Andrew Blackburn

The representation of the electronics in a *musique-mixte* environment: analysing some ontological and semiotic solutions for performance

andrewblackburn.org/
terpod1@bigpond.net.au

Abstract

There are diverse forms of musical communication between composer, performer, and so to the listener, the "reception of [a musical] idea" (Landy) to be found in processes of making and performing *musique-mixte* (for instrument with electronics) works. The creative process requires a nexus between composer-creator and performer(s) operating across both the acoustic, and electroacoustic realms. Having a system that is commonly understood and accepted as 'notation'– a common semiotic ontology – for the electronic component of a *musique-mixte* work, as comparably ubiquitous as the stave and stick or gestural notation within the instrumental paradigm, would assist the composition development process as well as discourse between musicologists.

Presently, there is no systematised, universally accepted form of electronic notation with which to record performance details in a form that can easily be shared between performers. Whilst there are excellent software which can assist analysing music performance after the event (e.g. EAnalysis or Sonic Visualiser), composers usually create individual 'notation' solutions to represent the electronics component in a *musique-mixte* work. These solutions are normally separately tailored to meet the needs of both the player's performing score (the instrumental score) and the technologist's score. The ontology of each solution is, initially, pertinent to the musical creation and its creator(s) and secondarily, to the performance environment.

Four *musique-mixte* works from the first years of this century provide exemplars for analysing the notation of the digital signal processing component of each work. The works are for pipe organ with live digital signal processing and, in each, the acoustic sound of the organ is the origin of all electronic emanations. The combination adds sonic complexity to the already rich sonic quality of the pipe organ, and how this is represented in the notation of each work is the core of this paper.

The semiotic ontologies of each 'system' used to represent the digital signal processing permit some conclusions to be drawn regarding the information which is required by each of the participants in the musical performance. With the exception of the work by Thurlow/Halford/Blackburn, the works are scored for an organist and technologist(s). Andrián Pertout's composition also includes flutes. The electronic notation solutions in each work provide the instrumentalist with a variable representation of the electronic component, which may have a currency beyond the exemplar works. The works are: Steve Everett, *Vanitas* (2005); Andrián Pertout, *Symétrie Intégrante* for organ, flutes and electronics opus 394 (2007); Lawrence Harvey/Andrew Blackburn *Eight Panels* for organ, live DSP; and Jeremy Thurlow/Daniel Halford/Andrew Blackburn, *Ceci n'est pas une pipe* (2015). The

backgrounds of these composers are diverse, though all are very experienced *musique-mixte* creators. While two of these works (*Eight Panels* and *Ceci n'est pas une pipe)* use Cycling74's Max to create a software patch which serves in part as the 'notation' of the electronics score, the others each use different software/hardware combinations including Kyma and Cakewalk. The electronic notations within the organist's scores are also equally variable, ranging from an indication of a 'scene' change to detailed gestural instructions for both technologists and organist. Every work provides quite specific 'recipes' for (re)creating the sound palette which the performer/technologist follows in conjunction with the organist's score.

The compositions provide an opportunity to delve into issues that have been raised earlier. While not intending to provide a solution to the lack of a common electronic notation (which will likely be evolutionary in development rather than imposed), the paper will identify how the issue has been approached in the selected compositions, noting both the commonalities and distinctions between each.

Introduction

> Fundamentally, notation is a serviceable device for coping with imponderables. Precision is never the essence in creative work. Subliminal man (the real creative boss) gets along famously with material of such low definition, that any self-respecting computer would have to reject it as unprogrammable. Creative work defines itself. Therefore confront the work[1].[2]

Leaving aside recent developments in creative machine intelligence, which was the stuff of sci-fi dreams and imaginings in 1969, the ontology of a music score and the communication of musical ideas and concepts between all participants continues to exercise the minds of composers, performers, listeners and musicologists. In *musique-mixte*, a common solution is the provision of a software patch that allows the performance of the electronics component of the work, but gives little or no information as to its actual content. Frequently, in a *musique-mixte* instrumental score, the only indication of the activity of the DSP is a note – 'scene change here', or similar textual instruction, without providing any information of what that activity might be – either aurally or technically. In other electroacoustic pieces, the only information or artefact of the work's existence is a software patch and perhaps recording of a performance (either live or studio).

Other works provide further details to the performer/technologist. With personal idiosyncrasies and a lack of a commonly agreed notation, there are as many forms and approaches to creating the 'device' mentioned by Gerhard (above) as pieces, and this plethora is a starting point for this paper. It will explore how several composer/creators differently approach the practical issue of the communication of their musical ideas through a music score. The artefact, which is a musical score, has, in recent years, changed to incorporate whole new forms and ontologies. Dennis Báthory-Kitsz, commenting on changes that have occurred in the last seventy-five years or so, posits that;

> […] composers create documents of musical and sonic ideas, sufficient but incomplete maps of compositions and the instructions needed to render them into sound […] So as historical

1 Karman posits that the last two sentences were added by Cage himself, though the opening comments are Gerhard's reply to a request (by Cage) for text on notation (Gregorio Karman Garcia, "Closing the Gap Between Sound and Score in the Performance of Electronic Music", in S*ound & score: Essays on sound, score and notation*, Paulo de Assis et al. (eds), Leuven (Belgium), Leuven University Press, 2014, pp. 143).

