(Re-) Presenting an altered interactive system.

On *et ego*, a piece for classical guitar, two piezoelectric microphones and electronics

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Abstract

INTRODUCTION: Starting from *et ego*, a piece for classical guitar and electronics, this paper aims to introduce the notion of the interactive system as a tool to understand the musical activity developed by a composer and/or performer in relationship with an instrument and a score.

OBJECTIVES: The primary objective is to show how the equilibrium within this interactive system can be affected by the introduction of an external technology.

METHODS: In *et ego*, the external technology is represented by two piezoelectric contact microphones placed on the soundboard of the guitar, which creates an interference within the usual performer/instrument relationship. The performer has to interact with these microphones and with a differently amplified classical guitar: the piezoelectric microphones make very tiny sounds audible and emphasize percussive sounds while feeding the patch for the live electronics. Consequently, the composer enacts different strategies to understand and represent this enriched vocabulary.

RESULTS: The use of piezoelectric microphones allows for working with specific gestures and extremely delicate sounds, enriching the vocabulary of sound material available within the compositional process. The use of notation becomes part of this process of comprehension and translation of different aural images.

CONCLUSION: The interdependencies between the agents of the system, constantly challenged by different levels of interferences, reveal the perceptual and recursive nature of the compositional labour.

1. Introduction

Starting from *et ego*, a piece for classical guitar and electronics, this paper investigates the compositional process through the dynamics of an interactive system developed by a composer and/or performer in relationship with an instrument and a score. The equilibrium within this interactive system is affected by the introduction of an external technology, represented here by two piezoelectric contact microphones that have to be placed on the soundboard of the guitar. The performer has to interact with these microphones and with a differently amplified classical guitar. Therefore, the usual performer/instrument relationship is compromised, while, at the same time, enriched by the discovery of new action possibilities.

The paper will then take the perspective of the composer who acts within this altered system, in which exploration becomes crucial to the process of the making of a new piece. The possibility to work with specific gestures and

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extremely delicate sounds – together with the use of the electronics – enriches the vocabulary of sound material available within the compositional process. Hence, the paper will question the strategies the composer has to enact to understand and represent this enriched vocabulary, as well as the mechanisms behind the way the composer's memory and imagination co-work inside and outside the time of different sonic events. The paper will finally address the role of notation. Its use will be considered not only as a tool to provide information through a shared code creating a certain contiguity between different agents of the system but also as a means to represent different sonic images and to shape the whole compositional process.

2. The system and its alteration

Musical activity, as an embodied and situated experience from the composer's perspective, happens through an interactive ecosystem made up of a sounding instrument, a performer and – in regard to western composed music – a score (fig.1).
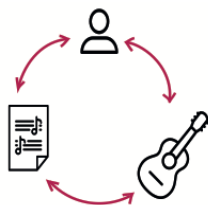

Figure 1. The interactive system

Between the different agents of this system, we can observe an ongoing feedback relationship, whose nature is primarily perceptual. I am interested in addressing the kind of knowledge about sound which comes from what and how we listen, we touch, we see, within such a system (already interactive in the absence of technology) and how we tend to react to the introduction of an external element which induces an alteration in the system, and consequently in the music-making process [1, 12].

I will start by considering the relationship between the first two agents of this system: the instrument and the performer. To avoid the subject/object duality which reduces the instrument to a physical object operated by a human subject, I adopt an ecological perspective, which takes into account the complexity of a network of different feedbacks, as well as practices, repertoires, institutions, social discourse, etc. Rather than understanding the musical instrument through its physical and material features, or its design, I propose starting instead from an active concept: the instrument has to be seen as "something which comes attached with actions— we must understand the instrument -as -played, not the -instrument -as - constructed or -observed" [6, p.317]. So, the instrument comes to the musician with a set of operations or actions that can be performed on it. Within an ecological approach,

the action possibilities offered by the instrument to the performer are often defined as affordances, borrowing Gibson's concept [4].

