COMPUTER MUSIC INTERPRETATION IN PRACTICE

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ABSTRACT

Computer music designer is still a new job, emerging as a professional practice only in the last decades. This function has many aspects; personally, I consider that one of the most important, and not well-documented parts of our job is the concert performance. In this paper, I will discuss this discipline (performing live electronic music) from a practical point of view. I will illustrate this idea with short presentations about the interpretation of some existing classic pieces of the electroacoustic mixed works repertoire.

1. INTRODUCTION

The development of mechanical music technologies (recording, analog and digital techniques, etc.) has had consequences and raised some questions about musical activity and about the category of musical interpretation: can we speak of "music" without interpretation? What is the status of the recording of a piece (between the score and the concert)? Now that we have audio recordings of the entire musical repertoire, why should we still build concert halls?

Since the beginning of the 20th century, composers (such as Stravinsky, Ravel, Bartok, etc.) foresaw the consequences of sound recording technologies on the musical interpretation of their works. And of course, the influence of sound technologies on musical composition continued to increase during the last century, from analog techniques to our current digital world.

In this paper I will focus on the category of musical interpretation. First of all, interpretation is different from performance. Interpreting is more than performing, playing computer music is not only performing it, but has many more aspects.

At IRCAM, this activity is now taught in a special workshop "AIRE" (Atelier Interpretation des musiques électroacoustiques), held during IRCAM's ManiFeste Academy since 2012.

More and more often, the person identified as a "technician" or a "sound engineer", became integrated in, appointed by, and toured with a number of new music ensembles involved in the performance of mixed music. For example, we can cite John Whiting in the vocal ensemble Electric Phoenix or Scott Frazer[1] with the Kronos quartet. More and more frequently, this function is recognized not only as a technical role but also as musicianship.

2. WHY?

Why is interpretation necessary for electroacoustic works, whether they belong to the "real-time" or the "tape music" category?

2.1 Live music

Most of the time, when we are speaking about "Music" today, we are speaking about recorded music, about music reproduction—dead music. Music, to be alive, should be performed "live"; an audio recording is simply a trace of a musical event. But we always speak about it, quite improperly, as music. As early as 1937, Bela Bartok was aware of the danger of what he called "mechanical music" vs. the variability of live music.

But what is the status of purely synthetic music? Is it too conservative to consider that music that is not performed is not music?

2.2 Interpretation against obsolescence

Interpretation is a way to overcome the technological obsolescence that every computer musician knows very well. The obsolescence of the technologies used by musicians in real-time works can be seen as a danger, as a risk for the existence of these new forms of musical expression [1].

It is possible to compare scores written on paper with a lifespan that can be measured in centuries – we can still find music written down in the Middle Ages – with digital supports whose instability can be measured daily, at our expense. But an antique parchment only has value to the person who knows how to read it, that written music remains virtual if it is not sung.

In the beginning of IRCAM, no one was aware of the seriousness of the problem: the works produced in the 1980s were made with a total lack of concern for this issue or with an optimistic technophily. We realized the problem later, in the beginning of the 21st century.

IRCAM is now concerned by the conservation of the works created in its studios. To create its repertoire, the institute asked composers to write works interacting with the institute's research departments. This concern for the conservation takes the form of archives on different supports and documentation written by tutors/assistants/computer music designers. Valorizing the

[1] http://www.allmusic.com/artist/scott-fraser-mn0001479637/credits

works by performing them in concert and on tour leads to the creation of an original repertoire. The conservation of this repertoire is obviously a part of the will to create a history, a kind of tradition.
The experience of computer music designers, who must transfer sometimes complex works to perform them again (at IRCAM we call this action "porting") from one system to another as technology evolves from one generation to another (from the historical 4X to the IRCAM computer music station and different versions of MAX software), has led us to invent, to develop, a specific *savoir-faire* of the techniques and practices that have made it possible to save almost the entire catalogue of works created at IRCAM (more than 700 works) from digital ruin.[2][3]

2.3 Interpretation as renovation

Moreover, porting a musical work to a new technology is not only a way to overcome technological obsolescence, but also esthetical aging. It seems especially true for tape music; we often have this impression while listening to old recordings that they sound "dated".

2.4 Interpretation and notation

The score is an integral part of our serious art music ("musique savante"). Even if all music is ephemeral and immaterial, the act of writing it down inscribes it in history and in the effort of "the desire to last". Not all composers seem particularly worried about the future of their works; creation is more about renewal, about a flow, than about keeping, storing, archiving. And yet, if composers write down their music, it is for its survival. The score is both a way to transmit music to the performers and a support that enables its long-term preservation. In this respect, electro-acoustic music, and particularly interactive mixed works, creates numerous problems because today there is no universally shared musical notation.
The conservation of electro-acoustic works seems impossible without the performers. The computer music designers are both archeologists of a near past, specialists of obsolete technologies, interpreters of musical texts, and virtuosos of new musical technologies. The responsibility of transmitting the composer's will with authenticity lies with them.

