cultural hangover from nineteenth century performance practice they are still relevant to many concertgoers in their assessment of an emotive and 'good' performance, despite the advent of post-punk DIY and lo-fi culture. Recent popular and academic studies of virtuosity indicate the lengthy periods of time needed to attain the level of the 'professional'. In his book *Outliers*, Malcolm Gladwell posits the notion that it takes 10,000 hours of practice to achieve a level of significant proficiency in any given activity. This research originally based on the work of K. Anders

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[1] New Interfaces for Musical Expression, www.nime.org

Ericsson, and further work by Zach Hambrick highlights that fact that we are able to appreciate this practiced fluency and skill as audience members. It also suggests that the audience is able to receive the signifiers of 'virtuosity' and that continual development of new (digital) instruments militates against such reception.

When assessing traditional notions of virtuosity in performance we combine both aural and visual cues. Greg Glassman, writes (on gymnasts) that to achieve a perfect score one must demonstrate risk, originality and virtuosity. Glassman writes that, 'virtuosity is defined in gymnastics as "performing the common uncommonly well". Unlike risk and originality, virtuosity is elusive, supremely elusive. It is, however, readily recognized by the audience...'[2] Francisco Monteiro, recognising the importance of visual cues in our reception of musical performance writes,

> Virtuoso performances are, at first, a kind of circus performance... As in a circus, performers are supposed to increase and overlap their body restrictions, or even to forget their own body and physical pain, in order to produce a series of movements with a musical instrument, resulting hopefully in structured sounds: in music. Virtuoso performers play the instrument very fast or very slow, very strong, or for a very long time; but most important is that it has to be somehow understood by the audience as an amazing musical performance. The audience has to be astonished by the performance, or their expectations of astonishment have to be fulfilled...It seems that the body of the performer is somehow important for some virtuoso musical performances. Virtuosity needs the mastering of the body, enabling the performance of musical works that seem to be incredibly difficult (or incredible performances of one apparently not so difficult work). This bodily virtuosity can manifest in two ways. In the first instance, the performance seems to go beyond physical frontiers. The body is an obstacle, an impediment that the virtuoso has to overcome. It seems then that the performer is liberated from those bodily restraints; the music flows and seems to be easy; there is no unpleasant or fearful body there, no restrictions for the pleasure of musical virtuosity.[3]

As well as the importance of the physical and the bodily, what is also significant is the continued emphasis on and appreciation of the aura of the work and its performance as defined by Walter Benjamin[4]. Such an emphasis on the ritual aspect of the concert is still recognised by musicians engaged with digital technologies. In interview with Andrew Deutsch, Lawrence Casserley indicates that he,

> ...wanted to perform from the beginning. But also I am interested in theatre, and particularly stylised or ritualised theatre. I was brought up in an Anglo-Catholic religious tradition ("High Church" Episcopalean) and the ritualised drama of the Mass, the use of symbol, etc made a strong impression on me. Of course it is possible to articulate these ideas in tape pieces, but for

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[2] Glassman, 2005
[3] Monteiro, 2007 pp.315-320
[4] Benjamin,1936

me the dramatic presence of the performer was crucial - and the instrument transformed by electronics offered a potent kind of drama.[5]

The emotive experience of the audience is directed by the physicality and expression of the performer and is not just achieved or communicated sonically. The conditions of 'virtuosity' are bound up in our notions of performance reception. Through recognising this, Casserley has deliberately adopted an instrumental approach to sound processing, developing his Signal Processing Instrument. John Palmer writes of Casserley, 'in the hands of the wizard, electronics become powerful means of expressivity and lyricism taking the listener through labyrinths of sound.'[6] The analogy to wizardry is not so far removed from that of Monteiro of virtuosity to circus performance. What is important to note is Casserley's terminology. The signal processing technologies he uses are identified by him as an 'instrument' - a collection of devices that implies a set of performance possibilities and constraints. Thor Magnusson writes,

