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Author: Parra Cancino, Juan Arturo
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On Interpretation Paths

During my research trajectory towards a performance practice in computer music, as a composer and a performer I have constantly dealt with the problem of *roles*. By this I mean the understanding that computer music practice demands that practitioners merge or *blend* in one person the roles of composer, performer and instrument builder/technician. At present there is almost no tradition of computer music practitioners trained or focused on interpretation of live electronic repertoire. Composers often become the performers of their own works; therefore, they become logistically bound to the presentation of their own music in front of an audience.

In addition to this many of these composer/performers also became the designers and builders of the instruments they were playing. Facilitating the creation and performance of works dealing with electronic instruments from the position of the interpreter was my initial motivation to develop a performance practice, and consequently, an *interpretation* practice where I could put my technical and musical skills at the service of others.

The development of interpretative skills brings with it the inherent challenge of searching for suitable repertoire that either explicitly demands the expertise of a computer performer in charge of the electronic media component of the piece, or presents a potential for such a musician to contribute his or her skills to the performance of music not written for electronic instruments.

I will present three case studies serving different initial needs and skills, detailing occasions on which I became familiar with and helped develop performance tools and techniques. Each of these case studies responds to a different approach for understanding the notion of interpretation: I have called these three categories *reconstruction*, *reinterpretation* and *re-appropriation*, depending on the degree to which the traditional notion of music interpretation was challenged. These categories are connected to the three sets of skills inherent to my understanding of the figure of the electronic musician (composer, performer and instrument builder) and how these skills are initially better suited to address the performative task. The three case studies are:
- Luigi Nono’s *A Pierre. Dell’azzurro silenzio, inquietum* and *Post-prae-ludium nr. 1 per Donau*, dealing with interpretation as *reconstruction*, starting from the skill set of the computer music performer as technician/instrument builder.

- John Cage’s *Aria/Fontana Mix* dealing with interpretation as *reinterpretation*, starting from the skill set of the computer music performer as a performer, recovering a pre-existent performance practice.

- Morton Feldman’s *The King of Denmark*, dealing with interpretation as *re-appropriation*, starting from the skill set of the computer music performer as composer, informing music interpretation.

These case studies served as antecedents to my own compositions developed within the framework of this research trajectory.
Reconstruction: On Luigi Nono’s *A Pierre* and *Post-prae-ludium*

Introduction

One of the problems inherent in the preservation and dissemination of live electronic music is the dependence of many such works on a specific set of tools. The use of apparatus created primarily for the recording and reproduction of sound (microphones and tape recorders) or for the measurement and testing of signals in the studio environment (tone and noise generators) is intertwined with the beginning of electroacoustic music. The transition from adapting these machines for creative purposes during the 1950s towards the construction of dedicated tools for electronic music creation during the 60s and 70s, as well as the advent and democratisation of computer technology during the 80s and 90s into the present, has created a flow of technological development, and therefore, of technological obsolescence. This has contributed to a difficulty in preserving musical works created with a specific technology in their original format, posing serious problems for the sustainable reproducibility of compositions involving live electronics, and therefore, for establishing a core repertoire to relate to as practitioners.

There are two main approaches to tackling this issue. The first approach advocates fidelity to the original conditions under and in which the piece was created, and defends and promotes the use of the original tools and technical setups.\(^{15}\) Although this would arguably be the ideal choice, particularly since the inherent limitations of certain tools are as obvious in the final result of a piece as are their declared features, the practicalities of such an approach negatively affect the potential of this music to be widely disseminated since it requires not only equipment that is difficult and costly to acquire and maintain but also a build-up of time and manpower that prohibits access to the setup for extended periods of time in contexts outside big, well-funded productions.

A second approach towards the preservation of live electronic music works is focused on dissemination and transferability. Starting with the acknowledgment that the

\(^{15}\) Such is the case in several of Steve Reich’s productions of pieces requiring AKAI samplers and their floppy-disk-loaded sound banks, and, more pertinently to this thesis, performances of music by Luigi Nono produced during his time at the Experimentalstudio der Heinrich-Strobel-Stiftung des Südwestfunks in Freiburg.
replacement of certain components or tools in the original setup of a piece will undoubtedly transform the final sonic result, this approach chooses to design digital models (mainly in software) of the entire system required for the reproduction of a piece. Although this reduces the costs while increasing the possibility of dissemination, it generates a new set of problems: first, the inherent limits of the tools are lost (along with their impact in the decision making process of the composer while making the piece); second, there is a lack of standardised computer tools.

The paradox of replacing potentially obsolete technologies with current ones is that the notion of currency has become increasingly ephemeral, particularly in digital media. Anyone familiar with current consumer-oriented computer technology has suffered the pressure to accept a schedule of obsolescence that gets shorter and shorter. This means that – even when the software tools created and used by computer musicians attempt to remain stable and backwards-compatible – the operating systems of the platforms used to run these tools might have a completely different agenda.¹⁶

Context
In the 1980s, the last decade of his musical career, Luigi Nono felt the positive impact of technology on culture and its contribution to social emancipation. At the same time, his output departed from the directly political topics he raised in his earlier works and began exploring the creation of music that proposed new ways of listening. These explorations culminated in Prometeo (1984), featuring texts by Hesiod, Friedrich Hölderlin and Walter Benjamin, which explores the origin and evolution of humanity. Nono’s shift towards a timeless and visionary context, which questions and challenges the relationship of oneself with the environment through listening, is expressed in his beautiful 1983 text “L’errore come necessità” (Nono 2001: 522):

