FROM EMULATION TO INSTIGATION:

REVISING THE NOTION OF ETUDE AS COMPOSITIONAL FORM IN LIVE COMPUTER MUSIC

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ABSTRACT

Using the notion of the musical etude as "a composition designed to improve technique of an instrumental performer by isolating specific difficulties and concentrating his or her efforts on their mastery", FluxPattern is a series of musical études aimed to pick up and refocus the inherent artistic-research elements found on the collaborative work developed by the author in a research project where the role of the computer and its performer was challenged, explored and developed to achieve the same level of musical nuance, expressiveness and responsibilities as traditional instruments in a chamber music setting.

1. INTRODUCTION

The common understanding of the etude as a musical form is that of a short piece, for a single instrument, aimed to tackle a specific technical problem and present its solution by means of a virtuoso output. When dealing with computer music, it is a practice to draw direct correlations with traditional instrumental practice. The interdependence of the roles of composer, performer and instrument builder in computer music call for a re-evaluation of our methods of understanding learning, practicing and technical improvement as performers.

During the six years of development of the ensemble “The Electronic Hammer” (Diego Espinosa, percussion, Henry Vega & Juan Parra, composers), the problematic of performance improvement in computer music practice was attempted to be tackled by considering and challenging computer performers as traditional instrumentalists. The outcome of this was a novel approach for composers to deal with electronic media.

The problematic presented to the compositional process were not those inherent to the material, but the main challenge(s) were related to successfully emulate traditional instrumental behavior in electronic media: how to create "one" part, but two "electronic" parts in a piece where the language and potentials where contrived to the possibilities (and limitations) of a traditional instrument.

The work methodology of “The Electronic Hammer” had a number of successful results, and although working as a traditional chamber music trio helped develop a rich output and pushed forward various aspects of the artistic output in live computer media, in general, the musical elements that could be consider unique to the electronic domain where always developed in an implicit way. This is to say, the driving force for composers, performer and the manifestation towards the audience was primarily the stage presence of the musicians on stage and the virtuosity of the traditional performer.

2. PERFORMANCE PRACTICE IN COMPUTER MUSIC

The research I am conducting as doctoral candidate at the docARTES program of the Orpheus Institute and the University of Leiden is focused in the development of a performance practice in Computer Music and as such, I am confronted with the need of bringing to light the unique performative qualities of a computer music performer. Therefore, it became necessary to find a work methodology that would both enable the development of a set of musical elements inherent to electronic media as well as their presentation in performance.

2.1 Etudes as compositional form

To contextualize the analytical and creative work conducted in the project “Tracking physicality and embodied musculature in computer music”1, led by the author and developed with several fellows at the Orpheus Research Centre in Music (ORCiM), a research that led to the creation of FluxPattern, I focused on the development of the étude as a musical form departing from being a set of tools for athletics acquisition, shifting to a complication of the problems posed to the performers and landing in a state where the driving force was the problematization of a compositional feature, exposed by the performer in a concert situation. Some of the points of inflection identified throughout history were the following:

- Athletics acquisition (Czerny)
- New athleticism (Lisz)
- Aesthetic considerations (Chopin)
- Creative performance considerations (Debussy)
- Composition and technological problematization (Messiaen, Schaeffer)
- The problematics presented to the compositional media.

For the considerations of this research project, the first important salient was Debussy’s Étude nr. 10, for les sororités opposées, given that is the first instance where the problematization of a musical challenge transcends the athletic dimension.

Other relevant elements were the almost parallel works conducted by Olivier Messiaen and Pierre Schaeffer, both on their treatises (Messiaen’s Traité de rythme, de couleur et d’ornithologie [1] and Schaeffer’s Traité des Object Musicaux [2]) and the use of the étude as a ‘practical implementation’ of the musical problems they were exposing. Boulez points that this period of Messiaen’s reflection and production “was, without a doubt, the most experimental period in his music. His rhythmic research in particular, which became more and more audacious, and his polyphony (l’epode de Chronométrie) became adventurous and extreme…”[3] The work of Schaeffer’s was aimed to define a ‘solos’ of the sound universe “based primarily in sound perception, and by doing so, question the pre-established notions of music, timbre, listening and sound” [4]

His études de bruits served as illustrations (or ‘primitives’) of his ideas on Musique Concrète later developed and presented on his Traité des Object Musicaux.

It was his Étude Violette, which uses as only source the noises and sounds that can be derived from a piano, what motivated the initial instrumental choice for the development of FluxPattern.

2.2 Etudes in Live Computer Music

The first stage of the research process behind FluxPattern brought as initial conclusion the need to relate to the evolution of the étude as "a composition designed to improve technique of an instrumental performer by isolating specific difficulties and concentrating his or her efforts on their mastery" [5] as well as to its less athletic dimension, as a tool for highlighting specific creative problems through performance. In addition, it was necessary to emphasize the musical salients of the études identified in early electronic music, where the focus centered on showing the multithreaded role of the electronic music practitioner: selecting the sounds, manipulating them with (re)created tools and capturing the final result (or ‘performance’) on tape or other fixed media.