The piece I will later refer to is for classical guitar, whose principal affordance lies in the possibility to produce sound by mean of plucking its strings. But, of course, the guitar, like most musical instruments, does not immediately inform the performer about its full use and its best playing techniques. The real challenge for the performer is not just to understand the main affordances of her instrument, but to master them. A certain degree of experience is required to acknowledge and get familiar with all the possibilities that the instrument could offer. In fact, the performer usually spends a huge amount of time to absorb the knowledge and the experience needed to deeply know her instrument, uncovering all its affordances. What usually happens to the performer approaching a new instrument is to interrogate more experienced performers on their practice. It is clear then that the musical instrument is never completely neutral to the performer because it comes with layers of embodied practices and idiomatic gestures, present in different repertoires, genres, historical practices and traditions [14]. Therefore, often what the instrument suggests is then studied by listening, learning, imitating and innovating within specific historical and social contexts. And while becoming more and more sensitive to the multiple affordances of the instrument, the performer adapts and tunes herself, developing her own specific relationship with her instrument. Her own agency is thus expressed and manifested in what is often defined as 'expressivity' and 'individual touch'. As Waters suggests, those features result "not only from the physiology of the player, but the complex feedback into that player's body of vibrating materials, air, room, and the physiological adaptations and adjustments in that body and its 'software' which themselves feed back into the vibrating complex of instrument and room" [15, p.2].

As a composer, at least in the first stage of the compositional process, I tend to put myself in the performer's place, trying to play with the instrument myself, in order to get a personal experience of its possible affordances. Provisionally assuming the role of the performer, I allow myself an exploration of the instrument which aims to go beyond the sound possibilities that the instrument has been designed for. My personal attempts to distance myself from the established instrumental practice have to be understood as a practice that is shared amongst a larger community of musicians and performers. At any particular historical moment, the adoption of transgressive behaviours has stimulated the creativity of different generations of artists [2]. But in the context of contemporary music, this mode of searching has become almost constant. Many musicians, composers as well as improvisers, tend to extend or to operate at the edges of the sonic possibilities offered by the instrument, changing or forcing its original design features, looking for other means of expressivity.

In the specific case of *et ego* the introduction of an external element provided me with the possibility to push the limits of the instrument. The two piezoelectric microphones, which have to be fixed on the soundboard of the guitar (fig.2) represent the element of interference.

Figure 2. Piezoelectric microphones on the soundboard.

The introduction of piezoelectric microphones as the mean of amplification determines a big change in the auditory perspective. A piezoelectric microphone is a very basic contact microphone1, which senses audio vibrations through the contact with solid objects. It transduces the sound energy directly transmitted by a surface, so in this specific case, it detects pressure variations of the soundboard of the guitar, converting them in electric signals, amplifying the instrument. There is no mediation of air between the sound source and the detection tool, and this creates a certain shift in the perception of the amplified sound. Moreover, the use of piezoelectric contact microphones represents a way to hyper-amplify the instrument, which implies an alteration of the usual feedback relationship with the performer, who thus experiences a different guitar: all contact with the instrument, even the smallest and accidental movements, become audible. In this way, the extension of the instrument back into the body of the performer is strongly perceptible, and demands from the performer another kind of awareness and negotiation with respect to her physicality. While opening up a different perspective on the guitar, this kind of hyper-amplification allows for the discovery of new affordances offered by the instrument [5]. When exploring them on the guitar I discovered the possibility of adopting certain gestures, almost inaudible on an unamplified instrument. In this respect one of the most radical examples could be seen in the gesture appearing for the first time in b. 9 (fig.3), where I ask the performer to play a glissando with the nail, which would have been barely audible in a usual acoustic situation.

Following this, many other sound gestures take advantage of this way of amplifying the instrument. In fact, during the piece, the performer is rarely asked to produce sounds by means of plucking the strings. More often she is asked to treat the guitar more as a resonating percussive surface, where different modes of sound production – like hitting,

scraping, striking, etc – are activated on various points of the instrument, such as strings, frets, soundboard, generating more or less resonant sounds. Some percussive actions also have to be done on the piezoelectric microphones, which become part of the instrument itself (they are no longer just the means of amplification, but they become part of the physical space of action of the performer). In this respect, this work could be seen as a personal search for a different perspective on the classical guitar, introducing interferences and elements of disruption in the usual relationship between the performer and her instrument.
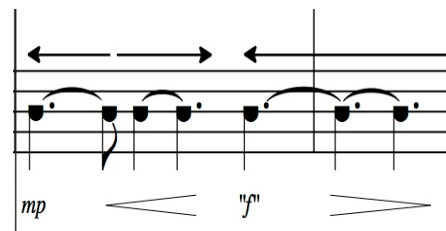

Figure 3. Bars 9 and 10 of *et ego*.