2 John Cage, *Notations*, New York, Something Else Press, 1969, n.p.

> knowledge – and repertoire – build up like silt behind a dam, composers anticipate the forgetfulness of the future, and provide that future with increasing information.[3]

While Báthory-Kitsz assumes a traditional musical paradigm of composer – performer – listener, research and practices in both electroacoustic music and *musique-mixte* is inherently embedded within a software construct which, as Landon Morrison notes, may have rendered "[…] the use of prescriptive scores obsolete [...] [reconfiguring] conceptions about music to favour the listener's experience of aural phenomena"[4]. So, instrumentalists, interacting with the world of live or recorded, digital signal processing, reasonably question if a score – particularly of the electronic component – is even a useful tool for the acoustic instrumental performer in a *musique-mixte* environment. If not, what is a better or more effective form of communicating what is happening within the electronic component of the musical ensemble?

Through exemplar works for pipe organ with live DSP, this paper explores how four very different composers address this question, and extrapolates this into a wider musical context. In each, the DSP is live – i.e. all electronic sounds are sourced from the acoustic instrument(s) – pipe organ or pipe organ with flutes and without the use of pre-recorded or processed sounds. In these four works, different software packages are used: *Vanitas* – Kyma and Max/MSP[5]; *Symétrie Intégrante* – Cakewalk[6]; *Eight Panels* – Max/MSP[7]; and *Ceci n'est pas une pipe* – Max/MSP[8]. Common to each work is a paper-based organ score (that ranges from gestural/graphic to conventional notation), yet each takes a different approach to successfully communicating similar performance information for the electronics. Approaches include 'set this electronic scene at this moment in the score' to a score that permits an instrumental and electronic recreation of the work from the ground up. A 'serviceable device for coping with imponderables' or terminology which can be understood by practitioners and creators will probably eventually arise from current and past practices, and this paper explores four differing iterations of the communication of DSP 'notation' within a *musique-mixte* environment. Developing sets of symbols and terms which are easily comprehensible through their intrinsic semiotic ontology, and can be applied in a performance score (in either *musique-mixte* or acousmatic contexts), would provide a means for composers and analysts to meaningfully converse and describe the DSP in their work.

In 1966, Pierre Schaeffer presented *Traité des Objets Musicaux* – a system for classifying sounds according to their underlying parametric characteristics, such as duration and density. Schaeffer's approach to the qualities of sound adopted a phenomenological approach to explaining it. His classifications and writing describe and reflect upon the *experience* of hearing a sound and offer ways of analysing the various objects within the sound. Schaeffer's system classifies sounds according to their underlying parametric characteristics, such as *durée* and *masse*. This approach, his Tableau de *Récapitulatif de la typologie* (TARTYP),

[3] Dennis Báthory-Kitsz, "To Anticipate the Forgetfulness of the Future", in *Notations 21*, Therese Sauer, New York, Mark Batty PUblisher, 2009, p. 23.

[4] See Landon Morrison, "Graphical Music Representations: A Comparative Study Based on the Aural Analysis of Philippe Leroux's M.É", in *Proceedings of the Electroacoustic Music Studies Network Conference Electroacoustic (EMS14),* Berlin, 2014, http://www.ems-network.org/IMG/pdf_EMS14_morrison.pdf, p. 1 (last accessed 01/18).

[5] See *kyma – sound design inspiration*, http://kyma.symbolicsound.com/ (last accessed 01/18).

[6] See *cakewalk*, http://cakewalk.com (last accessed 01/18).

[7] See *'74 CYCLING'74: tools for sound, graphics and interactivity*, https://cycling74.com/products/max/ (last accessed 01/18).

[8] See the video examples of each work on https://www.andrewblackburn.org/andrew-blackburn---article-video-link-page.html (last accessed 01/18).

uses letters to explain and analyse the sound – a detailed, though complex and unintuitive typology. Though highly informative, TARTYP has not been widely adopted beyond select musical communities[9].

There have been some attempts at creating a more intuitive typology using symbols instead of letters, particularly in the field of analysis and musicology. Lasse Thoresen, in 2006, revisited Pierre Schaeffer's approach to the qualities of sound which he characterised as a phenomenological approach. An issue that arises is, as Morrison notes:

> […] it takes a lot of symbols to sketch a relative outline of the infinite *durée-masse* sound continuum. […] [The] task of memorising Thoresen's presented symbology can prove to be a headache for the analyst, as well as a barrier to entry for the uninitiated reader […] these signs correlate to symbolic properties that must be correctly interpreted in order to link them to their associated sound objects.[10]

An advantage of Thoresen's symbols and signs is that they are fixed and consistent, based on the underlying acoustic properties, rather than the sound source. It is beyond the scope of this paper and presentation to comprehensively list Thoresen's catalogue of symbols, though his figure 1 and figure 2 provide a clue of their scope[11]. The diagrams give a less complicated representation of the different qualities of sound. The attack of the sound (the impulse) is in the centre of the diagram. To the left the sound (if sustained) is 'notated' in one way, sounds with imperceivable pitch (drums, etc.) are labelled 'complex' and sounds that develop over time (pitch or intensity, etc.) are defined as 'variable'. Each has their own symbolic representation[12].

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[9] See Lasse Thoresen, "Spectromorphogical Analysis of Sound Objects, An adaptation of Pierre Schaeffer's Typomorphology", in *Proceedings of the Electroacoustic Music Studies Network Conference (EMS06)*, Beijing (China), 2006, http://www.ems-network.org/IMG/EMS06-LThoresen.pdf (last accessed 01/18).