¹⁶ The endless back-and-forth exchange between publishers and potential performers of pieces using digital live electronic elements has become an almost unavoidable part of the preparation process of a performance – a process that discourages many non-technically-oriented musicians from approaching this repertoire.
Silence.
Listening is very difficult.
Very difficult to listen to others in the silence.
Other thoughts, other noises, other sounds, other ideas. When one comes to listen, one often tries to rediscover oneself in others. To rediscover one’s own mechanisms, system, rationalism in the others.
And this is a violence of the utmost conservative nature.
Instead of hearing the silence, instead of hearing the others, one often hopes to hear oneself once again. That is an academic, conservative, and reactionary repetition. It is a wall against ideas, against what is not yet possible to explain today.
. . . To listen to music.
That is very difficult.
I think it is a rare phenomenon today.
. . .
Perhaps one can change the rituals; perhaps it is possible to try to wake up the ear. To wake up the ear, the eyes, human thinking, intelligence, the most exposed inwardness.
This is now what is crucial.\textsuperscript{17}

Pianist and musicologist Paulo de Assis (2014: n.p.) remarks that

Nono’s late works bring the inner musical structures and features to the foreground, focusing on small instrumental forces, on subtle harmonic fields and clearly differentiable vertical sound-aggregates, on extreme soft dynamics and fine articulation markings, on fragmented successions of sections, and on a highly elaborated dialogue with old historical forms. The act of \textit{listening} to these works becomes a highly demanding process – the listener being confronted with his/her own capacity of listening.

Works from Nono’s late period require a completely different attitude to the conception of the work as a whole: sound perception, flexibility in the notation, the behaviour of performers, and positioning musicians and audience in the concert space. Regarding this concert space, musicologist Angela De Benedictis remarks that it “was conceived as an environment in which spatial and temporal relationships could form part of a total dimension both in acoustic terms (with the multiplication and spatialization of the sound sources) and visually (by eliminating the separation of stage and auditorium).”\textsuperscript{17}

\textsuperscript{17} Translation by Paulo de Assis.
The antecedents for this use of the space in Nono’s work come from the polychoral practice of the composers of the San Marco Basilica in Venice, such as Andrea and Giovanni Gabrieli and Adrian Willaert. (Raposo Martín 2009: 281)

Nono’s search for an ever-moving sound to activate the concrete and perceptual musical space he was proposing, what he calls the *suono mobile*, dates back to his *Epitaffio No. 2* from 1952 – in other words, before starting to work with live electronics.18 “The execution of the same sound by different instruments situated on different points onstage, carries a stereophonic, spatial, group quality that conditions and modifies how the total sound effect that reaches the audience is heard.”19 (Raposo Martín 2009: 277)

In preparation for performances of his large later works involving electronics, such as *Prometeo* (1984), *Caminantes.....Ayacucho* (1986–1987) and *No hay caminos, hay que caminar.....Andrej Tarkowskij* (1989), the position of the performers was determined by a careful calculation of the resonance characteristics of the venue. As a result, the orchestral groups were placed in different parts of the performance space to achieve the desired spatial trajectories for the sound lines between instruments.

Since the function of the live electronics in these works was primarily to extend, expand and project the instrumental resonances onto the physical space, for every new performance a new adaptation of placement and programming of the electronics was required, and thus flexibility in musical notation was necessary, as well as a sensitive understanding of the performer who must react to the subtleties of micro-variations in pitch, dynamics and timbre. In relation to this, Claudio Abbado (1999: 4–5) remarks that

> While it is true that the acoustics of a hall will influence the sound of any music, the works of Nono have to be actually recreated in every new hall. It was a profoundly moving experience to bring Gigi’s music to life together with young musicians [Gustav Mahler Youth Orchestra], to explore boundaries, to overcome limitations, to realise the

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18 Luigi Nono introduces the term *suono mobile* in his handwritten notes for *Guai ai gelidi mostri* (1983). (Nono 2001: 491–492)

19 My translation.
challenges of the score in ever changing circumstances: in other words to find new ways to new music.

In this last creative period, Nono also challenged the nature of the performative unit created by interpreters and their instruments – whether traditional or electronics. Highly accomplished performers were required to display a kind of “static” virtuosity: utmost concentration and control of the most subtle changes in sound, while retaining the ability to interact with the rest of the group. Nono’s considerations of the potential of live electronics helped create a new “musical space” in order to challenge both audience perception and the spatial conventions of the concert situation, as well as the instigation towards performers to challenge their relationship with their instruments. These are elements that not only influenced my work as a composer – as I will explain in the case study “On Multiple Paths” – but also prompted me to reflect upon and make decisions about the demands towards the reconstruction of the technology and the performance practice of the electronic setups for his *A Pierre. Dell’azzurro silenzio, inquietum* and *Post-prae-ludium nr. 1 per Donau*.

**Project**

I have been fortunate to work on Luigi Nono’s music in different capacities. My most striking experience was as a technical and artistic collaborator on the project “Seizing the Ephemeral”, led by musicologist Friedemann Sallis of the University of Calgary and conducted at the Banff Centre for the Arts in February 2009. This musicological, technical, and artistic research project aimed to unravel the musical secrets of *A Pierre. Dell’azzurro silenzio, inquietum* (1985), for contrabass clarinet in B♭ and contrabass flute in G, and *Post-prae-ludium nr. 1 per Donau* (1987), for tuba and live electronics, to “capture, for conservation, transmission and study, those aspects of Nono’s late work that can not [sic] be notated conventionally.” (Burleigh and Sallis 2008: 1)

From now on, when mentioning this works, I will use the abbreviations *A Pierre* and *Post-prae-ludium*, respectively.