2.5 Interpretation and transmission

In the domain of mixed music, scores are very often incomplete. Consequently, the only possible transmission of these highly technological artifacts still relies heavily on oral tradition!
We can suppose that composers should play their own music. But is the composer the best interpreter of his music[2]? And if not, why? Some of them are really expert in the art of sound diffusion but not all of them. As composers spent a lot of time listening to their own sounds in the studio, they don't necessarily have the same perception of it as the listeners in the concert hall. And unfortunately, composers are human, and consequently mortal.
In the real-time music context, I often have to face this paradoxical situation: real-time should come with the acceptation of the unexpected. But very often, composers are not ready to accept the unexpected in their music.
"The term "real-time" in musical composition can be inaccurate because a part of the musical components is often predetermined, and is not subject to variation from an interpretation to the other." [5]

3. WHAT?

3.1 What is musical interpretation?

As mentioned, interpretation is more than performance: it is a complex activity. In the classical music context, a musical interpretation requires the ability to read the music (knowing the vocabulary) and to understand the text (knowing the syntax). It also means mastering its instrument (it takes years of practice to make a virtuoso), interpreting the composer's will (knowing the stylistic context). Finally, the musician should be able to perform the music in concert, interacting with the audience, the hall, and the other performers.

3.2 Can we speak of musical interpretation for computer music?

For computer music, things are slightly different because of the nature of the "instrument". There is an extra step: constructing the instrument. In this sense the computer music performer is also his own instrument-builder (luthier). Moreover, there is no school or conservatory to learn how to become a computer virtuoso today.

3.3 Interpretation and "real-time" music

To allow the possibility of an interpretation, in every sense of the word, there must be a text to be interpreted. An exegesis is only possible if the following elements are present: a text, a tradition, and an interpreter.
What could be the meaning of interpretation in the context of what is called "real-time music"? In electroacoustic music, the text is almost always missing. The notion of tradition is also problematic because "real-time electronic music" has a relatively short history of about 40 years: it is a young tradition, but it exists.
Real-time has always been presented as a way to reinstate the function of the instrumentalist and his instrument is the electronic music context:
"The main advantage of real-time systems is the following: with them, the player is no longer a slave to the machine. For this purpose, the machine has had to become more intelligent, or at least, to simulate a part of the musician's activity in performance situation."[6]
The real-time concept is a result of technological evolution and also a historic process dating from the first tape music pieces from the 1950s, through the mixed music practices of the 1960s, ending with the real-time music

[2] "Le compositeur n'est sans doute pas toujours le mieux placé pour interpréter ces propres œuvres, même si cette solution prévaut aujourd'hui (en l'absence d'un nombre suffisant d'interprètes reconnus et en raison, entre autre, du surcoût financier que cela occasionne)" [4, note 60].

repertoire. The practice of mixed music was an answer to the lack of musical instruments in tape-only music. Real-time was an answer to the lack of interpretation in mixed music works.
The topics of musical interpretation and real-time technologies are obviously strongly interwoven. I was able to observe the relations of these concepts during my personal experience of more than twenty years of real-time music at IRCAM.

3.4 The computer as a musical instrument?

Real-time synthesis allows us to use the computer as a musical instrument. The computer can be used in a concert situation, "played" by a musician. But it is a peculiar kind of instrument because it doesn't possess a specific shape.
In computer music, controlling the computer as a "virtual instrument" is related to the development of gestural controls for electronic devices. It is also a question of synthesis control. Current acoustic synthesis techniques can surpass the musical instrument's limits, but at the same time, the musician control is still extremely simple, limited (very often to keyboard- or sliders-type), and rudimentary compared to the expert interaction involved between the virtuoso and his/her instrument.

3.5 Interpretation of mechanical music

Musical interpretation on a instrument involves playing with the instrument give. In English also it is possible to play on the meaning of "play": the ludic (a score is like the rules of a game) and the mechanical (an instrument has numerous mechanical degrees of freedoms, "avoir du jeu")
Rubato, swing are freedoms that the musician can take with the chronometric curse of time. But designing a machine able to produce a convincing swing is quite a serious challenge in artificial intelligence!
Real-time permits true interaction between musician and machine, i.e. reciprocity, a dialog going in both directions, similar to what happens between musicians playing together.