[10] Landon Morrison, *op. cit.*, p. 4.

[11] Lasse Thoresen, *op. cit.*, pp. 6-7.

[12] Lasse Thoresen explains this figure as follows, *op. cit.*, pp. 5-6:
"The minimal representation of the typology shows only cardinal cases – the extremities of the organizing axes - that later on will serve to orient the expanded version of the scheme. The vertical axis sets up three criteria of the sound spectrum (left hand side), the horizontal axis deals with that of *energy articulation*.
• The criterion *Sound spectrum* is a definition of that aspect of the sound in which the perception of pitch and pitch content is founded.
• The sounds that have a clearly perceivable pitch or fundamental will be termed *pitched sound objects* (*sons toniques*).
• The ones with no perceivable fundamental (drum sounds, tam-tam sounds, wind, consonants etc.) will be termed *complex* or *unpitched sound objects* (*sons complexes*). Sound objects with a gradual internal development in its sound spectrum (glissandi or sounds with gliding formants) will be termed *variable sound objects* (*sons variés*). These may be either pitched or unpitched.
• Beginning with the impulse (short thrust of energy) and moving to the left, the impulse is prolonged and comes to form *sustained* objects.
• Towards the right, the object is prolonged by means of *iteration*, i.e. quick repetitions as in a tremolando.
• On the extreme left of the diagram we find sound objects that, although basically sustained or continuous in energy, have an unpredictably diversified energy articulation, and could accordingly be termed *vacillating sound objects* (the English term is not a translation of the French *Echantillon* (lit. "Sample")). The creaking of a door, the cracking of the tone produced by a badly handled bow on a string instrument are examples of vacillating sounds."
• On the extreme right we find sound objects called accumulations. They are thought of as being overarticulated iterations; i.e. iterations in which the iteration pulse as well as the sound spectrum of the single occurrences are unpredictable in detail. Examples of these objects would be the sound of raindrops on a tin roof, the sound of a flock of sparrows, or of peas running out of a bag and hitting a table.

In Thoresen's figure 2 a more complex and comprehensive set of the symbolic representation including dystonic and composite sound objects are included. The two examples presented do not include the typologies of duration and regularity, nor pitch. These are covered in detail in Thoresen's paper (*ibid*) to which I would refer interested readers. As Morrison (2014) iterates, the symbolic system developed by Thoresen, and based on Pierre Schaeffer's Typomorphology, allows for the notation of the sound qualities which are found in electroacoustic music, but is disadvantaged by its complexity and lack of semiotic relevance for composers and musicians. Without a semiotic ontology, it is reasonable to suggest that the ability to think and imagine within such a system is limited.

Since 2006, further developments of Thoresen's adaptation of Schaeffer's graphic Typology of Sound have been proposed by musicologists including Robert Normandeau (2010)[13] and Israel Neuman (2015)[14]. Neither of these proposed adaptations are specifically oriented toward either the instrumental performer, or the creation of a score from which the work can be performatively recreated.

Vanitas Steve Everett[15]

The visual elements found in baroque Vanitas images, highlight specific objects of significance with an illuminated and virtuosic chiaroscuro. Objects include the skull, burnt candles, decaying fruit and coins. In some paintings, food may be rotting, or flowers portrayed as well past their prime. Such sentiments continued to be of interest to visual artists up to recent times, with computer generated still life images incorporating a vanitas overlay

Aurally, these find an equivalence in Everett's eponymous work. The use of Kyma sound system to transform sound in real time plays a major role in achieving this. The pipe organ is one of the great symbols of wealth, status and power in the Protestant north of Europe[16]. By selecting the organ and through his musical writing, Everett references the organ's long, history, one, which is still implicitly understood, even today. The aim of the electronic processing in this work is to create an impression of the decay and ephemeral nature of life, as depicted in the Vanitas paintings. Electronic processes include timbral shift, spatial re-location, delays and loops, and the re-tuning and detuning of the organ sound, particularly in close juxtaposition to the live acoustic instrument.

> […] the score contains cues for the eleven Kyma 'Sound Objects' used during the piece. Therefore, in addition to the standard music notation and information for the organist, the score

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Interestingly, the extremes of the diagram meet: Vacillating sound objects and accumulations can be very similar. Both of the types of sound objects can combine tonic and complex sonic elements. One could speak of homogenous accumulations (using only one type of sound) as opposed to heterogeneous accumulations (mixing different types of sound, particularly those with different characteristics of sound spectrum). A similar distinction can be made with regard to vacillating sound objects.

[13] Robert Normandeau, "A revision of the TARYTP published by Pierre Schaeffer", in *Proceedings of the Electroacoustic Music Studies Network Conference Electroacoustic (EMS10),* Shanghai (China), 2010, http://www.ems-network.org/IMG/pdf_EMS10_Normandeau.pdf (last accessed 01/18).

[14] Israel Neuman, "SIG~: Performance Interface for Schaefferian Sound- Object Improvisation", in *Proceedings of the International Computer Music Conference (ICMC 2015)*, Denton (TX, USA), 2015, http://israelneuman.com/content/SIG~Interface.pdf (last accessed 01/18).

[15] https://www.andrewblackburn.org/andrew-blackburn---article-video-link-page.html (last accessed 01/18).