> A musical instrument thus affords certain ways of playing, but at the same time it allows for a cultural reading of its expressive scope... Musicians often have problems breaking an instrument's cultural constraints. These problems are partly owing to extensive training in a particular musical culture where the instrument has become the vehicle of certain musical practices.[7]

This cultural reading of instruments enables the encoding of meaning and virtuosity for an audience. This encoding has evolved over centuries of practice, ergonomic development and the extension of sound production techniques. The issue surrounding new technologies and interfaces is that such readings are not yet mature in this new domain. Joseph Paradiso and Sile O'Modhain write that,

> In contrast, electronic instruments have been around for little more than a century, during which rapid, often exponential...advances in technology have continually opened new possibilities for sound synthesis and control, keeping the field in continual revolution and allowing few instruments to be mastered by a significant community of players.[8]

It is the decoupling of physical activity and sound production that has led to new paradigms in virtuosity being defined for the digital age. The development and understanding of these paradigms is of course complex and problematic for most audiences. It is only within the past sixty or so years that any performance *not* mediated by the bodily has been possible. In assessing performances with new technologies, whether we define the new musical controllers as 'instruments' or not is irrelevant. What is of fundamental importance is the development of and appreciation/reception of gross and

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[5] Lawrence Casserley interview by Andrew Deutsch (http://www.chiltern.demon.co.uk/ADInterview.pdf)

[6] Palmer, J., CD Labyrinths - liner notes, Sargasso SCD28030

[7] Magnusson, 2010(a), pp.62-73

[8] Paradiso, J.A., & O'Modhrain, S., 'Current trends in Electronic Music Interfaces
http://resenv.media.mit.edu/pubs/papers/2003-06-JNMR-Intro.pdf

fine motoric skills in order to convey gesture and nuance in digital performance. It is the mapping of fine muscular skills - the subtle timbral variations enabled on a saxophone through the muscular control of the embouchure that is often lacking in new controllers and digital instruments. It is this mapping of traditional human sensory-motor skills to the parameter space of the digital instrument that is often the equivalent to pouring new wine into old wineskins. The development of haptic controllers and vibrotactile feedback systems offer additional mulitmodal possibilities but still have the tendency to be assessed by an audience in the context of traditional instruments - what F.R. Moore has termed the 'oleo-margerine effect'[9] where physicality and mapping of gesture is key - the discrepancy between what is expected by the audience and what they get leads to the 'imitation' of instrumentality being highlighted and causing a disjunction on the part of the listener/viewer.

On Controllers

The New Interfaces for Musical Expression, NIME[10], conference is a dedicated forum for music technologists, musicians and computer scientists to consider new ways to control digital sound. The participants at NIME are continually trying to refine the level of control and thus expressivity in musical controllers. But is this expressivity being sought in a more traditional sense, analogous to classical instruments, rather than in ways that respond to the new forms of musical performance that have developed from DJ remix practice and loop-based performance? Just as the theremin's first virtuoso, Clara Rockmore, achieved fame for her performances of Saint-Saens and Rachmaninov rather than exploiting the truly revolutionary sound potential of the instrument, so many controllers and much research is dominated by traditional paradigms. Should we not be focusing on instrumental practice that goes after a different domain of expression, closer to live effecting and mixing, in the spirit of the last fifty years of musical development?

In this context it is worth considering what a digital musical instrument is and what makes it different from a traditional musical instrument made of wood, metal, gut or a combination of all these. We agree with Jan Schacher when he states in his paper 'Hybrid Musicianship' that digital musical instruments are constituted by more dimensions that just the physical, that they include a symbolic layer that gives us 'the dual perspectives of materiality and abstract structures'[11]. Thor Magnussen, in an earlier paper, also presented

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[9] Moore, 1996, pp.25-41
[10] ibid. 1
[11] Schacher, 2013

at a NIME conference[12], looks at how digital systems bring to the fore the conceptual and music-theoretical aspects of musical instruments.