3. The role of the electronics in the altered system

Before taking on completely the composer's perspective, moving to analyze the compositional process and the role of the score within the interactive system described above, it is worth taking into consideration the element of electronics, or live electronics, as in the case of *et ego*.
The presence of electronics in relation to the acoustic fact poses some questions about the understanding of its role within what we have described until now as the music-making system.

As Waters [15] points out, the engagement with computers and electronics heightens the sense of mutability between the different elements of the system. Waters observes how the computer – with its associated software – is usually considered as an 'instrument'. But in acknowledging its own agency it can be understood as a 'performer', or, in other circumstances, it is addressed as a 'performing or composing environment'. As 'composing environment', I would add, it might be considered as sharing the role of the score – understanding the score in terms of its role as providing a set of instructions that has to be followed during the performance. In the case of *et ego*, the electronics pose a similar sense of mutability, suggesting a multiple role. In the programming of the software, a set of instructions about behaviours and parameters of how the sound will be processed is defined in advance.

Hence, the electronic part is composed, and through the code partially assumes the role of the score. At the same

time, a performer of the electronics is required in order to evaluate the code and to control all the parameters that can be changed live, contributing in a personal way to the musical result, just as any other kind of instrumental performer would do playing her instrument. Finally, since the electronics is actually producing sounds, it can also be understood as an instrument itself, or at least as an extension of the acoustic instrument, whose sound is processed [7, 9]. Nevertheless, besides any effort of fitting the electronics in one role or another, I think it is worth noting how it could be intended as an extra layer of interference. The microphones placed on the soundboard of the guitar impart a very specific sound quality to the recording of the close-captured sound – primarily due to the low-fi quality of the piezoelectric microphone. This peculiar sound quality is transferred in the recording and consequently, it affects the way the sound is processed. While enlarging the possibilities of the instrument, the use of electronics interestingly affects further the relationship between performer and instrument. In the specific case of *et ego*, this is partly due to the fact that most of the recorded sounds – especially in the first part of the piece – are only slightly processed before being reintroduced in the performance in form of playbacks and delays, and this creates multiple layers of similar sounds. By varying and repeating small percussive gestures, the guitar and the electronics contribute together to the accumulation of almost pitchless percussive sounds. The recognition of the instrumental or electronic origin of the sound becomes difficult, and it could at first be confusing for the performer herself. Progressively, during the piece, the percussive pace starts to slow down, leaving space to a slower texture of harmonic sounds, even if the sonic result still depends on the instrumental origin of the sound, filtered through the piezoelectric microphones.

4. The making of new works within an altered system

At a certain moment, the creative act of experimentation through improvisation and exploration within the altered system needs to converge to an understanding of its object of research: the sound material. The need to grasp and achieve control over the sound material is a requisite task for a composer in order to organize sounds within the frame of a composition. In my personal experience, at the beginning of the compositional process, some kinds of sonic images tend to emerge from the exploration of the instrument. These mental sonic images are perceived as completely out of focus but at the same time as extremely significant, although their meaning eludes any attempt of being defined. The process of getting a better definition of these images is often quite slow and usually difficult to grasp. Nevertheless, it could be worth addressing the question of how the composer's mind works in elaborating and storing these unfamiliar sonic images.

I have slowly begun to realize that this mental process tends to be recursive, rather than linear, and that its recursivity is manifested on different layers. Principally, its recursivity is shown in the constant shift between what can be called the 'inside time' of the performance and the 'outside-time' of the composition process. A sound always occurs 'inside time'. A picture can be observed for a long time, but a sound allows for its contemplation just for the duration of its happening. Even within the 'real time' phenomenon, effects of memory and anticipation are at play. So, how does the imagination work outside time? Amongst the strategies that I have identified in my practice, there is not only that of getting a personal experience of sound by provisionally assuming the role of the performer, but also that of rehearsing this experience. Consequently, I have developed a practice of recording moments of improvisation and exploration, as well as rehearsals of different stages of the process. I then store and catalogue these recordings so that I can listen back to them as many times I need. The possibility to rehearse many times the empirical experience of sound helps to understand the acoustic features of the recorded sound material, to outline its internal temporality and to fix its aural memory.