According to Sallis (Burleigh and Sallis 2008: 1),

*A Pierre* and *Post-prae-Ludium* involve real-time manipulation of sound, producing micro-tonal variation and spatial distribution of sounds and [...] these aspects have the
effect of short-circuiting traditional musicological analysis. The musical scores provide reliable information for the preparation of a performance, however, as the editors admit "the acoustic and dynamic result [of a concert performance] will not correspond to the graphic notation."

Since the graphic notation used to represent the actions of the live electronic component did not correspond with the sound result of the piece, it was necessary to look into the actual sound results to understand better the musical structure.

The method of the "Seizing the Ephemeral" project was, first, to produce a recording of both pieces, and, at a later stage, to analyse, study and interpret the recording by incorporating sonograms and other computer-based analyses into the traditional study of the score. In addition to the recording, the research data included interviews with the performers at the different stages of the project (preparation, rehearsal, concert and recording).

Initially, my involvement in this project was purely technical. The task was to create computer models of the original live electronics setup, to allow the performers and researchers involved uninterrupted access to the whole musical system for an extended period.

One of the drawbacks with creating digital versions of early electronic music setups are the choices that occur in the mapping and design of the interface. Unless one is using commercial software and adapting the signal processing and routing to the features and limitations of that software, the decisions made in rendering the functionality and signal flow will almost inevitably make the designer the most suitable performer of the system.

For this reason I was invited to become more involved in the project as a performer, thus expanding my own artistic involvement with the pieces through searching for connections between the score and the intrinsic potential of the electronic components of the two pieces. What is presented as notation for the electronic performer in the scores is more a suggested guideline for actions based on previous performances, rather than the product of a preconceived musical idea devised by Nono. I considered that by unravelling the potential interpretative opportunities available in the relationship
between traditional instruments and electronic systems, I could both find my own artistic position and help to define what an electronic performer could contribute to these works.

I will now describe the electronic setups for both pieces, how I reconstructed them in the digital domain, what musical salients I identified in the reconstruction process and how they influenced my artistic choices.

**A Pierre**

The electronic setup consists of two delay lines set to no feedback, which results in a single repetition of any incoming signal. The delay times are twelve seconds for the first delay, and twenty-four for the second (which is effectively another twelve-second delay on top of the first). Anything played is thus repeated twice: first twelve and then twenty-four seconds later. The choice of these durations is far from arbitrary: they are the result of studio experiments conducted by Nono in collaboration with Hans Peter Haller at the Experimentalstudio der Heinrich-Strobel-Stiftung des Südwestfunks in Freiburg, whose goal was to find the threshold of short-term auditory memory. This twenty-four-second threshold emerged as the necessary time span to perceive a repeated sound event as new and thus no longer connected to its source. Further experiments targeted shortening this time span. Nono and Haller observed that if the repeated event was presented with an alteration in its timbre (filtered), the time span between original sound and repetition could be shortened by half: a filtered repeated event was perceived as new after only twelve seconds.²⁰

This constitutes the entire electronic setup for **A Pierre**: an initial sound event is filtered and presented twelve seconds later, and presented again, unaltered, twenty-four seconds after its original exposition. The live electronic performer must make musical sense of this reality to help shape the structure of the piece.

[Media: How is A Pierre set up: Scheme, score and audio excerpt]

²⁰ This kind of experimental setup is very interesting since it merges a psychoacoustic enquiry with an artistic one. Most research done on auditory time spans focus on either echoic memory (short-term span) and its connection to memory development and speech. (Anderson 1939: 95) Connecting these lines of research directly into the creative experimental process is what makes Nono so fascinating.
If the electronic performer were to stop analysing the piece once the technical setup was successfully reproduced, there would be little else for him or her to do other than to control the potential feedback from the microphones once they start picking up repeated information coming from the loudspeakers, and to balance the overall dynamics of the amplified instruments and the delayed signals. Were this the only job at hand, it would be easy to feel disappointment that there was not more to access – and therefore, influence – in the musical development of the piece.

My personal approach to the role of the electronic performer in _A Pierre_ was to study the instrumental score to understand the challenges Nono set for the instrumentalists, and from there to consider how I could relate the electronic system to those challenges. In doing so I found a performance strategy informed by the material itself and not only based on aesthetic choices made by previous performers.

What I discovered was a deceptive simplicity. The score of _A Pierre_ is written in 4/4 and has a tempo marking of $\text{♩}=30$. At first glance, there are very few events per bar (if we want to use note density as a measure). But precisely herein lies the stimulating aspect of this piece: the apparently simple tasks required from the performers become extremely complicated because of two factors.

The first factor – what I referred to above as the challenge of the performative unit – is to place performers in conflict with their instruments by demanding actions and sounds that go against their nature. Nono’s choice of dynamics and pitch make this true for both the flautist and the clarinettist. For most of the piece, the performers are asked to play at the top of their instrument’s pitch range but with extremely soft dynamics (pppp), which requires a high level of tension and gives very little control over the result – they play on the verge of breakdown. What this creates is only the first layer of confusion in this piece. It is extremely difficult for anyone playing, once the instruments are amplified and the sounds are being repeated in the space, to connect with certainty any actions with the sounding results.

The use of fermatas creates a second level of confusion for the performers. Their durations are up to the discretion of each performer, with suggested durations of six to eight seconds. These successfully destroy any sense of temporal stability in the otherwise rigid grid of 4/4 at $\text{♩}=30$. So even if one performer wanted to stay in the grid, the other will have a six- to eight-second temporal suspension, which, added to the
kind of sound material being produced, breaks any hope of metric stability. This confusion is already present before adding the layers of delayed instrumental sounds.