[16] Hans Davidsson, "The Organ in Seventeenth Century Cosmology", in *The Organ as a Mirror of its Time: North European Reflections, 1610 – 2000*, Kerala J. Snyder (ed), Oxford (UK), Oxford University Press, 2002, p.83.

> also contains a so-called "Kyma Timeline"[17]. The piece was originally scored for an organ with three manuals, and the manual change directions throughout are both precise and complete. The notes that are represented by the notation is just one component in the total musical sound that reaches the listener: what Landy describes as the 'Reception'[18]. The printed score appears complete, and it is both seemingly logical and musically coherent when played independently. The whole musical environment changes when the signal processing is added.[19]

Whilst originally a baroque artistic device, the subject has continued to interest visual artists to the twentieth century, with artists including as Georges Braque (1882-1963) who continued to paint in this tradition. A parallel between the pipe organ (an icon of the high baroque) and the musical topic of the work may be drawn, and provides contemporary relevance to the work and its musical intent.

While there is considerable interplay between the instrument and the electronics, as with all the works under discussion, the organ remains the source of all the audio. It highlights what Emmerson (2016) describes as the interplay between the "local" and the "field"[20]. Details of this interplay may be deduced from deep within the software and Kyma hardware settings, significantly the information is not contained within the paper version of the organist's score (which is the only notated form of the work that exists). The DSP component is the least visible in all the works under discussion, as without access to the Kyma software patch (which is not presently publically available), the work is not performable without the presence and input from the composer.

Symétrie Intégrante Andrián Pertout

> […] It is known[21] that an experienced organist is capable of playing an organ which he does not know, which has more or fewer manuals, and stops differently arranged, compared with those on the instrument he is used to playing […] During the rehearsal, as during the performance, the stops, pedals and manuals are given to him as nothing more than possibilities of achieving certain emotional or musical values, and their positions are simply the places through which this value appears in the world. Between the musical essence of the piece as it is shown in the score and the notes which actually sound round the organ, so direct a relation is established that the organist's body and his instrument are merely the medium of this relationship.[22]

In *Symétrie Intégrante* (2007/2009)*,* Andrián Pertout takes another approach to notating the electronics, making the settings accessible beyond the internal workings of the software. As a listener, or musicologist, one can hear or analyse the relationship between the three distinct performer entities in this piece (flautist, organist, and technologist) after a performance, but

[17] Stephen Everett, *Vanitas*, Atlanta, UnPublished, Music Score, 2005, p. 2; quoted in Andrew Blackburn, *The pipe organ and real-time digital signal processing (DSP): an organist's perspective*, PH.D Thesis in Musical Arts, Brisbane (Australia), Queensland Conservatorium of Music / Griffith University, 2011, p. 115.
[18] Leigh Landy, *Understanding the Art of Sound Organization*, Cambridge (MA), MIT Press, 2007, p. 38; quoted in Andrew Blackburn, *op. cit.*, p. 116.
[19] Andrew Blackburn, *op. cit.*, pp. 115-116; and see for a complete performance of the work with Andrew Blackburn (organ) and Steve Everett (electronics): http://www.hutes.com.au/hutes/Vanitas_Performance_-_Toorak_May_2010.html (last accessed 01/18).
[20] Simon Emmerson, "The Analysis of live and interactive electroacoustic music: Hans Tutschu – Zellen-Linien (2007)", in *Expanding the Horizen of Electroacoustic Music Analysis,* Simon Emmerson and Leigh Landy (eds), Cambridge (UK), Cambridge University Press, 2016, p. 342.
[21] Cf. Jacques Chevalier, *L'Habitude*, Paris, Boivin, 1930, pp. 202 et suivantes, quoted in Maurice Merleau-Ponty, *Phénoménologie de la perception*, Paris, Gallimard, collection « Bibliothèque des Idées », p. 169.
[22] Maurice Merleau-Ponty, *op. cit.*, pp. 169-170; quoted in Andrew Blackburn, *op. cit.*, p. 148.

the setting of the work in the room is left largely to the devices of the performers, and the performance situation.

In order to read the electronic notation which is within the score, the performers need to drill down through several levels to get to what is intended. At the most basic level of information, within the organ and flute score, at B14, we see for example, 'Organ PG02'[23].