To merge all these considerations, the second stage of the research, leading towards the production of the musical work, started by posing the following questions:
- What are the possible musical relationships between traditional instruments and electronic set-ups?
- How does the inter-related roles of composer-performer-instrument builder in computer music practice work together in collaboration with ‘traditional’ performers and composers?
- How can we move from and ‘emulation’ model to a differentiation of skills in computer music instruments?
- How can the non-sounding aspects of music performance help to enhance the malleability and richness of the electronic media in a concert situation?

2.3 FluxPattern

The development of the series of études FluxPattern, in collaboration with Henry Vega (programming and computer performance) and the ORCiM researchers Catherine Laws (piano) and Stefan Östersjö (guitar) as well as the flutist Richard Craig, dealt with the creation traditional and electronic instruments and, its problematization and possible solutions through performance.

In order to make evident the intention inform every decision-making starting from aspects inherent 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 feedback (auditive) as the only point of reference in performing an instrument.

This assumption led to the exploration of different modes of listening, (active, selective) as the point of connection and shaper of the structure of the étude. Eventually, the intention to ‘normalise’ resulted led to the design of a dynamic cue system, programmed in Super Collider, that would generate patterns of onsets and pauses for each performer based on both individual and collective density of playing.

Figure 1. Snapshot of the dynamic cue system developed by Henry Vega in Super Collider 3

b) Highlight an interdependent relationship between traditional and electronic instruments:

This was achieved by designing the musical materials of both traditional and electronic instruments based on blur of spectromorphological identity by means of (live) sampling and filtering, and the use of real time analysis.

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1 For more on The Electronic Hammer go to http://www.electronichammer.com
2 More information and roadmap of the project in http://ampusparc.com/fluxpatternpage17.html
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1. INTRODUCTION

The common understanding of the étude as a musical form is that of a short piece, for a single instrument, aimed to tackle a specific technical problem and present its solution by means of a virtuosic output. When dealing with computer music practice, it seems like a futile exercise to draw direct correlations with traditional instrumental practice. The interdependence of the roles of composer, performer and instrument builder in computer music call for a re-evaluation of our methods of understanding learning, practicing and technical improvement as performers.

During the six years of development of the ensemble “The Electronic Hammer” (Diego Espinosa, percussion; Henry Vega & Juan Parra, composers), the problematic of performance improvement in computer music practice was attempted to be tackled by considering and challenging computer performers as traditional instrumentalists. The outcome of this work was a novel approach for composers to deal with electronic media.

The problematics presented to the compositional process were not those inherent to the material, but the main challenge(s) were related to successfully emulate traditional instrumental behavior in electronic media: how to create “one time” but two “electronic” parts in a piece where the language and potentials where contrived to the possibilities (and limitations) of a traditional instrument.

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• Compositional problematization (Messiaen, Schaeffer)

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To merge all these considerations, the second stage of the research, leading towards the production of the musical work, started by posing the following questions:

• What are the possible musical relationships between traditional instruments and live electronic set-ups?

• How does the inter-related roles of composer, performer-instrument builder in computer music practice work together in collaboration with ‘traditional’ performers and composers?

• How can we move from and ‘emulation’ model to a differentiation of skills in computer music instruments?

• How can the non-sounding aspects of music performance help to enhance the resecutability and richness of the electronic media in a concert situation?

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The development of the series of études FluxPattern, in collaboration with Henry Vega (programming and computer performance) and the ORCiM researcher Catherine Lawes (piano) and Stefan Östergren (guitar) as well as the flutist Richard Craig, dealt with the creation of a composition aimed to develop possible answers to the questions presented above. Through the work conducted within that experimental setting, it was possible to define two clear goals:

a) The formulation of a musical aspect, common to both traditional and electronic instruments (and performers), its problematization and possible solutions through performance.

b) Highlight an interdependent relationship between traditional and electronic instruments to develop possible answers to the questions presented above. Through the work conducted within that experimental setting, it was possible to define two clear goals:

- The formulation of a musical aspect, common to both traditional and electronic instruments (and performers), its problematization and possible solutions through performance.

- Highlight an interdependent relationship between traditional and electronic instruments to develop possible answers to the questions presented above.

In order to make evident the intention inform every decision-making starting from aspects inherent 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 feedback (auditive) as the only point of reference in performing an instrument.

This assumption led to the exploration of different modes of listening, (active, selective) as the point of connection and shaper of the structure of the étude. Eventually, the intention to ‘nomalize’ results led to the design of a dynamic cue system, programmed in Super Collider, that would generate patterns of onsets and pusses for each performer based on both individual and collective density of playing.