During my collaboration with the “Seizing the Ephemeral” project, I had the opportunity to reflect upon how these elements of the instrumental part of *A Pierre* influenced the setup of the electronic system and how they could potentially be reinforced by the performance of the electronic part. Given that the goal of the project was to shed light on the musical and structural elements of the piece that are absent in the score, I felt encouraged to introduce my take on Nono’s technical and creative choices into the performance as much as possible.

Although using digital technology to reproduce analogue electronic equipment, I attempted to preserve the inherent limitations of the automation and routing of the original setup, considering them part of the identity of the electronic instrument. In the case of *A Pierre* and *Post-prae-ludium*, these limitations of the original material are, more than technical considerations, connected to cost, dimensions and availability. The use of dedicated hardware for each delay and filter necessitates a number of routing choices given the number of inputs and outputs and the processing power of the tools. The routing choices seem arbitrary when dealing with a computer-based version of the setup. It was, and still is, my opinion that these choices are not only an essential contributor to the sonic and structural identity of these pieces, but demand from the electronic performer decisions that lie between the technical and the artistic and, therefore, should be preserved when dealing with computer models.

I wanted to draw a connection between the apparent simplicity of the score and the unravelling complexity of the musical result. The challenge was to relate the task of keeping the balance between input and output levels for the electronic performer to the playing of very high pitches at very soft dynamics by the instrumentalists.

In the rehearsals conducted at the Banff Centre, with Marieke Franssen on contrabass flute and Carlos Noain Maura on contrabass clarinet, it became clearer that one of the biggest challenges was to control feedback in the system. This feedback was induced by two factors that were part of the original setup: The sound projection is done over four loudspeakers, two directly behind each performer and two at the back of the hall. Since two microphones capture the sound of each performer and they sit directly in
front of a loudspeaker, the amount of sound emanating from the loudspeaker that is recaptured by the microphone is quite substantial. To avoid immediate feedback, the electronic performer must constantly act as a real-time, human limiter-compressor who opens the microphones when the instruments are playing but reduces their sensitivity when the repetitions come back too loudly through the front speakers. Accepting this task plunges the electronic performer into the twelve-seconds/twenty-four-seconds cycle of the piece and leads to more calculated choices for the sound location of the repetitions within the performance space.

[Audio excerpt: Demo of the twelve- and twenty-four-second delay cycle, and the room feedback that needs to be controlled]

The second source of feedback – an additional challenge for the electronic performer – comes from the use of band-pass filters to modify the first wave of repetitions. The schematics for the piece indicate that the incoming direct signal of each instrument’s microphone must be routed to the opposite speaker (so that the direct amplified sound of the flute comes from the speaker behind the clarinet and vice versa). In performance, this adds an extra layer of confusion, which makes controlling the feedback induced by the heavily filtered repetition entering the microphone (and going to the opposite front speaker) extremely difficult.

All these elements make the system very sensitive and fragile. The musical challenge that *A Pierre* poses to the electronic performer resides in controlling and balancing the overall sonic texture.21

[Media: sound excerpt of *A Pierre*]

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21 Although some computer-based performances of this work take advantage of the automatisation and dynamic limiting and compression possibilities of today’s sound amplification technology, I strongly advocate preserving the risks of the original setup as the starting point for the creative contribution of the electronic performer in a concert situation.
Post-prae-ludium

The creative process for Post-prae-ludium was somewhat similar to the one of A Pierre. Intended as the first of a series of pieces for solo instruments and live electronics written by Nono for (and with) his close collaborators, it ended up being the only one of these works ever officially finished. Created in collaboration with tubist Giancarlo Schiaffini, the piece employed an experimentation process that started with the documentation of the extremes of the frequency and amplitude ranges of the tuba. Schiaffini remembers being asked to present his personal range extremes on the tuba, as well as his own approaches to timbre transformation. All these findings were then used as source material, organised on a score with a timeline, which provides a “traditional” linear progression to the time structure of the piece. Schiaffini recalls that “we experimented with different instrumental and live-electronics techniques. Sometimes it was a kind of improv to be recorded and studied.” (Tignor 2009: 9) In addition, to adapt the sound to the musician, Nono was known to explore the instrumentalist’s sound world within experimental sessions such as this. Schiaffini states that “the composition was tailored to my technical possibilities; he wanted to know different transformation of sound (1st page), then the highest and the deepest pitch, the most powerful (loudest) and on these extremes (as fffff and pppppppp) he built the composition.” (Tignor 2009: 9)

Just like the apparent rigidity of the notation grid of A Pierre, Post-prae-ludium proposes a path to the performer where the first step of the journey seems to dissolve the apparent rigidity of the path itself. The piece is divided into five sections for the tubist and four programmes for the electronics, each of which are assigned to one of the sections of the piece. Extremes of pitch and the timbral limits of the tuba are explored in the instrumental part and are further shaped and expanded by a series of spatial and temporal displacements controlled by the electronic performer.

[Media: How is Post-prae-ludium set up: Scheme, score, and audio excerpt]

Originally, this piece required two technicians for the opening section. In this section the electronic setting consists of four delays of fixed duration (five, seven, ten and thirteen seconds of time difference) feeding into a double spatial rotation system developed by Hans-Peter Haller (and therefore named the Halaphon). The function of the first technician was actively to open and close the input of the tuba signal routed to the different delays, while the second one varied the speed of the Halaphons, which
rotated in opposite directions (clockwise and counterclockwise). This produced an unpredictable layer of delayed and chopped-up tuba sounds that appeared unexpectedly from the speakers located in each corner of the room.

![Score of Post-prae-ludium]

The score shows how the tuba player needs to switch from system to system, selecting the musical material offered, which depends on the path chosen. The score also presents a suggested dramaturgy for the opening and closing of the delay inputs that, given the different speeds of the halaphone and the choice of material produced by the tubist, inevitably creates different sound results from one performance to another.

