Multiple paths. Towards a performance practice in computer music

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On *Flux*|*Pattern*: The etude as compositional form in live computer music

Introduction

The research process leading to *Flux*|*Pattern* sought to relate live computer music practices with technical challenges borrowed from traditional instrumental practices. I studied the etude as compositional form in the repertoire for piano, and identified aspects of different interpretations of the notions of the etude throughout history, specifically how it has been used to create and propose different challenges for performers to solve on stage. This helped me shape a framework where the artistic work conducted within the percussion and computer trio The Electronic Hammer[40] could be critically reflected upon and used to create new musical outputs. During the eight years of activity of the trio, the role of the computer and its performer was challenged, explored and developed to achieve the same level of musical nuance, expressiveness, and range of musical functions as those performed by traditional instrumentalists in a chamber music setting. Seeking to push this emulation role for the electronic instruments in new directions, *Flux*|*Pattern* was a series of etudes created for both traditional and electronic instruments using the challenges posed to the electronic performers rather than those presented to traditional instrumentalists. Considerations about features of computer music practice such as timbre flexibility, mapping, the use of the concert space as a dynamic parameter and the disassociation between physical action and sonic manifestation helped formulate the following research questions:

- What are the possible musical relationships between traditional instruments and live electronic set-ups?
- In computer music practice, how do the interrelated roles of composer, performer and instrument builder work together in collaboration with traditional performers and composers?

[40] For more information on The Electronic Hammer, visit http://www.electronichammer.com.

- How can we move from an emulation model (the imitation of traditional instrumental features and actions) to a differentiation of skills in computer music instruments?
- How can the non-sounding aspects of music performance help enhance the malleability and richness of the electronic media in a concert situation?

During the eight years of development of The Electronic Hammer (Diego Espinosa, percussion, and Henry Vega and myself, computers), we attempted to tackle the problem of improving performance in computer music practice by considering and challenging computer performers as traditional instrumentalists.
The tasks posed to the composers working with the trio were not to focus primarily on issues inherent in the electronic material. Rather, the main challenges were related to successfully emulating traditional instrumental behaviour in electronic media: how to create not one, but two electronic parts in a piece where the language and potentials are designed for the possibilities (and limitations) of traditional instruments.

The Electronic Hammer's working method produced a number of interesting results, creating technical and artistic solutions to the problems presented in the compositions. Some of these solutions, such as the use of network technology to continuously change tempo markings, or the development of "meta-instruments" that would receive gesture input from all three performers, dealt with finding ways of differentiating in a concert situation fixed and real-time generated electronic layers, developing cue-systems that could derive their tempo indications from the performance of each musician, and notation strategies that went from traditional scores to computer cue systems and to graphs mapping the computer keyboard as a trigger instrument. Although working as a traditional chamber music trio helped develop a rich body of musical pieces and advanced various aspects of artistic output in live computer media, in general the musical elements that could be considered unique to the electronic domain were always developed implicitly; the driving force for the music being created was primarily the onstage presence of the electronic performers and the virtuosity of the traditional performer. The technical and artistic work being done by the electronic performers was never approached as the starting point to build musical questions, and therefore it was never pushed to the point of becoming the most important aspect of the ensemble's output.

Context

Owing to my work at the Orpheus Research Centre in Music (ORCiM), I had the opportunity to develop collaborative settings to explore the relationship between live computer music and other musical traditions and practices. It was within this context that I started looking at the notion of the etude as a compositional form and how it could be used to create small musical problems derived from features unique to electronic instruments, which could be transferred to traditional instruments as well.

One of the general notions of etudes is that they are compositions "designed to improve technique of an instrumental performer by isolating specific difficulties and concentrating his or her efforts on their mastery." (Randel 2003: 301) I wanted to depart from the idea of the etude only as a set of tools for acquiring what could be called "athleticism" and expand my attention towards a definition in which the etudes would also pose aesthetic and compositional problems to performers, challenging them to present possible solutions in performance. In this search for a contextualisation of the etude from a compositional perspective, I identified the works of certain composers in relation to a single instrument (the piano), and worked out a development line between different etudes, their composers and the framework I wanted to use to create the *Flux*|*Pattern* series.

Starting from the athletic acquisition aspect of the etudes by, for example, Carl Czerny, I looked into the etudes of Franz Liszt, specifically the *Etudes d'exécution transcendante*, in particular number four, *Mazeppa* (1852), because of the unusual technical demands posed to the performer. Czerny's and Liszt's works helped me understand how athletic acquisition can be used as the core element of a musical piece. Next, I looked into the etudes of Claude Debussy, which provided a shift towards the notion of etude I was looking for. Debussy's etude no. 10, *Pour les sonorités opposées* (1915), for example, problematises for the performer musical aspects beyond the athletic dimension, such as colour, harmony and texture.