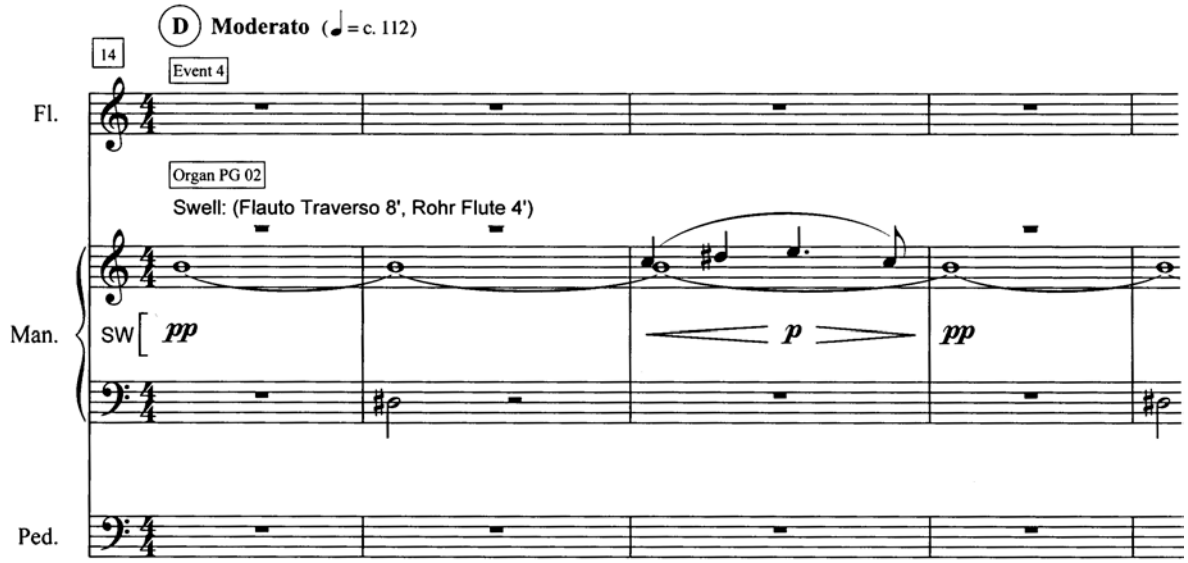

Figure 1: *Symétrie Intégrant*e (Andrián Pertout, 2007/2009) B 14 – 17
(used with permission of the composer)

Such information provides a timeline event for the technologist of *when* to trigger 'Organ PG02', and for the instrumentalists, an indication that there will be a change in the DSP. Only with rehearsal and repetition does the instrumentalist learn what to expect at that point of the work. From the notes in the score, Pertout indicates that the detail of the scene is based on: "Waves metaflanger 5.0 VST plug in (a vintage tape flanging and phaser emulation audio plug-in that generates gentle choruses and dual delay flanging sounds to sharp phasing and extreme jet sweeps)."[24]

This refers to the original electronic processing setup using Cakewalk, and a number of VST plug-ins. Pertout indicates the complete settings for this scene (used in the Melbourne Town Hall performance) are:

mix: 100%;
feedback: 80.0%;
phase enable: on;
filter type: low pass;
cut off frequency: 1.2HΩ;

[23] Andrián Pertout, "*Symétrie Intégrante*", in *Symétrie Intégrante for Organ, Flutes and Digital Signal Processing*, Melbourne, Unpublished, Music Score, 2007, p. 7; "Andrián Pertout Symétrie Intégrante", performance, May 2010, composer's introduction and performance begins at about 23'35'', http://www.hutes.com.au/PipeOrgan/742/appendices/appendix-15/recital-2-organ-and-realtime-dsp-may-2010/index.html (last accessed 01/18).
[24] Andrián Pertout, *op. cit.*, p. 7.

filtering: on;
delay: 9.0ms;
tape: on;
rate/oscillation speed: 0.10Hz;
sync: manual; depth: 12.0%;
link: off;
waveform: triangle;
stereo: 180.00 ;
gain: +0.0dB.[25]

In subsequent performances of the work – in Ballarat (2009) and Toorak (2011), Australia – the different instruments and acoustic environments required some adjustment of these plug-in settings. Importantly, the information contained within these settings enable its recreation in any VST capable software, releasing the work from the tyranny of a single software for its performance.

The extended notes provided in the score, act as a key table for the technologist, permitting them freedom to use any preferred software for performance, and to adjust the settings for the specific acoustic environment at hand. In *Symétrie Intégrante*, the spatialisation of the setup – that of the organ, the placement of the loudspeakers and the changes in relationships that such a musical environment makes possible – is explicitly anticipated by the composer, but its actuality is left entirely to chance. The VST plugin of Organ PR02 quoted above, contains flanging and delays that when projected through the loudspeakers creates what Emmerson describes as a

> continuous exchange between the two [functions]…Local seamlessly becomes field – indeed, to a very great extent the local controls the field, but not vice-versa […] an event in an electroacoustic part could at times appear to cause a live event, this is a musical (not a literal) cause.[26]

Eight Panels (2007, rev. 2011) Lawrence Harvey & Andrew Blackburn

In *Eight Panels*[27], the score's notation is different. A structured improvisation, *Eight Panels* uses a graphic/gestural notation to record DSP settings and actions which combines details of the signal processing and spatialisation at each moment. For the organist, the score contains gestural information around which to improvise, taking advantage of the resources and strengths of the pipe organ at hand. Serendipitously it was found that, in preparation for the second performance, there is sufficient information contained in the score to allow the recreation of the electronics. The performers in the work's first performance were the organist (Andrew Blackburn), and technologists Lawrence Harvey and Jeffrey Hannam. In the second performance, Lawrence Harvey was replaced by another technologist (Stephen Adam). In the intervening period between performances (2007 & 2010) Max underwent a significant number of upgrades and versions, so the Max patch that was used for the second performance had to be recreated entirely. Its re-creation was undertaken from the detail of the technologist parts of the *Eight Panels* score (see Figure 2 below).

[25] Andrián Pertout, *ibid*.
[26] Simon Emmerson, *op. cit.*, p. 342.
[27] Video excerpt, http://www.hutes.com.au/hutes/Lawrence_Harvey_Eight_Panels.html (last accessed 01/18).