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Figure 1. Snapshot of the dynamic cue system developed by Henry Vega in SuperCollider 3
The first iterations of the piece consisted of three simultaneous ‘fluxes’, three continuous musical gestures that operated as semi-independent units, following pre-determined multi-parameter directions (from high to low pitch, increase of density, decrease of amplitude). The three gestures shared several timbre commonalities and were ‘intervened’ by the computer cue system, which took place during the 4th ORCiM Research Festival at the Orpheus Institute in Ghent, in October 2013.  

3. CONCLUSIONS AND THE WORK AHEAD  
This research-through-practice project aimed to determine what has been learned by the two computer performers in terms of musical and technical performance development over the years of activity of “The Electronic Hammer” and explored, both as duo as well as in combination with selected instrumental performers, what salient elements of the unique setting can be further develop. The final ‘etudes’ helped to highlight how aspects of “traditional instrumentality” can serve to expose performance and musical elements unique to the potential of electronic media. A next experimental setting will look for more intuitive ways to incorporate the active/selective ‘listening’ attention of the performers was at times replaced by a conscious ‘anticipation’. Future work will aim to keep an inner structure and cue system in the auditory, sensorial dimension.

4. REFERENCES  

ABSTRACT  
This paper discusses the new harmonic possibilities enabled through the implementation of Sethares’ theory of the dissonance curve in Max/MSP and its use in a live electronic composition by two of the authors.  

1. INTRODUCTION  
Much of the research informing the authors’ composition Shards (2012) has been informed by the notions of consonance and dissonance outlined by William A. Sethares in his book ‘Tuning, Timbre, Spectrum, Scale’. Sethares writes that the notion of sensory consonance and dissonance has two implications. Firstly, individual complex tones will have an intrinsic or inherent dissonance:  

Since dissonance is caused by interacting partials, any tone with more than one partial inevitably has some dissonance. This is a stark contrast to all the previous notions, in which consonance and dissonance were properties of relationship between tones. [1]

Secondly, that consonance and dissonance will depend not only on the interval between tones, but also on the spectrum of the tones used,  
Since intervals are consonant when the partials interact, the exact placement of these partials is crucial. [2]

The latter is something that Pierce was already aware of more than thirty years earlier in the 1960s when working with his arbitrary scales and correlating sounds [3]. Based on these experiments, our research examines how sounds with other kinds of spectral relationships work together to derive a new sense of harmonic consonance and dissonance in our electroacoustic compositional practice.  

2. SETHARES DISSONANCE CURVES  
Composer and theorist Harry Partch begins chapter nine of his ‘Genesis of a Music’ with the following,  

According to Galileo, “agreeable consonances are pairs of tones which strikes the ear with a certain regularity; this irregularity consists in the fact that the pulses delivered by the two tones, in the same interval of time, shall be commensurable in number, so as not to keep the eardrum in perpetual torment, bending in two different directions in order to yield to the ever-dissonant impulses.” The fairly “perpetual” torment which is our heritage in Equal Temperament has long obscured this aural axiom. [4]  

Partch’s work and research is based on a tradition dating back to the ancient Greeks, the Pythagoreans and Ptolemy in particular, through music theorists and mathematicians such as Zarlino, Rameau, Galileo, Kepler, Helmholtz until the early 1900s. Partch was interested in creating music based on scales with more than 12 notes per octave. He built his own instruments, such as the Chromelodeon, a reed organ, in order to play the music he had composed with a scale of 43 scale steps per octave. He tuned his reed organ with “no other aid than the ability of the ear to distinguish pulsations ‘commensurable in number’ and those which bend its tympanum in two different directions” [5] in this 43 tone per octave scale with the focus on Just Intonation. By doing this, as summarised by Sethares, “classified and categorised all the 43 intervals in terms of their comparative consonance”. [6]  
A consonance curve portrays the perceived consonance and dissonance versus musical intervals. Helmholtz’s roughness curve [7], Plomp and Levelt’s consonance curve [8] and Partch’s “Once Upon a Bride” [9] are examples of dissonance curves. All of these dissonance curves show how the ear perceives sounds with harmonic or no (pure sine tones) spectra as sensory consonant or dissonant traditionally “consonant” step scales, if the scale is tuned in Just Intonation (rather than the equally tempered tuning). The points of maximum sensory consonance occur on the scale steps, which shows the correspondence between spectrum and scale. Sethares’ dissonance curve is however, mathematically constructed to portray the perceived consonance and dissonance versus musical intervals with sounds containing any spectra. A comparison with Sethares’ dissonance curve (Figure 2) and an experiment carried out by Kameoka and Kuriyagawa [10] show that Sethares’ calculations are related to the results of their experiment (Figure 1). In Kameoka and Kuriyagawa’s third experiment presented in 1969, chords of two identical complex tones were used. One of the tones containing eight partials was fixed at 440 Hz and the other tone was played together with the first from 440 Hz to 880 Hz (an octave) divided into fifteen steps. The degree of dissonance was calculated for each step according to the circles seen in Figure 1. The results from the experiment showed that the degree of consonance and dissonance seemed to occur on the same minima and maxima steps that were calculated in advance.