![sound example]

Haller (Haller 1999: 13) mentions that

Nono thought of the interpreter as an equal partner in his work. He considered the instrument and its player, a voice and the personality of the singer, as a unity. In his imagination an abstract sound could exist, but usually he connected it with the personality of an interpreter. [...] The flautist Roberto Fabbriciaini played with his mouth and nose very close to the microphone; as a result of this experiment, the musician was able to additionally produce wind sounds with his breath directly in the microphone while he played a normal sound. [...] This playing technique represented one of the materials which Nono used for the flute part of *Das atmende Klarsein*, electronics sound extensions by means only of the microphone.

Although these timbral transformations might seem rudimentary compared to the possibilities of manipulation of timbre in electroacoustic music today, it is fair to say that no fundamental evolution has taken place in the world of signal processing in the digital domain since then.

*Post-prae-ludium* was studied, performed, and recorded during the “Seizing the Ephemeral” project, with tubist Tjeerd Oostendorp. In this piece, the main challenge for me was to adapt the original electronic setup, conceived for two electronic technicians, into a system controlled by one single performer, while preserving the limitations of
both the original system and the tasks assigned to each technician. Rather than using automatisation procedures in the digital domain, I opted for a simplified layout of the entire system interface where, emulating a rack of hardware equipment, I had all effects available and active at all times, and could activate any of the sections at all times, rather than shifting between each module or “programme”. In doing so, I succeeded in preserving the challenge of gatekeeping the incoming signal of the tuba, while being able to follow the path delineated during the performance and activate/deactivate each section of the electronic setup accordingly.

Reflection
A close examination of the tools Nono used in his pieces with live electronics reveals how he was able to devise performative strategies that transcended the limitations and characteristics of the time and place in which these tools were created. His timeless, and therefore very current, musical notions are instrumental to my understanding of musicianship in live computer music. They can be distilled into two key concepts, which I will elaborate later: the transformation of the physical space over time and the challenge of the performative unit.

In addition, in the case of A Pierre, as in most of Nono’s pieces for multiple instruments and live electronics, there is the goal of con-fusion, understood as “fuse-with”. This is a task given to the traditional instruments, the aim being to create a common timbre by weakening the upper harmonics of the instrument (therefore generating a signal as close as possible to a sine-tone). The demand on the electronic performer is to deal with the delicate challenge of amplifying this con-fusion without adding any extra colour to the global spatial mix. For this reason, the use of compressors or limiters for the incoming signal is not recommended, since they might introduce a slight colouring that could potentially destroy the illusion of fusing the timbre of the two instruments.22

22 These ideas about con-fusion, as well as the technical and aesthetic functions of using very weak instrumental sounds, come from my personal notes taken both during the course on interpreting Luigi Nono’s, conducted by André Richard (et al.) at the Fondazione Giorgio Cini, Venice, Italy, 2–7 November 2007, and during the performance and recording sessions of A Pierre, Dell’azzurro silenzio, inquietum and Post-prae-ludium nr. 1 per Donau, organised by Friedemann Sallis at the Banff Centre for the Arts, 20–27 February 2009.
As a composer, I wanted to extract this information and reshape it in my own musical output using the experiences gained in the reconstruction of the tools and performance strategies of these two works by Nono. This was the initial impulse for the series of experiments leading to *Multiple Paths (omaggio a Nono)*. As a performer, in order to transition from technical translation into performative analysis and decision-making, I sought to find points of connection between the inherent qualities of the original electronic setup and the instrumental score. The multithreaded role of the computer music practitioner reveals itself in this project, unfolding the creative and performative demands of a task that was meant to be purely technical: to create a digital version of the original electronic setup. This is what I call interpretation as *reconstruction*. 


Reinterpretation: On John Cage’s Aria/Fontana Mix

Introduction
This case study deals with the notion of reinterpretation, understood as the process of recovering not only a particular piece of music but also the circumstances of composition and original performance of the work in order to adapt them for a performance with electronic instruments. Although they are nowadays considered and performed as individual compositions, Aria and Fontana Mix were first performed together as a single work. This was the point of departure for me to (a) review the compositional procedures behind the creation of Fontana Mix, (b) apply them in the design of a musical instrument to be used in performance, as complement to Aria, and (c) propose a simultaneous performance of both works following the score of Aria as a structural guideline.

Context
One aspect of John Cage’s compositional strategies was his concern with the role of the performer’s contribution to the musical structure of a piece. His abandonment of harmony, and attempt to define structures based on rhythm, opened a creative path that can be illustrated with his early percussion works. The search for new sonorities to fill these structures moved him to extend Henry Cowell’s experiments with preparing the piano and, at a structural level, to deal with the importance of silence as musical material (presented in extremis in his 4’33”). But more important to Cage’s output was his quest for a new philosophical approach to musical phenomena: “I was to move from structure to process, from music as an object having parts, to music without beginning, middle, or end; music as weather.” (Cage 1993: 243–44)

This focus on process rather than on a predetermined structure led Cage to create pieces in which the musical result was entirely dependent on the performer’s creative contribution. The performer’s influence on Cage’s musical output can be perceived through the work of, among others, David Tudor, one of Cage’s closest collaborators. Tudor’s approach to interpreting contemporary piano music was very meticulous; for each piece that was written with a certain degree of indeterminacy, Tudor would produce a detailed performance score with precise, fixed measurements.