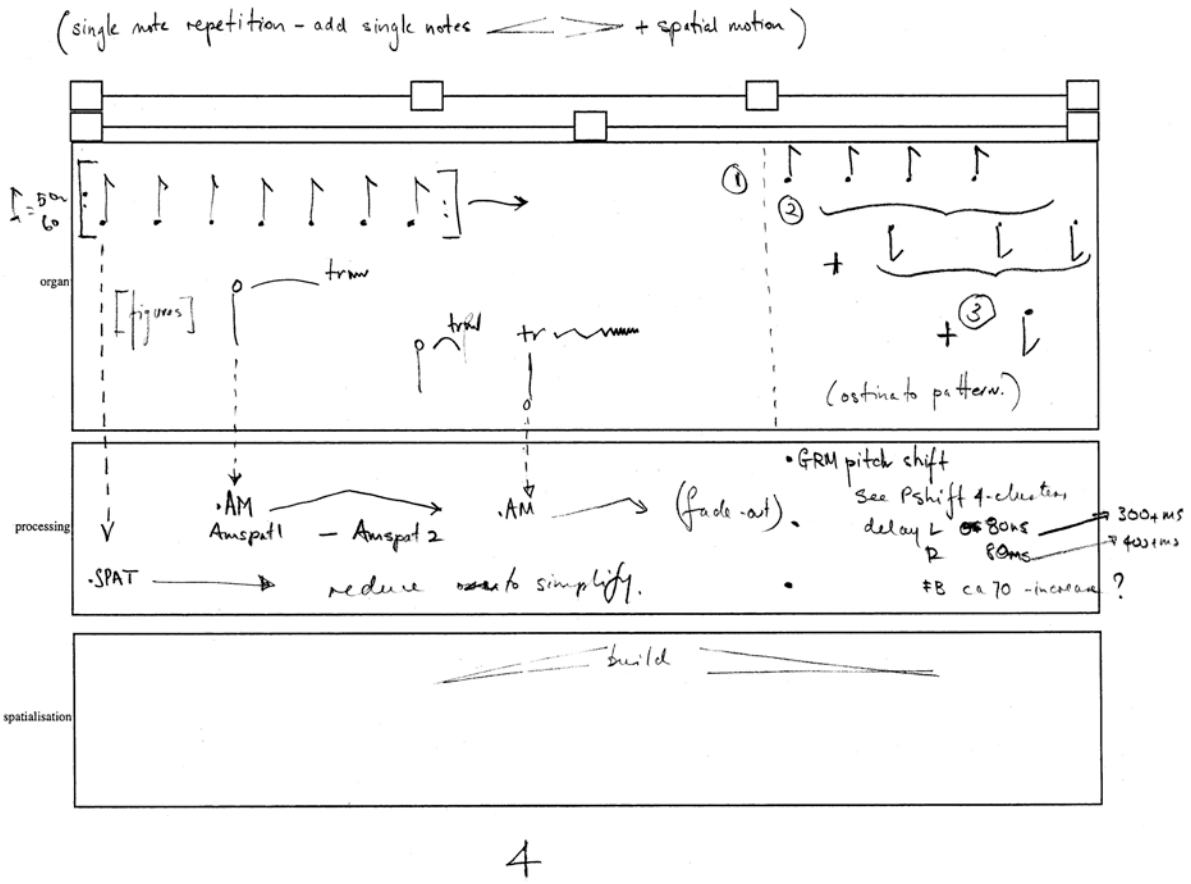

Figure 2: *Eight Panels* – Panel 4 – detail (Used by permission)

Pierre Couprie observes…

> Graphic representation is a good tool to represent listening characteristics of sound (type, space position, transformation) and implicit musical aspects (rhythm and duration, structural construction). Moreover, associated graphics, waveform and sonogram allow us to represent more parameters (pitch, range of spectrum, intensity variations).[28]

That this graphic notation of *Eight Panels* is sufficiently open to permit the reinterpretation of the electronic score by a third party in performance confirms the suggestion that the material is sufficiently informative for this purpose.

The notation of *Eight Panels* is certainly open to refinement, perhaps using the Thoresen symbols or within a software environment such as EAnalysis. EAnalysis has the potential to use the Thoresen symbol set as part of the user library. This symbol set is already incorporated into the software as the annotations of EAnalyse are based on this[29].

[28] Pierre Couprie, "EAnalysis: developing a sound-based music analytical tool", in *Expanding the Horizon of Electroacoustic Music Analysis*, Simon Emmerson and Leigh Landy (eds), Cambridge (UK), Cambridge University Press, 2016, p. 179.

[29] Pierre Couprie, *ibid*., p. 178: "EAnalysis functions as a tool for the analysis of an existing work or soundfile, reliant on the timeline of another file type to create a sonogram. The reversal of this process, where the user creates a series of events along an otherwise empty timeline would potentially work."

Ceci n'est pas une pipe (2015) Jeremy Thurlow, Daniel Halford & Andrew Blackburn

Ceci n'est pas une pipe is a work for organ and live electronics created jointly by Jeremy Thurlow, Daniel Halford and Andrew Blackburn for the Performance Studies Network Conference 2015 held in Cambridge UK. The work extends the technique of the organist through the incorporation of the 3D LEAP MIDI controller (AeroMidi) as the principal MIDI interface for the organist. The LEAP MIDI controller requires the organist to add a 3D spatial control dimension to their playing, which is an addition to the 2D of a keyboard (width and depth). Other interfaces include several MIDI pedals and buttons located around the organ console, which are simple on/off switches. The other developmental facet of the work is the intent of the work to remove the need for the technologist to be present and actively participating in the performance. The software is open, but self-contained, and within the score are quite detailed performance instructions of the interactions between the organist and the LEAP controller, and additional MIDI pedals and other buttons which are attached around the organ console. This work represents a development of organ performance practice. Although there are quite detailed performative instructions in the score (See Figure 3) the detail of this is found and 'notated' in the Max patch and easily adapted by the user to the local performance and instrument.