The role of auditory memory in our experience of music is described very well by Bob Snyder in his book "Music and Memory" [13]. Here the author addresses the abilities and limits of our memory in the organization, recognition and recollection of sound events. Snyder suggests that our memory is organized on a model consisting of three processes: an early-processing echoic memory, a short-term memory and a long-term memory. Each of these three memories differently processes information that comes to our ears. Each one functions on a different time scale, that for Snyder loosely relates to different time levels of music organization, called respectively "level of event fusion", "melodic and rhythmic level", and "formal level".

Within these processes, acoustic features are extracted from continuous data of echoic memory and then bound together and organized into groupings based on similarity and proximity in perceptual categories, which later becomes conceptual, in the long term memory. These different memory processes do not function completely independently of each other, and the actual consolidation of long-term memories consists of a recursive process, which can occur either unconsciously and spontaneously, or as a result of conscious effort. This distinction of three processes of memory based on three different time levels reinforces the need for an iterative listening in order for the aural memory of the related sound material to achieve definition. As the abstraction of sonic images become clearer, the necessity to notate the aural memory of the gestures tested and experienced starts to emerge, in order to find a way to bring the sonic image from its 'inside' time to the 'outside' time of composition. The visual translation of the sonic image becomes, therefore, part of the process of comprehension and acquisition of the sonic material.

5. The role of the notation

In the visual translation of any sound image, notation comes into play. Auditory imagination is helped to recall different sounds by visual cues, graphically represented with a symbol or a set of symbols. Therefore, notation becomes a means for the composer, as has being the case for the last few centuries of Western composed music. We can observe with Impett:

"Symbol-manipulation lies at the heart of Western composition. The symbolic representation and manipulation afforded by technology from wax tablet to computer constitute a form of conceptual prosthesis. Virtual, mental quasi-external representation are both more ephemeral and more plastic than their material counterparts. The points at which a current state is externalized constitute a unique signature in the compositional process" [8, p.661].

The uniqueness of this signature lies in the personal set of choices made by the composer herself. This decision-making process requires constant negotiation between the understanding of the mental representation of each sonic idea and the physical one in its visual form. Therefore, the process is again to be considered as recursive. It is part of the composer's task then to decide how to translate the sonic image into a visual one. The composer has to choose what features of the sonic image she needs to graphically represent and how. Negotiation within the limits of the visual representation is required to define the amount of information that could be delivered by the notation, in order to define and make clearer specific features of a certain sound event.

In my compositional practice, what I am usually concerned to define and indicate are the following aspects:
- the temporality of the sonic image, intended as the internal duration of the sound event or its rhythmical contour,
- the physical action, namely the movement that has to be done within the physical space of the instrument in order to produce the related sonic idea,
- the space of the instrument where the action takes place, as well as the material/tool through which the sound is produced – such as plectrum/fingers/nails, piezoelectric microphones, string, wood, etc.,
- the quantity of energy – the dynamics – that has to be put in the action.
Hence, I have come to understand that in my personal practice, a clearer definition of the mental image of a sound through its graphical representation crucially informs the definition of the sonic gesture through which the performer produces a specific sound. This attitude is somehow linked to the embodied and perceptual nature of music-making, in which the physical production of sound is understood as tangible, through its situated empirical experience.

In order to define and design the visual representation of different sonic images, I rely on different ways to notate scores. They go from a more traditional/descriptive notation to a more prescriptive action-notation – which is now recognized as a quite established mode, inherited from Helmut Lachenmann's work [10] – to direct description of techniques used through verbal instructions or symbols, usually explained in the performance notes (fig 4).

Performance notes:

Tapping with fingers on the piezo microphones.

Fast movement, up or down, scraping the nail on the scotch tape.

Scraping the fingertip towards the bridge or towards the fretboard on the indicated string, according to the direction of the arrow (right side=bridge / left side=fretboard).