Tudor’s approach to Variations II (1961), a piece dedicated to him, was slightly
different and marked a departure from the strict notation of performance scores towards a more personal path, a quest that later would lead Tudor towards the creation of his own compositions for live electronics. For Variations II, instead of predetermining a time structure for the sound events, Tudor designed a binary process in which each sonic parameter could have one of two values: simple or complex. His performance notation consisted of fifty squares, one square per sound event, presented sequentially in rows on the front and back of three narrow pieces of thick paper. These square notations he called “nomographs.” In addition to this non-traditional approach to notation, Tudor incorporated another level of innovation: the use of amplification as a creative resource. He used not just an amplified piano but a system “conceived as an electronic instrument, whose characteristics orient the interpretation of the six parameters to be read from the materials provided by the composer.” (Pritchett 2004: 14)

The setup used by Tudor for Variations II included microphones placed above and below the piano, contact microphones attached both to the piano body and to a set of stiff springs that were used either to play on the strings of the piano or to serve as connectors between the strings and phonograph cartridges (with inserted objects) that could be used as amplifiers and as exciters for the strings of the piano. Pritchett (Pritchett 2004: 14) describes the setup as follows:

This setup produces a number of feedback loops. Playing on the strings of the piano excites the various microphones in different ways depending on their placement and nature. When these signals are amplified and played back into the space, feedback is communicated directly through the microphones but also through the sympathetic vibration of the strings of the piano. The whole system presents a very complex interaction of its various parts. Adjusting the levels of the various microphone signals, the ways in which the cartridges are deployed in the piano, and the ways in which the piano is played will alter the behavior of the whole system.

Tudor’s realisation of Variations II encouraged him as a performer to explore the possibilities of the whole system. The sounds, complex as they were, demanded from him the flexibility to drop ideas and change paths while trying to shape the musical result. His later work as a composer and performer of live electronic music would focus increasingly on the real-time manipulation of sound, reinterpreting Cage’s departure from structure towards process and translating it into an even more radical idea: a
focus on performative gestures rather than sonic results. David Tudor’s contribution to the fleshing out of Cage’s works of this period was then to solidify these processes into sonic identities, reinforcing with each performance the structural salients of the work, acting as a composer from the perspective of performative practice, and, in doing so, mirroring Cage’s performativity in his compositional process.

Project

My own interpretation of Fontana Mix aims to honour both Cage’s and Tudor’s legacies. To interpret such a piece today requires one not only to be aware of the different musical and social contexts (something applicable to any “historical performance” situation) but also to expose and revise the technical limitations of the original material, demonstrating how these limitations were, and still can be, used by the performer to present his or her musicianship. Pritchett (Pritchett 1993: 132) accounts the genesis of Fontana Mix and its relationship to Aria:

Cage used Fontana Mix to compose several other works, beginning with Aria for solo voice. This work was composed for Cathy Berberian immediately after the Fontana Mix tapes were completed in 1958, and was premiered together with those tapes on January 5, 1959. [...] Here, Fontana Mix was used to determine the placement and durations of the events, along with the colors and languages to be used. Aria can be performed together with the Fontana Mix tapes and any part of the Concert for Piano and Orchestra, thus indicating the common ancestry of these three works.

The historical context made presenting Fontana Mix together with Aria a natural choice, not only to provide a clearer view of the historical circumstances but also as a performative strategy that would redirect the time/place structure of “my” Aria/Fontana Mix away from the fixed form of the original (the tape recording) and bring it closer to Cage’s ideas of collaborating with performers. I mention this since other reinterpretations of Fontana Mix, such as Karlheinz Essl’s FontanaMixer (2004–2012) and Max Neuhaus’s Fontana Mix-Feed (1964–1968), have tended to focus on conceptual aspects of Cage’s work (an approach common in modern interpretations of his work), missing the opportunity of (re)instating a dialogue with the inceptual Cage: that is, engaging with and learning from Cage the performer as well as Cage the composer.
Preparing a performance-oriented version of *Fontana Mix* required that the creative process be divided into three parts:

(a) Musical and technical analysis of the original work and its architecture.

(b) Design and creation of “Fontana-Mix: The Instrument”.

(c) Elaboration of an event-oriented score, based on the pacing and events of *Aria*.

The sound materials for *Fontana Mix* are recordings divided into six categories that were defined by Cage for his 1952 piece *Williams Mix*. These are:

(a) City sounds

(b) Country sounds

(c) Electronic sounds

(d) Manually-produced sounds (including music)

(e) Wind-produced sounds (including songs)

(f) “Small” sounds (requiring amplification)

For each category I selected three different sounds having lengths varying between 3 and 30 seconds. No two of the eighteen sound-files have the same duration, and each category has a “short” sound (3-7 seconds), a “medium” sound (8-15 seconds), and a “long” sound (longer than 15 seconds). At this stage, my first creative decision was to use the “c” category (the electronic sounds) to invoke some historical sonic references. By doing so, I intended to make a performative repository out of my *Aria/Fontana Mix*.

All three sounds belonging to the electronic category are strongly linked either to *Fontana Mix* itself or to other electronic music associated with Cage. The sounds chosen were excerpts from Max Neuhaus’s *Fontana Mix-Feed*, a run from Karlheinz Essl’s *Fontana Mix Feeder* generative patch, and live recordings of electronic music performances by David Tudor. The second and third steps – the development of the instrument (with an associated performance technique) and the elaboration of a performance score – were realised using the Max/MSP software environment and TouchOSC, a TCP-IP control client for the iPhone. In the instrument, a computer algorithm randomly selects as next-in-queue a sound event from the available sound material, obeying only one rule: never to choose two consecutive sounds from the same category. The reason for doing this was to aim for a continuous flow of contrasting sounds between categories, which I considered a possible point of connection with the way the sound material for the singer in *Aria* was organised.
In addition to the selection algorithm, a number of mild sound-manipulation algorithms were implemented as additional expression tools for the performer: a panning tool, a band-pass filter, and a reverberation algorithm in which length and resonance are fixed but feedback and early reflections are controlled by the performer.