It was in the work of Olivier Messiaen that I found a clear notion of the etude as a didactic tool from a compositional perspective. His *Quatre études de rythme* (1949–1950) could be seen as practical examples of specific compositional ideas presented in his *Traité de rythme, de couleur, et d'ornithologie* (1949). I gave special consideration to *Mode de valeurs et d'intensités* (1950), the second of the series, since

it is usually quoted as “the first work by a European composer to apply numerical organisation to pitch, duration, dynamics, and mode of attack (timbre).” (Toop 1974: 142) Messiaen’s proto-serialism helped organise the initial materials used in the development of *Flux|Pattern.*

Boulez points out that the late 1940s and early 1950s “was, without a doubt, the most experimental period in Messiaen’s music. His rhythmic research in particular, which became more and more audacious, and his polyphony (*Epode* from *Chronochromie*) became adventurous and extreme.” (Boulez 2002: 5) In his *Treatise*, Messiaen explains how the structure of *Mode de valeurs et d’intensités* was conceived:

> The durations, intensities and attacks operate on the same plane as the pitches; the combination of modes reveals colors of durations and intensity; each pitch of the same name has a different duration, attack and intensity for each register in which it appears; the influence of register upon the quantitative, phonetic, and dynamic soundscape, and the division into three temporal regions imbues the passage with the spirit of the sounds that traverse them, creating the potential for new variations of colors.

While the work of Messiaen provided me with a clear compositional context for the use of etude, and the views of Debussy, Liszt, and even Czerny gave me enough nuances to approach the task of creating etudes from an athletic perspective, it was Pierre Schaeffer’s use of etudes as compositional devices that contributed to add a connection between traditional instrumental practices and the sonic and creative tools I was aiming to use, those of electronic music. Schaeffer’s *Traité des objects musicaux* (1966) is the culmination of a work aimed to “define a ‘solfège’ (i.e. define the ‘elements’) of the sound universe based on the perception of sound and to question what were clearly false notions about music, listening, timbre, sound, etc.” (Chion 2002: n.p.)

Schaeffer defines his notion of *mass* as the correlation between spectrum and pitch in a given sound-object: “whether it is a tonal or complex, concise or diffuse, related to a harmonic or non-harmonic spectrum, whether it consists of a single or an unlimited number of frequencies, mass is a musical perception that accounts for the harmonic structure of a sound.” (Schaeffer 1966: 517) The importance of the concept of mass lies in liberating a sound from its preconceived source, and turning into perception of the sound itself as the articulator for organisation and musical structure. This was

important for the development of a common challenge for both traditional and electronic instrumentalists in *Flux*|*Pattern,* since it gave me a basis to focus on listening while producing the work.

Created in 1948, Schaeffer's *Etudes de bruits* served as illustrations of his ideas on musique concrète. In his *Etude violette* (1948), the sole sound source is the noises that can be derived from a piano. The etude "consists of isolating sound fragments or rhythmic figures in different tempos and at different pitches, to be used structurally with different techniques: reverberation, reverse playback, etc." (Chion 2002: n.p.) The importance of *Etude violette* for the development of *Flux*|*Pattern* is that this particular musique concrète etude deals with sounds derived from a traditional instrument. Since the series *Flux*|*Pattern* was conceived as etudes for a combination of traditional and electronic instruments, it was very important to study and experiment with the possibilities of disassociating the instrument as identifiable object (i.e., the piano) from the sounds it produces as proposed by Schaeffer, seeking to mask, blur and combine the spectral characteristics of all instruments involved in my works.
It was this limitation to a single sound source, and Schaeffer's compositional goal to transcend the spectro-morphologic nature of the original source that motivated the creative choices behind *Flux*|*Pattern*.[41]

Project

The development of the *Flux*|*Pattern* series of etudes, in collaboration with Henry Vega (programming and computer performance), the ORCiM researchers Catherine Laws (piano) and Stefan Östersjö (guitar), and the flutist Richard Craig, dealt with creating an experimental setting to come up with possible answers to the questions presented in the introduction – experimenting with the possible musical relationships between traditional instruments and live electronic set-ups, with the interrelation of the roles of composer, performer and instrument builder in computer music, with evaluating the models of emulation and skill differentiation in computer music

[41] According to Denis Smalley, spectro-morphology "refers to the descriptive analysis of perceived morphological developments in sound spectra over time." (Smalley 1986: 61) What I consider important as a follow up to the definitions of sound morphology by Schaeffer, is the incorporation of the time variable, the perceptible change of the morphological structure of a sound while being listened to.

instruments, and with the influence of non-sounding aspects of music performance in a concert situation.

The goal was to recover the artistic and technical achievements produced during the previous work of The Electronic Hammer. The project started from the premise that looking into the interdependence of the roles of composer, performer, and instrument builder in computer music could lead to a re-evaluation of how traditional instrumentalists understand learning, practicing, technical improvement and performing.