We could say that these investigations are evidence of new paradigms of virtuosity. One musical invention after another proposes innovative ways to make sound more expressively controlled by a mix of fine and gross motor skills. As mentioned earlier, it is the control of these fine motor skills that we perceive as defining virtuosity, But what if a 'new virtuosity' combines in effect the negotiation with a general computing device interface at the same time as gross motor skills, augmenting and nuancing the latter as a result of high level decision making that does not require fine motor dexterity to enable it, thus maximising the 'cognitive and conceptual'[13] aspects of a digital musical instrument as well as the physical/gestural gross motor skills associated with user interface triggering, typing, clicking, and scrolling the track pad?

On what to control and new forms

One of the questions surrounding new interfaces and digital instruments then becomes what to control and how is/can this be effectively communicated? In the past two decades we have witnessed the explosion of performances using Wii controllers, game pads, infrared batons, sensor gloves with little discussion of the changing nature of the material or parameters to be controlled and how this results in new and exciting musical artifacts. The focus thus far has predominantly been on the advent of new technologies rather than music. Although we are encultured to map large physical gestures to imposing sounds and expect a pianist to lean into the keyboard in a quiet passage of a Mozart concerto, in digital music, often the tools used only require small parameter changes to produce significant timbral and gestural changes. Conversely, Bob Ostertag writes,

> If I had some really wild controller that doesn't exist now but that I could dream up - such as a big ball of a mudlike substance that I could stick my hands into, squeeze and stretch, jump up and down on, throw against the wall and wrap around my head, resulting in a variety of parameter streams that would be seamlessly digitized and fed into the computer - even if I had such a thing I don't know how I would use it. I have no software that could use all of that data and I don't think anyone else does either.[14]

Instrumental control, as discussed above relies then on gross and fine motor skills as well as cognitive abilities for abstraction. We would argue that the more gross motoric and abstract-thinking-led performance practices such as DJ performances and live remixing have given rise to new musical forms. These forms may be conceptually traced to

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[12] Magnussen, 2010(b)

[13] Magnussen, 2010(b)

[14] Ostertag, 2002, pp.11-14

earlier forms in the history of music but we would argue that they are, by and large, unique to the late Twentieth and Twenty-first Centuries. These forms we would call 'stream-form' and 'delay-form'. As we will see, there are elements of pitch-class based musical development forms in them in the sense that a *fugue* or the earlier *ricercare* deal with layered melodic material or the *canon* deals with repetition and layering.

Delay-form is what we call the result of building of musical material 'on top of' long delay captures in the style of, say, Robert Fripp's Frippertronics or Terry Riley, Pauline Oliveros and later Brian Eno's ambient music. The musical constraint of delay form is that it builds layers which fade out only when purposefully discarded and so the form can be described as a continuous build-up which can then be dismounted by layers depending on the technology used to create the layers (earlier looping systems based on tape delays depend for their complexity on the length and introduction of the phrases which then determines how many will be layered as a whole). In FUSIL+ we have used this form through looping capture of long phrases but by far it is more common for us to use musical streams and thus 'stream-form'.

Stream-form is the result of introducing musical layers that overlap or are concurrent to some extent. The earliest examples are the sequential mixes found in early Jamaican 'toasting', or talking over rhythmic tracks, where the musical tracks were strung end to end, possibly overlapping to achieve a sense of continuity. This practice was popularised by DJ Kool Herc in the early 1970s in New York. The skill of choosing and matching plus scratching (which is in essence a form of 'effecting') took primacy of place over actually playing the musical instruments featured in those recordings. As playback technology evolved so did the possibilities for effecting tracks and layering and looping whole songs or just elements of songs. In a sense bringing Schaeffer's 'Sillon fermé' to the masses and developing compositional styles based on layer and repetition. Although in the case of Schaeffer we find that his elements of concrete music were discretely separated from their original sources, in a sense functioning in a similar way to traditional pitch class elements and their relationships[15], in the development of Hip-Hop, Rap and breakbeat based music the essential difference has been the tendency to use the whole 'streams', songs in their entirety. The stream can then be modified as it plays through and layered with other elements (which may be other streams or separate musical phrases or loops). But beyond the semiotic dimensions of musical streams as style indicators and other musical synechdoches[16], the purely technical dimension consists in how to layer and balance the layers. As loops and samples have become longer, thanks to improvements in RAM and hard disk playback, the possibilities for triggering longer streams as opposed to just inserting breakbeat elements have multiplied. Fast forward to the late 2000s and early