[IMAGES: Snapshot of Fontana Mix: the instrument and the TouchOSC controller]

The rehearsal process soon revealed a need to divide the events into two global categories: structural and incidental. In order to create a repeatable structure, some sound events in my version of Fontana Mix would remain consistent, appearing after or together with specific events in Aria; these could then serve as structural reference points for both the electronic performer and the singer throughout the piece. This led to a slight modification of the instrument in order to allow the electronic performer to recall these specific structural sound events at any time. The sound events in the second, incidental set, remain a mystery to the performers until they appear. Only then can the limited set of sound manipulations (panning, filtering) be used to shape a new sound event into or away from the material that the performer of Aria is presenting.

Reflection
Where the interpretation project of Nono’s A Pierre and Post-prae-ludium started from a technical challenge that later informed the composer and performer aspects of the multithreaded role of the computer music practitioner, my involvement with Aria/Fontana Mix started from a performance-oriented enquiry: to deal with interpretation in electronic music as a process of recovering both historical performance strategies and the material itself. In other words, looking to interpretation through performance (what I call reinterpretation), opens possibilities to the computer performer that go beyond the materials used, or even the work selected for interpretation. The combination of a traditional notion of interpretation and choice-making processes that traditionally lie in the hands of the composers has resulted in musical ideas that inform my personal practice in a broader performance context.

Aria/Fontana Mix has thus turned into an organic play with various elements of the Cagean conceptual palette: inflexibility of the material, extreme flexibility of the material, chance, the unexpected, control, discomfort, fragility and strength. This play reveals new directions for defining musicianship in live electronic music, invoking a
task that is commonplace for music practitioners but little explored by performers of electronic media: the development of tools and skills that will allow creative expression and decision-making while honouring the aesthetic and conceptual ideas of a different person.
References


Re-appropriation: On Morton Feldman’s *The King of Denmark*

**Introduction**

One of the greatest challenges in computer music practice today is the lack of a performance tradition for almost all its repertoire. The sole fact that we still define computer music and live electronic music by the media that are being used rather than by its aesthetic, historic or social relevance, shows a lack of maturity in these areas. Since we are approaching nearly the ninth decade in the production of electronic music, it seems odd that very few attempts have been made to define the positive aspects of developing a performance methodology around this practice. Additionally, little has been done with regard to experimenting with the collision between what it is possible to derive from traditional instrumental practices and what escapes the norm of a traditional instrumental discipline.

A personal method for exploring and challenging these potential points of connection (and collision), has been the definition of a historical and aesthetic context through the interpretation of music that, although not conceived to be performed live by electronic instruments, is suitable for it, given the relationship between its conceptual framework and its manifestation in sound. This is what I call interpretation as *re-appropriation*.

Looking for repertoire to be interpreted in this way, one of the main elements that I search for is feasibility. This requires an analysis of the musical challenges present in the score, as well as an evaluation of the features and constraints demanded from a specific traditional instrument, and how these could be translated into electronic media. The other important element when selecting potential repertoire is the mapping that the composer proposes between the musical identity of the composition and the performative challenge. This demands a specific way of interpretation. It is here that the element of “appropriation” takes place in interpretation. Once the challenges proposed to the traditional instrumentalist in the score are identified, it is necessary to seek a possible answer to the question of why the composer is posing this challenge, and from there restate the challenge, the question and a possible answer in relation to electronic media.
Context

In particular, solo percussion pieces lend themselves to in-depth exploration, as they tend to focus on using and combining diverse sound sources, thereby generating a rich timbral texture. This is something that is not only feasible for a live computer system but allows one of the unique qualities of electronic media to shine. On the other hand, the interpretative challenges presented to a percussionist can serve as an interesting point of departure for the computer performer, as the rather clean one-to-one relationship between physical action and sonic manifestation can be emulated, contrasted and commented on by a computer music practitioner. Finally, the solo percussion repertoire has a history that in many ways parallels the history of computer music in its ongoing evolution from effect – or novelty – towards maturity.

An example of such a solo percussion piece that lends itself to being re-appropriated by electronic instruments is Morton Feldman’s *The King of Denmark* (1964).

[Sound excerpt: Max Neuhaus version]

The score consists of a grid of densities, timbres and registers, and although it has a set tempo, in the words of the American percussionist Steven Schick, “no rhythmic coherence emerges. Sounds simply float out, detached and weightless. One instrument has no more sonic gravity than another does. A small bell weighs the same – takes up the same acoustical space – as a large gong.” (Schick 1998: n.p.)

[Image: Score of *The King of Denmark*]

In “American Sublime”, the music critic Alex Ross reviews the genesis of and reasons behind the title of Feldman’s composition:

There is no mistaking the lonely, lamenting tone that runs through Feldman’s music. From time to time, the composer hinted that the horrors of the twentieth century, and in particular the Holocaust, had made other, more ornate kinds of musical expression impossible for him. He explained that the title “The King of Denmark,” which he bestowed on a graphic piece for percussion, was inspired by King Christian X, who was
occupying the Danish throne when the Germans invaded his country in 1940. Feldman proceeded to tell the story, now considered apocryphal, of King Christian responding to German anti-Semitism by walking the streets with a yellow star pinned to his chest. It was a “silent protest,” Feldman said. In a way, his music seemed to protest all of European civilization, which, in one way or another, had been complicit in Hitler’s crimes.

