The Identity of the Work: agents and processes of electroacoustic music

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An electroacoustic musical work is a complex network of processes and elements: technical, musical, human, etc.; therefore, while the aesthetic perception is unified, its definition is fragmentary. This observation compels us to intensify our study of a taxonomy of agents and processes, with the aim of clarifying the identity of this music.

The discussion is positioned according to two different vantage points: (i) analysis of works, and (ii) the writings devoted to the aesthetics of electroacoustic music. Musicological analysis is simultaneously the means, the goal and the motivation for getting to know this arborescent reality. It allows us to arrive at the identification of six agents and four processes associated with the work, whose main properties we will describe. These elements are used as a methodological and theoretical grid for organising the discussion about the works. The question centres on a paradigm which is created from the analysis and returns to it, as an essential link between hermeneutic knowledge and the knowledge of the internal logic of an electroacoustic work.

1. THE STATE OF ELECTROACOUSTIC MUSIC ANALYSIS

In 2006, the musicological community will celebrate the twentieth anniversary of the publication of *The Language of Electroacoustic Music* by Simon Emmerson, the first book where the problem of the analysis of electroacoustic music was defined. Since 1986, musicologists and sound engineers (those people working in computational analysis, Music Information Retrieval, etc.) have been more and more interested in this music, and they have taken analysis as a useful means by which to understand it.

As analytical theorists state, there are two important aspects to remember during any analytical operation: the first is that no 'single method or approach reveals the truth about music above all others' (Bent 2001: 528). The second is that any analytical method must start with the declaration of the dimension to be analysed: the microstructure or the macrostructure, the mid-level, the harmony, the timbre, etc. (Dalmonte 2001). Electroacoustic music analysis is still problematic because these dimensions are blurred and there is no stable compositional theory which could reflect and guide the process of listening as the fulfilment or frustration of expectations (Meyer 1956).

Our musicological research has started from an analytical approach. Nevertheless, the more we proceeded in this discipline, the more we understood that electroacoustic music is a complex 'object' with numerous agents and processes involved – both human and technological. The challenge was not only of a methodological nature (i.e. the question of what is the best method to analyse a piece and its dimensions), but also theoretical (i.e. the theoretical discourse and the investigation of those dimensions resulting from the analysis; their contribution to the making of an artwork; their connections, nature and behaviour). Here, analysis stops being a mere means and becomes a starting point for the research: it allows one to discover each level, and becomes necessary once again when the level is defined, in order to deepen it. The point is, analysis cannot be an end in itself (it cannot explain a piece because of its subjectivity), but must be set up on the needs and the goals it is looking for. Moving from the practical to more general and theoretical, these could be: (i) the preservation of a musical heritage; (ii) the drawing of graphical scores for helping the listening; (iii) the production of automatic scores for helping the musicologist in the investigation of structural dimensions; (iv) automatic classification of electroacoustic music for web searches; (v) definition of analytical details (genetic composition, performance, score, listening process) in order to define its human and technological dimensions; and (vi) aesthetical definition of the electroacoustic arborescent object (Dufourt 1995: 30), its dimensions and inner associations.

It is fundamental that future studies have an interdisciplinary character. Forthcoming procedures for the analysis of electroacoustic music should derive from the synthesis of top-down and bottom-up views derived from different competences. The research on the identity of electroacoustic music shifts continuously from the analysis, towards the theoretical discourse, and back to the analysis, both being fundamental to the investigation of the electroacoustic object.[1] Several domains are involved: the study of texts (in the larger

[1]This research is developed with the support of a post-doctoral fellowship, Department of Visual Arts and Music, University of Padua (Italy).

sense), the digital revolution and the art of making digital instruments, the consequent problem of studying various and unstable sources (a different era of the philology of music), and the problem of authorship of pieces which, beyond the creative process of composition, involves a large quantity of technological competence which invades the compositional dimension.

2. THE PHILOLOGY OF ELECTROACOUSTIC MUSIC

We borrow an image from studies devoted to digital texts. Domenico Fiormonte, in speaking of them, reconsiders the notions of author and unique text: the digitalisation of the text writing dethrones the supremacy of the physical object (Fiormonte 2003). When 'a document enters the digital dimension', it 'strips off its analogue clothes' by a process of codification.