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[15] Schaeffer & Reibel, 1967

[16] to use Philip Tagg's (2012) terminology for dealing with musical signs

2010s and we have an entire performance practice of laptop artistry which relies on realtime mixing as an expressive device. Essentially the skills of selecting, matching, effecting, looping and balancing/mixing are the same as for a DJ (and arguably for VJs who have evolved along similar lines), but the music is using such various and potentially disparate layers that the result is far more abstract than the dance based genres that gave birth to this way of musical creation.

Before the FUSIL+ collaboration, both authors had explored stream-form in differing ways and to differing effect. What follows is a brief recount of these experiences to highlight approaches, which we think, are worth sharing with fellow practitioners.

On Materialising the Stream: A plastic visual art and music collaboration

In 2011 one of the authors (Adkins) undertook a collaborative project with the painter Pip Dickens. The resulting series of musical works that were produced from this collaboration were informed as much by the technique Dickens used to produce her work, as the final pictorial surface/image of the painting. Dickens procedure was to build up layers of paint, to scrape off parts of the surface layers to make what was underneath visible. She also utilitised different forms of varnishes, resins, gels, liquin and her own 'secret recipes' to create a sense of transparency and translucency. The resulting painting was one in which the 'history' of the process was made visible. The surface of the painting was one in which an archeology of layering was evident. The result could be considered a material expression of musical stream form, each layer of the painting process being balanced against earlier layers resulting in an overall finalised and fixed visual mix.

In Adkins' compositions[17] a similar process was adopted. Multiple streams of sonic material were pre-composed and then layered and mixed aspiring to a materialisation of the streams akin to the layers of Dickens' painting. The importance of working in non-realtime for this project was to enable the modeling and sophistication of Dickens' brushstrokes and other physical objects to manipulate paint on the canvas in sound. Initial attempts to mix these multiple streams of material in realtime using a digital mixing console proved unsatisfactory. The resulting mixes were deemed to lack the intricacy and interplay that Dickens was able to achieve in her painting. It was soon realised that the simple linear fader movements were producing gross effects as opposed to the finesse of Dickens' work. The transitions needed control of further parameters. In the final mixing process the streams of sonic materials were not only subject to volume control but also the transitions between these layers were transformed sonically through processing. This further processing resulted in a sonic complexity that whilst not creating a direct mapping

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[17] Adkins, M., Four Shibusa, Aubiobulb 040, 2012

of processes from the artistic medium to the sonic nevertheless generated a parallel. The importance of this process was the considerations of musical form that were engendered through thinking in stream-form rather than more traditional blocks of sound. The process demonstrated that in order to deal with stream-form in a sonically convincing manner that it was not merely a case of fading (volume) linearly between sounds, but also required the manipulation of multiple and concurrent parameters to create convincing transitions from one layer to the other. Much in the same way as sounds change in timbre when produced in movement (due to changing acoustic conditions), sound which is 'moved around' in the stereo, quad or octaphonic image should not simply reappear in a different position. It should, for the sake of richness, undergo, even if slight, modulation as a function of position. The same applies to the surfacing of sound from a texture as described above, the timbral change seems to imply that the sound has been affected by being 'submerged' in the mix, and this aids the re-balancing process giving fresh new perspectives on the overall mix.

Adkins' recent work with FUSIL+ has been to create such sophisticated transitions and layerings using stream-form in realtime using both pre-composed and multiple live inputs.