Through the work conducted within that experimental setting, it became possible to define two clear goals that relate to the relationship between traditional and electronic instruments.
The first goal deals with the selection of a specific musical aspect common to both traditional and electronic instruments (and performers), the problematisation of this musical aspect, and its possible solutions through performance. The musical aspect selected for *Flux|Pattern* was *performative listening*, which was defined as the auditory feedback that allows the evaluation of one's own performance. The problematisation of performative listening started from the evaluation of its role with regard to electronic media and their possible transference to traditional instruments. The formulation of the musical problem dealt with the absence of primary (tactile) feedback in electronic instruments and the understanding of secondary (auditive) feedback as the only point of reference in playing an electronic instrument.[42] Thus, the goal was to focus on the act of listening as the evaluation tool of one's own performance as if it were the "primary feedback" for both electronic and traditional instruments. Eventually, the intention to exercise the listening flow between the performers by responding to a predetermined framework, led to the design of a dynamic cue system, programmed in SuperCollider, that would generate patterns of onsets and pauses for each performer on the basis of both individual and collective density of playing.

[42] An exception to this lack of tactile feedback is the "crackle box", an electronic instrument developed by Michael Waisvisz in the 1970s which provides small electric shocks to the performer interacting with the circuit. STEIM, the Dutch Studio for Electro-Instrumental Music still offers a version of the circuit. More information is available at
http://steim.org/product/cracklebox/.

[Image: Video of the dynamic cue system developed by Henry Vega in SuperCollider 3]

The second goal highlighted an interdependent relationship between traditional and electronic instruments. This was achieved by designing the musical materials of both on the basis of blurring the spectro-morphological identity of each instrument through (live) sampling and filtering. It was necessary to emphasise those elements of Schaeffer's use of the etude as illustration for the ideas of musique concrète. That is where the focus centred on showing the multithreaded role of the electronic music practitioner: selecting the sounds, manipulating them with (re)created tools, and capturing the result (or performance) on fixed media.

The first versions of the piece consisted of three simultaneous fluxes – that is, three continuous musical gestures that operated as semi-independent units, following predetermined multi-parameter directions (from high to low pitch, increase of density and decrease of amplitude). The three gestures shared several timbre commonalities and were cued by the computer system, which then determined when and for how long a particular flux would be allowed or whether it needed to be interrupted. The cue to resume playing ("the green light") was given by the same computer system, inviting the performer to choose how and when to continue, on the basis of both the current sound activity and the position within his or her own flux at the moment of interruption ("the red light").

[Video: Video of the rehearsal, with the cue system visible]

To merge all these considerations, the second stage of the research led towards the production of the musical score or structural diagram. It was created to serve as documentation of the sedimented processes of generating, testing and refining the materials generated by the performers, as well as the different patterns given by the computer cue-system. It became obvious at this point that to develop the project further, particularly with new potential performers, it would be convenient to present this documentation as a jump-start for producing new versions.

[Image: Structural diagram for *Flux|Pattern II*, for flute]

The first performances of *Flux*|*Pattern* (I to III) took place during the fourth ORCiM Research Festival at the Orpheus Institute, Ghent, 2–4 October 2013.[43]

Reflection

The production of *Flux*|*Pattern* aimed to determine what had been achieved by the two computer performers of The Electronic Hammer with regard to the development of musical and technical performance skills during the eight years of activity of the trio. It allowed them to explore what salient elements of the particular setting proposed to composers could be developed further, both as a duo and in combination with selected instrumental performers. By reflecting upon the different notions of etude in traditional instrumental composition, it was possible to create a framework in which aspects of traditional instrumentality and composition as problematisation of a musical aspect were used to find a common challenge in performance for both traditional instrumentalists and electronic performers. The understanding of Messiaen's and Schaeffer's compositional ideas, articulated in their etudes, helped to give shape to the material and sonic identity of *Flux*|*Pattern*.

The original questions that served as motivation for the development of the series of etudes dealt with the relationship between instruments (electronic and traditional), with the relationship between performer and instrument, and with the interaction between the roles of composer, performer, and instrument builder in the persona of the electronic practitioner, as well as its potential influence on traditional instrumentalists. Furthermore, the goal was to turn the tables in the creation of a piece for traditional instruments and live electronics that, rather than following a model of emulation from the electronic practitioner towards the traditional instrumentalist, would propose features belonging to electronic music as the starting point. I believe that by identifying a common challenge for both kinds of performer (performative listening), by focusing on the generation of common sound-objects among all instruments and deriving musical structure from computer based performance analysis, we generated several avenues for reflecting upon these issues.

After the first performances, one of the aspects that became necessary to address was the sensorial discrepancy between the musical challenge (performative listening)

[43] To watch the recording of Flux|Pattern_II go to http://www.youtube.com/watch?v=DeUlxc380SM.

and the way it was being controlled in the piece (the visual cue system). More recent versions of *Flux*|*Pattern* have addressed this issue by taking away the visual cues for the performers and replacing it with a pre-recorded soundtrack, which in turn is being triggered or paused according to the cue system. This has helped to reinforce the performative challenge of listening: evaluating and matching (or contrasting) each member of the ensemble's performing activity in relation to the soundtrack has become the new challenge, as well as the structural backbone of *Flux*|*Pattern*.

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