But the codification, a transition phase between the musical universe and the digital universe, is a translation (what Marc Battier calls 'the representation') and, 'along this transition, there are all kinds of influences from simplifications and dispositions in terms of scale when we work on data which ''represent'' the behaviour of a traditional active instrument' (Battier 1999: 120). From here, the language of the digital (and we would add musical) alphabet provokes an alteration and, consequently, a shifting of the centre of gravity of the *product* to the *process* (Fiormonte 2003). The blind belief in the Unique Text gives way to the concept of Mobile Text. The 'crises of philology as an instrument of reconstruction of the *truth* of the text', is reflected in the difficulty of discovering the priority of a defined and individual will of an author in contemporary digital texts.

These are notions which also function well for computer music, which we can explain in three ways: (i) the codification is a link between musical and computer writing; (ii) the study of texts, computer and musical, can show the process of a work in the making (this is not, in any case, a linear process, but a network of proficiencies and different types of writings); and (iii) if mobility characterises computer music, we can say that through the *writing* this mobility becomes a reality. In consequence, the study of the *texts*, in the larger sense (emanation of the writing), is fundamental.

2.1. Texts, writing

Texts can be of a heterogenous nature, ranging from compositional sketches up to the computer score, if one considers the texts as physical objects where sound becomes symbol. But in electroacoustic music, the text is not necessarily just a visible trace. As Angela Ida De Benedictis emphasises, while referring to analogue music – and provoking a tremor among the philologues of music – the text is the support medium, the tape, which preserves the sound (De Benedictus 2004).

In computer music, the text is also the data which demands a calculation, a text which does not correspond to symbols that are immediately comprehensible. The term writing – and consequently the Text – must therefore be applied to the tape, the CD, the computer memory, the list of data used by the software, 'since in this type of text the visible context of writing is certainly missing, but certainly not its essence and its technology of reproduction' (De Benedictus 2004). And lastly, between the texts converging in the network of the computer music composition, there is the mental text which is the composer's intention, if we think of text as being support for the elaboration of the articulation of a thought. We disapprove of the unconditional faith of the critic of the text, and of the musical philology of the text as a physical entity (whether a score or a sound support), since many works of computer music show that the text is not unique, and that we must study the mental text of the composer (the communications which he has decided to publish either in written documents or verbal statements) or of his collaborators. We must also recognise that human memory is less definitive than a written text, but if it can be compared to the analytical sources (or even if that is the only way to construct at least a part of the truth, given the opportunity) then it becomes fundamental.

3. THE MUSICAL ELECTROACOUSTIC OBJECT

After the analysis of many works of computer music, we are able to define a schematic which groups together six physical agents contributing to the realisation of the work, and four more abstract aspects linked to the work's realisation (figure 1). Each dimension articulates itself in many directions and meets the others.

Analysis allows us to go into more detail on different levels of the theoretical grid and imposes, in other ways, a multiplicity of analyses of the work to complete, verify, or else refute it. In this discussion, we offer reflections on specific aspects of the elements of the grid (notably compostion, performance and interpretation) giving a practical example as applied to John Chowning's work *Stria*, a quadrophonic work produced in 1977 with frequency modulation and based upon the golden section.

3.1. The process of composition

According to the philosopher Jerrol Levinson, the musical work is not a sonic entity, but rather corresponds to a network of creative acts, sonic structures, performance practices and historical and musical contexts. The *writing* is the key which unlocks this background.

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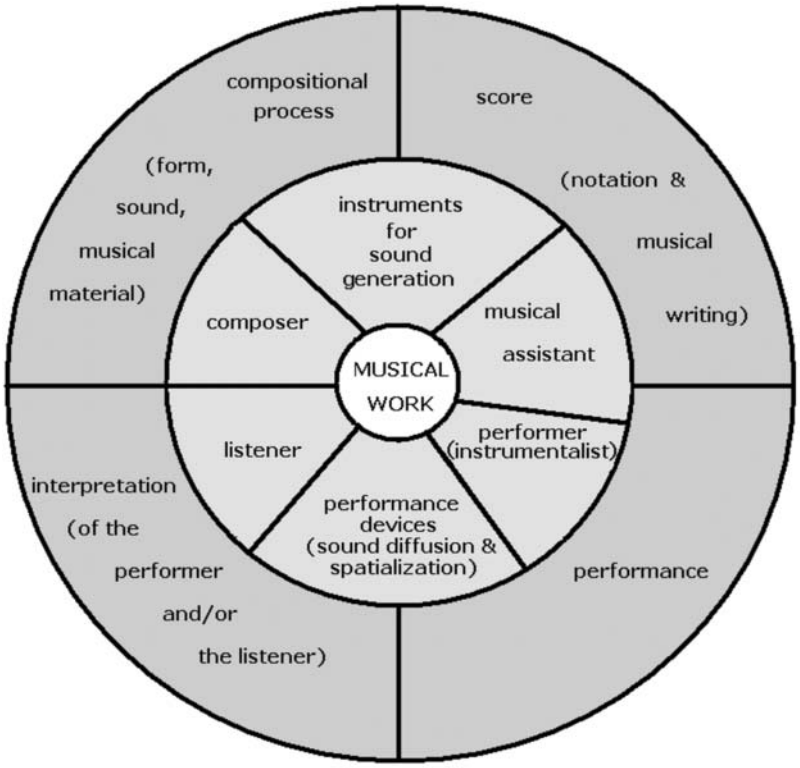