The relationship between the software and the performer (organist) is 'fixed'. The score contains the potential for re-creative musical activity by the organist, but the software–like the organ itself–remains immoveable and inflexible.

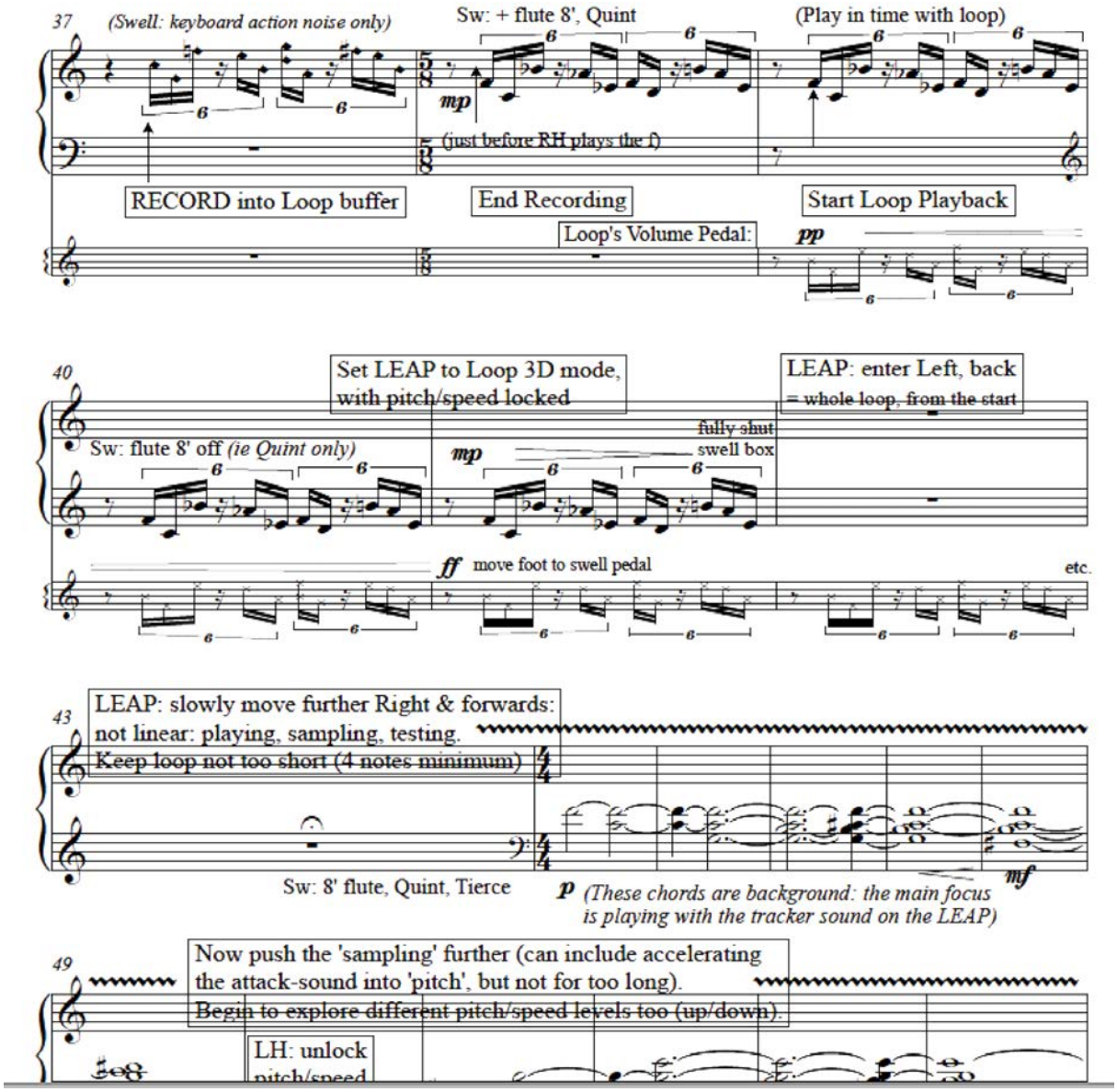

Figure 3: *Ceci n'est pas une pipe*, Thurlow, Halford & Blackburn (B 37 – 54) (used by permission)

Conclusion

> These […] composers [Schoenberg and Russolo] sought practical solutions to notating new aspects of early-20th century performance practice and instrumentation, as composers of electronic music following World War II would later do. Lukas Foss described the impact of this new medium (writing in 1963): "Electronic music showed up the limitations of live performance, the limitations of traditional tone production, the restrictiveness of a rhythm forever bound to meter and bar line, notation tied to a system of counting. Electronic music introduced untried possibilities, and in so doing presented a challenge, shocked live music out of its inertia [and], kindled in musicians the desire to prove that live music 'can do it too'.[30]

[30] Benjamin Boretz and Edward T. Cone (eds), *Perspectives on Notation and Performance*, New York, Norton & Company, 1976, p. 73. A complete explanation of the control requirements and potential of the LEAP MIDI controller, please see *AeroMidi*, http://aeromidi.net/index.php (last accessed 01/18).