On Managing the stream: fine motors vs. grosser motors & algorithms

Another implementation of stream-form has been developed by one of the authors (D'Escrivan) in his work with saxophonist Iñigo Ibaibarriaga as part of duo FUSIL. In this duo D'Escrivan acts as both performer and like Casserley - controls a signal processing instrument of sorts, in this case based upon a setup of Ableton Live augmented with Supercollider live-coding for pitch-class based interactions. The latter supplementing the effecting by reacting to the saxophone interventions with algorithmic streams that result in vamping material, ostinati, crescendi/decrescendi and other broad musical processes where overal rhythmicity and note choice are the result of simple algorithmic patterns.

In the Oxford Handbook of Computer Music (2011), in his chapter on 'Envisaging Improvisation in future computer music', Roger Dean discusses what computers can actually do in improvisation. In quoting Pressing (1988) he comments on how the computer is able to output discrete musical gestures that would require outstanding manual dexterity (fine motor skills) to emulate and that a performer works hard in rehearsing or practice to remove these gestures from conscious control and so play them effortlessly. Accordingly, the role of live-coding in FUSIL and in FUSIL+, is to stand in for pitch-class based musical elements, mimicking traditional instrumental virtuosity in a hyperreal way. Impossibly fast arpeggios jump effortlessly through the whole tessitura of the synthesisers or samplers, while unplayable riffs grove along, consciously poking fun at outmoded notions of instrumental virtuosity.

In terms of layering of textures, the saxophonist's signal is routed through multiple channels of loop-based sequencer software Ableton-Live. Each track with several processing plug-ins affecting its copy of the signal. According to how contrasting the chosen effects are, even small changes in the mix of the various tracks can yield dramatically different results in the overall sound. Using this method, the different and concurrent streams of sax processing are chosen for highlighting in response to the musical material being played or improvised by the saxophonist. In this way, for instance, long notes can be modulated by continuously balancing streams containing granulation delays or choruses, flangers and bit reduction plug-ins among many possibilities, creating an ever changing bubbling sonic mix that is richly textured. In a similar way, short phrases can be captured and looped or delayed for further transformations and to produce shimmering rhythmic textures. There is, still, however a strong pitch-based melodic development of themes in the hands of the saxophone player (in traditional fashion), yet the broader contextualisation and conceptual development of form is operated by the laptop artist as he selects, matches, edits and deploys the on-the-fly recordings of the saxophone.

Although this may sound perhaps like a fluid performance scenario, working with musical streams in this case entails limitations to a speed of traditional musical interaction (call-response, echoing, sequenced imitation, melodic paraphrase, rhythmic variation) that would really be possible if the saxophone had a traditional instrumental counterpart. This is due to the challenge of responding at speed in a precise way when all you have is grosser motor control (like controlling hardware or software faders, or XY software widgets with full arm movements) rather than the fingering-based fine motor control of instrumentalists. Further, to help supplement this potential deficiency, the duo often rely on triggered 'beds' of sound, sonic streams on the fly, that provide structural signposts as and when they are faded in and allow for variety in the overall mix.

An issue that becomes evident for us is that this style of performance demands live playing as opposed to just playback. This is because 'scoring' sound streams amounts to fixing the sound elements in time and may diminish the potential for expressive interaction. The ongoing challenge is then to move beyond both the non-realtime and reactive processing of the instrumentalist - which is the easier option and for the laptop player to become an equal performer capable of extemporising and initiating the musical dialogue or enabling what George Lewis has termed as its dialogic imagination (Lewis, 2007).