Figure 1. The electroacoustic music network.

The phase of writing which precedes the codification (the idea, the creative act, the writing of the mental process) would seem to be shared between two types (figure 2). The analysis of computer works unveils a certain tendency among composers to choose, on the one hand, between attention to the creation of computer instruments and timbres ('to compose the sound itself', to refer to J. C. Risset's definition; the concept is as valid for music in studio time as for real time or live electronic music), or on the other hand to consider the computer software as a means to realise ideas relating to form. Nevertheless, that radical subdivision is relative. Computer music incessantly requires an inextricable conjunction of the two aspects, in order to avoid falling towards the two extremes.

3.1.1. Stria *by John Chowning. A case study*

Stria corresponds to a good example of an intermediate point between parametric composition, rather '*sonologique*', and the automatic writing of compositional structures. In fact, as we read in the articles already published (Meneghini 2003; Bossis 2005) and in the computer data,[2] each section forming the piece is rendered by a procedure (*event 2*) which generates the complete section. Each section in turn is based on a highly structured timbre which is generated by frequency modulation (the division of the octave according to the golden mean: 1.618).

In the computer score of the first section (TO.MEM), one can easily detect the duration of the first event, the *ratio* which controls the divisions of the frequency spectrum, the number of events generated, and the total duration of the section. Even if the complete score of the work (in other words, the list of the data of each parameter) has been lost, we have located one part of the score of the first section, TO.SCR (figure 3), relating to the first three instruments, which shows the logic of the programming (and also makes it possible to resynthesise the work). If we think of the schema which represents the composition, then we can say that this work by Chowning is situated between the two preliminary choices of the computer orchestra (FM synthesis) and a general form.

3.2. The writing of the score

According to different definitions by specialised dictionaries, the concept of notation must satisfy three characteristics: it symbolises codified sounds (those of the traditional instruments) or those to be created (in electroacoustic music); it is an interface; or it preserves (Bent *et al.* 1980). The case of computer music, however, is complex, as the concept of score is fragmentary. If, as we have seen, each codification carries a translation, an interpretation and a distancing of meaning, we go

[2]The work has been realised with the program SAIL, Stanford Artificial Intelligence Language.

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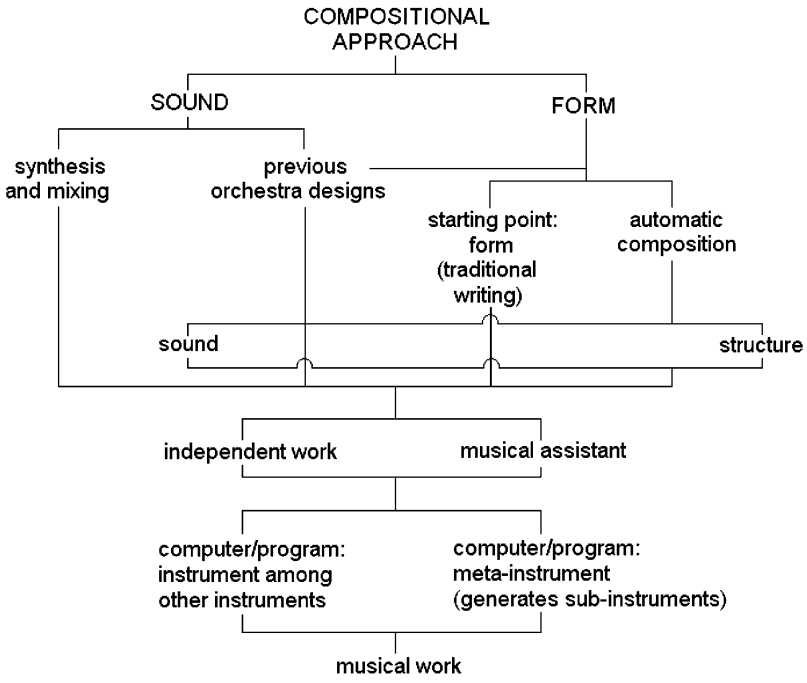

Figure 2. The composition of computer music.