Whether the original story is true (it has now been documented that the yellow Star of David badge was not introduced in Denmark during the Nazi occupation), Feldman’s political view is apparent due to his focusing on this pacifist protest, this silent resistance, as well as its human fragility. Feldman translates this silent resistance into performance by removing from the hands of the percussionist what had until then been his or her most important means of sound production – sticks and mallets – and instead has the percussionist produce the sounds with his or her fingers, hands or arms. The sounds produced by the percussionist’s actions now become not only soft but also fragile, played with the dramatic intention of producing sounds, or rather, performing actions that lead to sounds, at the limit of audibility – something later explored, for example, in Luigi Nono’s works with live electronics.

Flutist Eberhard Blum (Blum 2008: 1) recounts that Feldman’s silent resistance not only corresponded to a very clear political statement in music, it also served as a direct answer to Stockhausen’s *Zyklus*, composed five years earlier, which featured the expressivity of the solo percussionist in a completely different way:

In 1956, John Cage had composed the first work ever of this kind, his “27.10.554 for a Percussionist.” Stockhausen reacted to this pioneering work with his “Zyklus.” The soloist places a great number of instruments in a circle enclosing him, according to a plan by Stockhausen. During the performance, the player slowly turns, clockwise or anticlockwise, as he chooses, and executes one of the possible cycles of the composition. It is a most impressive and virtuoso act, one could almost say “expressionistic”. Feldman knew this work, as it was performed in New York by the percussionist Max Neuhaus shortly after its completion. He called his own new percussion work “the American answer to ‘Zyklus.’”

In contrast to Stockhausen, Feldman’s approach to the politics of the soloist led him to propose a performance where the fragility of the sounding results would suggest an equal fragility in the actions of the performer him- or herself.
It was this notion of performative fragility that I wanted to preserve when translating *The King of Denmark* into the electronic domain. The lack of a clear interdependency between physical action and sonic manifestation in electronic instruments led me to rethink how to expose this fragility.

**Project**

*The King of Denmark* presents its performer with the challenge of balancing controlled and decontrolled elements. Feldman divided the musical parameters at the disposal of the percussionist in these two categories, providing instructions to the interpretation of dynamics and articulation (always with the same extreme softness, on the verge of not producing a sound), tempo register and duration. Rhythm and pitch are left unspecified. Pitch becomes then a quality absorbed by the timbre of the instruments chosen by the interpreter for his or her setup. Rhythm is somewhat framed by the prescriptions of the other parameters, in as much as the natural resonances of the instruments – their constantly soft dynamics and the way they overlap – suggest the need for a sustained, stable unfolding of the piece. My solo computer version of *The King of Denmark* aims to transfer the notion of silent resistance into the world of computer music by creating an interface between performer and instrument that varies in responsiveness according to the instrumental densities defined in Feldman’s score. In this way, the timbral palette remains consistent, as in the original, but the uniqueness of electronic media reveals itself through the emphasis on its disjointed nature, such as in the relationship between physical action and sonic manifestation and in the potential negation of the spatial cause/effect relationship between sonic impulses and resonances.

This approach allowed me to preserve the original challenges posed to the interpreters by the piece, while recovering the feeling of uncertainty towards the sonic manifestation of each sound. Whereas in the percussion a restrained physical effort might deem a particular action too “soft” to be heard, in the case of my version, the intensity and densities of gestures might deem a sound too “early” or too “late”.

The software component of the instrument is developed in the Max/MSP environment and consists of two parts: an instance of “bamboo~”, a physical model of a wooden percussion instrument developed by computer music researcher Perry Cook as part of
the PhISEM (Physically Informed Stochastic Event Modelling) Library for Csound, and a resonator bank composed of an array of twelve decaying sinusoids.

To recreate the uncertainty in audibility present in the original percussion piece, I decided to implement three elements that would help simulate a feeling of instability in the instrument. First, at each hit, the resonator bank would retune itself by rotating through a list of twelve preset pitch values.

Second, the wooden physical model (bamboo~) was used to feed a granular synthesis engine that in turn was mapped to project the sound at random intervals between four sound outputs, two of which were not connected to any speaker.

The aim of the third element of instability was to transfer the dynamic uncertainty of the original piece into the time domain; this was achieved by creating a non-linear mapping between the software instrument and the physical controller used to trigger it. This controller was a small pad array (Korg NanoPad\textsuperscript{23}) that, rather than sending an on/off signal, sent continuous control MIDI values according to how hard the pads were hit.

This controller allowed me to create a variable mapping calculation whereby the input sensitivity for the instrument could vary continuously on the basis of how many pads were hit simultaneously. In doing so, the instrument would change its responsiveness (the time difference between hitting a trigger and hearing a sound), creating a visual gap between action and sound that varied throughout the performance. I decided to

\textsuperscript{23} More on the Korg NanoPad can be found at http://www.korg.com/us/products/controllers/nanopad2/.
preserve the original ending of the piece (a sustained G# on a vibraphone) – given that it is the only traditionally notated element – by simply triggering a sample.

Reflection
This case study aimed to capture a particular element of a piece written for a non-electronic instrument and re-appropriate it through electronic media by translating the element in question (dynamic fragility) into time displacement between physical action and sonic manifestation, in order to better illustrate the features of electronic instruments.

By focusing on the fragility of the audibility of The King of Denmark and shifting that fragility from dynamic to time displacement (or responsiveness), the piece maintained its nature while presenting a new challenge to its performer. In doing so, it was possible to emphasise a feature in electronic instruments (the nonlinearity between physical action and sonic manifestation), and present it as a tool for expressiveness and performative theatricality.

[Video: Performance of The King of Denmark]
References