On the Challenges of Stream-form

In order to evaluate the efficacy of a system to control stream-form it is necessary to question what affordances and mapping are allowed by the system and what we want to achieve with it. Here it is a question of what to control and how. As noted above in D'Escrivan's work with FUSIL, the incoming data stream can at times be overwhelming. Thor Magnusson writes, 'Owing to the complexities involved in technological artifacts that originate in such an integrated cultural practice as music, learning a digital musical instrument is therefore more appropriately described as "getting a feeling" for the

instrument's constraints, rather than engaging with its affordances.'[18] In a traditional instrument such as the saxophone, constraints are inherent in the physical properties of the instrument itself and can be expressively explored by the performer. From a creative perspective Margaret A. Boden writes that 'constraints map out a territory of structural possibilities which can then be explored, and perhaps transformed to give another one.'[19]

From the perspective of stream-form, improvisation is less to do with the intuitive creation and development of material within the constraints of an acoustic or digital instrument or interface but rather with the manner in which incoming data-flow is treated. The constraints in this instance are fluid and continually re-evaluated in-time by the performers choice of which steams to combine, mix and process. The incoming streams of sonic material continue to flow into the computer. The notion of virtuosity then is one that is less to do with the traditional idea of physical dexterity and pushing the constraints of the musical or digital instrument but rather one of managing and meaningfully interacting with, and directing musical streams; the performer becomes a sound-painter of data.

In the author's collaboration FUSIL+ (D'Escrivan, Ibaibarriaga and Adkins) we are dealing with both composed and improvised streams of material. Although studio composition is usually seen as being 'out-of-time' and improvisation 'in-time' we are dealing with all material in an 'in-time' manner. Improvisation is notionally about having an idea and working in the moment continually unfolding, returning to and developing this idea. The cognitive ethnomusicologist Aaron Berkowitz writes,

> A dedicated musician will immerse himself in the recordings of his chosen genre or composer… eventually, through constant practice, you get to the point where, scientists believe, these processes get pushed down into the subconscious. They don't need to be consciously worked out anymore. They become a subroutine. Suddenly you realize you're saying things you haven't heard or memorized. You're able to free-associate. Your brain begins exerting control at a higher level, directing bigger chunks of information that can be expressed as whole ideas."[20]

This is a model that we readily recognise from much instrumental and computer-based improvisation. The improvisational skills required in stream-form however, are rather different. This form is like Lutoslawski's 'chain form' in which sections interlink and build on one another to create a fluid yet dynamic sense of forward movement. In FUSIL+, incoming streams include (normally) 8 live channels of saxophone input to Adkins' and D'Escrivan's computers as well as triggered pre-composed streams. In reality this means that at any one point up to 12-16 streams of material with live processing is accessible. The

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[18] Magnusson, 2010(a), p.65
[19] Boden, 1990, p.95
[20] Amanda Rose Martinez, The Improvisational Brain, Seedmagazine.com
http://seedmagazine.com/content/article/the_improvisational_brain/

virtuosic challenge therefore becomes a musically cognitive one, relying on predictions of the resulting texture and its effect on the musical 'energy'. Thus far, the implementation of this challenge is handled via two laptop computers and two ipads using touch-surface controller GUIs like touchable and konkreet performer.

On moving foward

As two practitioners who started off working in a studio-based rather than performing-based environment we are still predominantly interested in the new compositional and formal possibilities provided by new technologies. We are driven artistically by, and respond to, sounds that excite us. As such we are not proposing new algorithms for data control or new interfaces or digital instruments. On the face of it, our use of ubiquitous technologies like tablet computing devices presents no novel technical solutions. However, this is not our prime concern. Our concern is musically driven. It is only through negotiating the tension engendered by working with such technologies that we are driven to explore new musical forms - stream-form, and produce works that we would not have created without such a working environment. As such, our research and work echoes the words of Bob Ostertag who writes that, 'The fact that musicians have not resolved this tension [between the human body and the machine] indicates no failure of imagination on their part. It cannot be *solved* in the sense of a solution that can make a problem disappear. It can only be *experienced* in various ways.'[21]

Through our use of current technologies and stream-form we do not seek 'solutions', but a new musical experience. We propose a new form of virtuosity rather than developing yet another interface. Just as over the past decade the amount of information we receive through the media and digital technologies has risen exponentially, so our method models this contemporary phenomenon. A kind of musical information overload. We seek to explore new and stimulating means to recontextualise and appropriate this excess and create something artistically meaningful from it.

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[21] Ostertag, 202, pp.11-14

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