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26 Sep 1977   21:48          T0.SCR[ PC, JC]              PAGE 1-1

OUTSPEC←"U:T0.SND/BYTESIZE=12/HEADER/SAVE=2048";
 < T0.SCR
 PRINT"<REVERB CALL?";
 PLAY;REV 0 167.5 1 2,-1;
<Begin Event number    →      2
 INSA     1.000  6.924 151.644 2618.000 4235.924   .056   .223 4235.924   .000  1.023
          1.385  2.306   .006   .333   .150   .000   .000   .000   .000   .000
           .082   .997   .000   .000   .000   .000   F2  F6  F2  F4
;PRINT P1;<   INSA
 INSB     7.110 11.485 262.383 1306.507 2113.929   .089   .355 2113.929   .000  1.155
          2.297  3.825   .013   .333   .150   .000   .000   .000   .000   .000
           .000   .796   .606   .000   .000   .000   F2  F6  F2  F4
;PRINT P1;<   INSB
 INSA     8.520 16.066 253.198 1378.262 2230.027   .086   .345 2230.027   .000  1.145
          3.213  5.350   .012   .333   .150   .000   .000   .000   .000   .000
           .000   .497   .868   .000   .000   .000   F2  F6  F2  F4
;PRINT P1;<   INSA
```

Figure 3. Page of the computer score of *Stria* (TO.SCR).

through different types of codification in computer music which require an attentive and differentiated study.[3] The alphanumeric score, first of all, demands a reading.

In a music created in 'studio' time – e.g. *Stria*, for which we are here skimming through a detailed analysis – the alphanumeric text is indispensable to the analysis, even if the codification is not done by the composer (in

[3]Among the eighty-seven pages that are devoted in the *New Grove Dictionary*, in 1980, to notation, only about a hundred words (fifteen lines) are devoted to electroacoustic music. No allusion refers to the difference between *tape music* and computer music. 'Notation has sometimes been used for electronic music, although when such music is composed on tape the necessity for notation is not always present. Some pieces have been notated in order that the composer may be protected by copyright; or to provide a study score; or to provide a cue-sheet for performers when electronic music is combined with live performers. Scores of electronic music may thus be either prescriptive or descriptive, and may not always contain representations of every aspect of the music. The notation used may draw on the resources of conventional mensural notation, insofar as these are usable for the purpose, and on those of graphic notation'. The article proposes a thesis (1968) by Fennelly which applies to the argument: Fennelly, B., *A Descriptive Notation for Electronic Music*, diss., Yale Univ. 1968 (Bent *et al.* 1980: 415).

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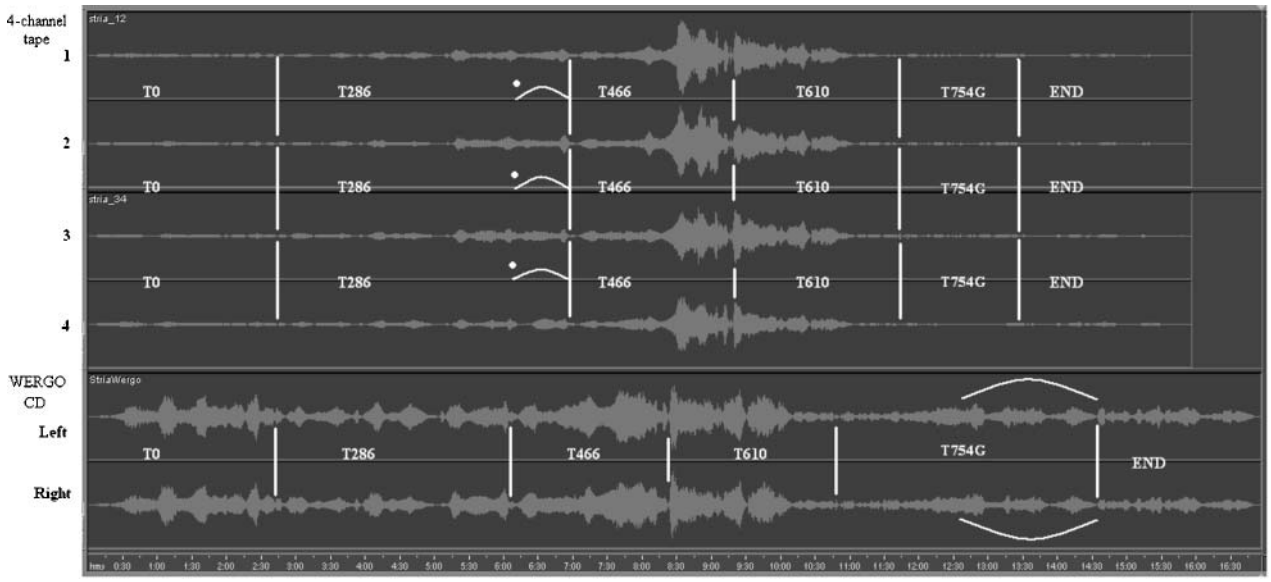

Figure 4. *Stria* four-channel version and Wergo stereophonic version.

this case, we must study the different transitions of codification and interpretation: we are referring the presence of a musical assistant). The comprehension of the writing of *Stria* (completely compiled by Chowning), for example, leads us to an understanding of a problem of different durations which was brought to light by analysis, as well as introducing the third process: that of a work's performance.

3.3. Performance and interpretation

With the 'electronic revolution', music goes from a paradigm based on the chain of the type 'writing / score / performance / listening' to a logic of the type 'writing / notation / projection / listening' (Tiffon 2002), enriched by the presence of a professional figure (the musical assistant) who can work in the phase of recording and/ or projection. Theoretical literature focuses attention on 'fixed' music, music which seems immobilised perhaps because of the practices of live electronics, real-time and mixed music, thus recovering some live dimensions which resemble traditional music and elaborates the performance with non-static dimensions.