Figure 4. Examples from the performance notes

Prescriptive action-notation in particular, indicates mechanical properties of the sound production, such as the direction and the energy of the movements that the performer is asked to do [11]. The attempt to define as precisely as possible the different sound gestures is a recursive process that happens both at a visual and at an aural level. This recursive process of defining and re-defining becomes fundamental to the compositional practice since the gestural structure in which the sounding matter is inscribed comes to constitute the starting material of my work.

Once I get a better understanding of the sound material I want to work on, that material tends to reveal its potentialities more easily. Around each sonic image, others come into being, by analogy, symmetry or opposition,

Figure 5. Example from *et ego* score

through an interplay between the aural memory and the aural imagination.

At this stage of the compositional process, I have to operate within other time levels, namely within the meso time level in which musical ideas unfold – corresponding to Snyder's idea of "melodic and rhythmic level" – , and the macro time level of the structural form of the piece. The global structure of a piece is usually built by various sonic images differently organized in time, which interweave to produce multiple stratifications or successions of varying temporal dimensions. The composer often has to take many decisions, working simultaneously on all different time levels of music organization – the same ones observed by Snyder – constantly zooming in and out between them. Keeping track of this complex set of operations can be difficult; notation can therefore again be considered as a crucial visual cue for guiding the composer during this decision-making process.

The strategy adopted to visually represent the macro time level of the formal and architectural structure of the composition is personal. In this respect, in my practice, I tend to construct on paper a spatial representation of time. This is particularly clear in my usage of a timeline placed on top of the score, during the writing project – which is sometimes preserved in the final version of the score, as in the specific case of *et ego* (see fig 5). Through this timeline, I am able to visualize the disposition and the development of different sound-events in time, the possible relationships between them, and to get an overview of the global form of the piece. The adoption of a timeline reveals a 'left-to-right' reading habit, which comes from the assimilation of traditional notation, as well as from frequent use of sound-

editing software, in which the waveform is usually represented in the time-domain. The mode of representation chosen by the composer reflects her personal experience, within her own specific technological and social environment. Since the composer usually operates within the same environment in which the performer acts, is often the case that performer and composer share similar codes.

Hence, the score might be also understood as the interface to share sonic ideas, through their visual inscription, and to provide a set of instructions for the performance of the piece.

6. Conclusions

In order to consciously make her own choices and honestly assess her own compositional practice, any composer and researcher needs to develop her own personal method, which allows her to reach a certain awareness concerning the physical production of sound, and the embodied, perceptual and situated nature of music-making. In this paper, I have presented my personal experience at this regard. I have observed the consequences of introducing an element of disruption in a more established ecosystem, made of the sounding instrument, the composer and the score. The introduction of piezoelectric microphones as elements of interference within this interactive ecosystem has provided me with a personal lens through which observe the kind of interdependencies happening between the agents of the system. Constant feedback and information exchanges reveal the organic nature of this system, which inhabits musical activity through recursive and perceptual processes. Through moments of exploration, I have personally experienced the altered

system, while enriching the vocabulary of sounds available for the compositional process. New sonic images emerge from the empirical exploration of the instrument, but at a first stage they are perceived as difficult to grasp, completely out of focus. The consequent mental process of understanding these new sonic images happens through a constant shift between what can be called the 'inside time' of the sound production and the 'outside-time' of the composition. Notation comes into play to support this process of comprehension of the sound material the composer is going to work with. Moreover, notation reveals its potentialities as a tool to guide the composer through the compositional process, providing a mode of fixing the recursive work of memory and imagination.

The whole observation of my way of working brings me to understand my compositional work as a process that shares the empirical recursive nature of the system in which it takes place. A visual representation of the musical thought orients and mediates this process as it takes shape, providing the possibility to externalise mental representations of sound.

"Composition is a reflexive, iterative process of inscription. The work, once named as such and externalizable to some degree, passes circularly between inner and outer states. It passes through internal and external representations – mostly partial or compressed, some projected in mental rather than physical space, not all necessary conscious or observable – and phenomenological experience real or imagined. At each state-change the work is re-mediated by the composer, whose decision-making process is conditioned by the full complexity of human experience. This entire activity informs the simultaneous development of the composer's understanding of the particular work in its autonomy, of their own creativity and of music more broadly. Environment (culture, technology) and agents (composer, work) coevolve at different rates." [4, p.457].

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