This paper has investigated the notation practices of a diverse group composers in compositions for a set combination (pipe organ with live DSP), reimagining what the desirable qualities of a notation system for the electronics component for *musique-mixte* might be. The collection of works for pipe organ and live DSP provides a representative overview of a wider state of the practice notating electronics in the *musique-mixte* environment. The works under discussion are not the only examples of works for organ and live DSP. Each composer is experienced in writing for instruments with live electronics, but the examples used in this paper are their only (to date) pieces for *organ* with live DSP. So the works provide a snapshot of their personal practice notating the electronics at the time of composition.

It is apparent from the performances scores of these compositions, that the usual function of whatever notation relating to the DSP is to either tell the technologist when something should be triggered, and the instrumentalist that something will occur at that point. In *Vanitas* this is the only information which is notated, although in discussion with the composer, some of the musical intention behind the electronics is made clear, but how these are achieved remains somewhat opaque.

The more technical information may be included as a set of textual notes in an appendix or similar, as occurs in Pertout's *Symétrie Intégrante.* This score contains the information which allows the performers to recreate the DSP using whichever software is to hand. One significant advantage of this is the fact that the work is performable independently of the original software (Cakewalk with VST plug ins). For example, the DSP can be created in Max[31], Bidule[32], Ableton Live[33], Logic-Pro X[34] or ProTools[35] to name but a few of the many software available.

Of the exemplar works, *Eight Panels* has a history of re-creation (by a third party) of its electronics, from the score. That this score contains both textual information that describes the static state of the DSP and gestural movement to describe its variation over time is highly significant. It has a degree of semiotic richness as the gestural information has semiotic qualities of movement (Blackburn, 2013). The codification of Thoresen's symbol sets which has been described is arguably well suited to further development in a software environment, particularly if combined with the semiotic, gestural typology that is embryonically visible in the score of *Eight Panels*. In this work, all the basic sonic information is derived from an acoustic instrument, so the existing notation maps the digital signal processing that will be applied to it. That the notation 'works' could make it a useful conceptual starting point for a software directed towards making an re-creatable artefact to record the composer's musical intentions.

When there is a music technologist (who is not the original creator) participating in the musical ensemble, the notation from which they work ideally will include the potential for contribution to the musical creativeness of the performance in the same way as an instrumentalist. The technologist's role can be so much more than the person who triggers a preset at a certain time, or balances the song levels between instrument and electronics. If

[31] See *'74 CYCLING'74: tools for sound, graphics and interactivity*, https://cycling74.com/products/max (last accessed 01/18).
[32] See *Plogue*, https://www.plogue.com/products/bidule/ (last accessed 01/18).
[33] See https://www.ableton.com/en/live/ (last accessed 01/18).
[34] See *Apple*, https://www.apple.com/logic-pro/ (last accessed 01/18).
[35] See *AVID*, http://www.avid.com/pro-tools (last accessed 01/18).

elected to contribute as an active participant in a musical ensemble, then the composition process and the way it is notated also must express this potential. In Cage's *Notations*, the Turkish composer Ilhan Mimaroglu opines "[…] notated music is music only to the degree a blueprint is a building or a screenplay a motion picture"[36].

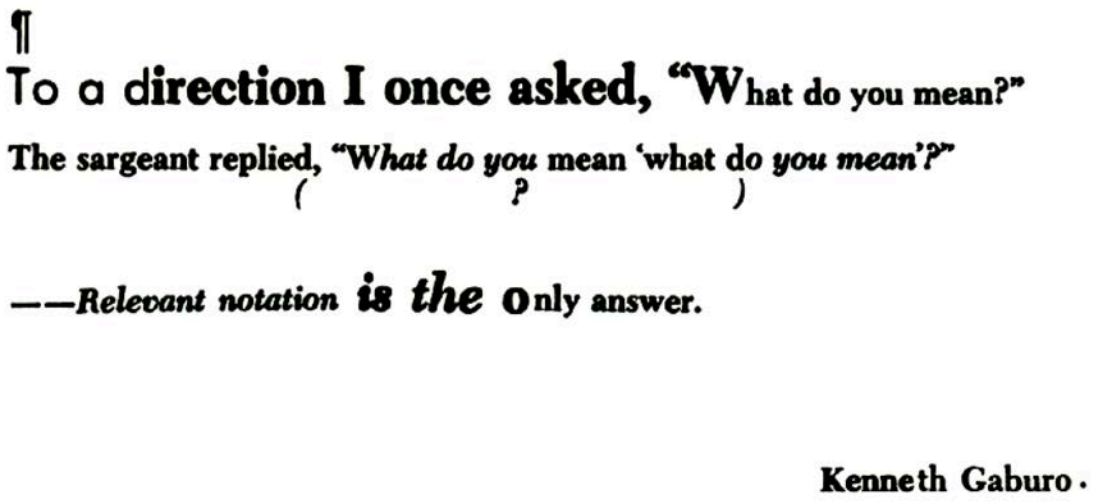

Figure 4: Gaburo K from Cage, *Notations*, 1969, n.p.

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[36] John Cage, *op. cit*, n.p.

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