However, while there are some works which are totally recorded and determined during the period of production, and some works which are completely created in real time during a concert, we very often find that the two strategies are mixed. The example of *Stria* is appropriate; it exists in a four-track version for concerts and in a stereophonic version (Wergo 1988). Normally, when a quadrophonic electroacousic work is published on CD, it suffers due to a reduction from circular spatialisation to a stereophonic spatialisation. However, the analysis of the time-amplitude chart shows that *Stria* quadraphonic does not have the same length as the work on CD (figure 4).

We have compared the two versions through listening and with the computer data and the writings of John Chowning and Johannes Goebel (the assisting technician at the time at Wergo). This allowed us to establish that: (i) the second section is longer in the four-track version; (ii) the fifth section, T754g, has been cut down in the WERGO version. We came to this conclusion by considering both the tape version and the CD as texts. But only the mental texts of the protagonists provide an explanation of the work's mixing process.[4]

This example furnishes us with a pretext to underline two questions concerning research on the identity of the work and on its analysis: (i) first, computer music on tape or in real time poses some serious philological problems. The immutability of the work on tape, so lauded, is contradicted by the example that we have just shown. As a matter of fact, the two versions of *Stria* (which truly seem to be two versions, each with an autonomous life and not variations of the same piece) co-exist peacefully. There is not a 'best' *Stria* or a definitive version. The second question, deriving from the first, concerns the discussion of the nature of electroacoustic work as an 'apparently illusive object', according to the definition of Jean Baptiste Barrière (Barrière 1990: 4). The analysis of the work, of its genesis and of its existence, brings us to understand why it is a unitary object even if existing in two versions. The question concerns, in this case, the performance, or more precisely, what happened during the assembling phase of the different sections to arrive at the version realised for the WERGO disc.

[4]The complete analysis of the assembling process of *Stria*, with explanation of the details of the different versions, will be the subject of an article to be published.

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4. CONCLUSIONS

The goal of my discussion is to find a way to define the criteria, the lines and limits inside which an electro-acoustic work for computer is formed. The necessity to classify originates from the realisation that if it is true that this music seems to be fleeting, since it multiplies the agents and the processes of setting the work, fragmenting its self-identity, it reflects in reality our current society where a division of labour is the norm. Analysis is the scientific domain within which we must place the problem. While the present analytical methods are divided (listening analysis, genetic analysis, computer analysis, MIR, etc.), still the entire ensemble is profitable. What is needed is the comparison between them and the collaboration between musicologists and computer scientists devoted to music.

Musicologists are interested in comprehending the sonorous, compositional and social identity of the electroacoustic music work. Their knowledge of the fragmented network of agents and processes concerned in making a piece, together with the competence of computer scientist and composers, could define more clearly 'what makes computer music computer music'.[5]

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[5]The quotation retakes the title of a round-table organised by Martin Supper for the Colloque SMC (*Sound and Music Computing*) 2005, Salerno, November 2005.