3.6 Interpreting space

We have seen that real-time allows the reintroduction of traditional characteristics of musical interpretation, by the flexibility that these techniques bring, compared to prerecorded fixed sounds. But it also brings into play a new kind of musical interpretation in the spatial dimension of sound diffusion and sound projection. A very important and new domain of electroacoustic interpretation is spatial diffusion.
A new kind of instrumental practice emerges: spatial interpretation is a prolongation of concrete and electronic tape music practices. This role is often (but not always) undertaken by the composer. During the concert, the electronic sounds are projected into the concert hall space using the mixing desk faders or specific electronic devices. It can be a simple fixed assignment of the audio tracks to specific loudspeakers or spatial trajectories of sound sources controlled by either manual or automatic processes. The loudspeaker setup can be frontal, surrounding the audience on a horizontal plane, or even in a three-dimensional sphere around the audience. Space has become a compositional parameter that should be interpreted and performed live, in function of the music style and in function of the concert hall acoustics, dimensions, and configurations.

3.7 Obsolescence and re-interpretation

As mentioned earlier, real-time musical works evolve with time. Technological evolutions imply these works are a kind of life form that depend heavily on these technologies. Real-time music works should perpetually be adapted or die. Porting, re-mixing are also new forms of re-interpretation of the will of the composer by this new kind of interpreters that today are called "computer music designers" or computer musician.

3.8 New species of musicians

At the end the computer (and the sound recording technologies) hasn't replaced the real life performance of living interpreters. On the contrary, it has demonstrated the crucial importance of humans in music, and brings to life new interpretative practices, new disciplines, such as acousmatic music sound diffusion, turntablism, DJs, or computer music designers.

4. HOW? : INTERPRETATION IN PRACTICE

In this last section, I will present some real cases of musical pieces from the classic electro-acoustic repertoire, from the point of view of the computer musician. Because interpretation is not only knowledge and skills, but mainly a practice, the only way to know how to perform these pieces is by rehearsing and playing in concert. The examples and anecdotes presented here are taken from my experience and repertoire as a computer music designer.

4.1 Luigi Nono

"Electronic sound transformation, timbral distribution and time spaces does not mean the rigidity of the electronically extended sound, but the personal interpretation, a very important point for Nono." (Hans-Peter Haller, *Diary note 3.9.84*).
As a consequence of this esthetic, Luigi Nono's music can only be played by people to whom he transmits the knowledge such as Andre Richard (who defined himself as "a composer, conductor, and performer of live electronic music") or Hans Peter Haller. It illustrates the oral tradition nature of the live electronics repertoire. Some modern technical re-interpretations are documented in [7].

4.2 Stockhausen: Mantra

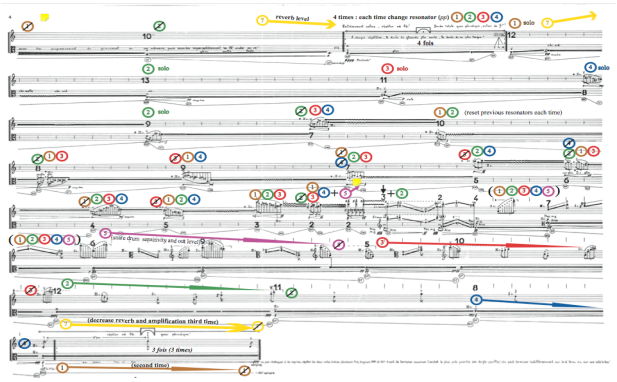
In 1970, the original version of Mantra required some analog gear: sine wave generators, shortwave radio receivers, and ring modulator. These devices are integrated

in the instrumentarium played by the two pianists, in what is often considered as the first important piece of the "live transformed" repertoire.

In the score, the composer precisely describes the characteristics of the required hardware. But as analog equipment of this kind was getting more and more difficult to find in the beginning of our century, Jan Panis realized the first digital version. Miller Puckette also wrote a computerized version of *Mantra* in his "pure data repertoire" [8] (http://msp.ucsd.edu/pdrp/latest/files/doc/)
Even if one finds a shortwave receiver, the Morse code that could still be heard on these frequencies in the 1970s have vanished today, so they are replaced by a recording. This is not without consequences on the philosophical esthetic of the piece! The consequence of the evolution of the available controllers and electroacoustic devices is that each time such a piece is performed, new realizations are necessary.

4.3 Grisey: Prologue

« All the works I have written using electronics have had to be constantly reviewed because of technological evolutions. If you write a piece for electronics, you should always renew the system to make it available to the concert hall. Technology forces me to look back and to work again. A new kind of tape. Going from tape to computer. And from a computer to a new computer model. Or from a synthesizer to a new synthesizer model. It has no end.» [9]
Prologue is the viola solo opening his *Espaces Acoustiques*. If played alone, it should be played through five acoustic resonators (a snare drum, Ondes Martenot "diffuseurs", a tam-tam, etc.). In 2001, Eric Daubresse realized a computerized version virtualizing the resonators.
The performance of the electronic part is rather virtuosic; the level of the viola sound exciting each resonator has to be controlled as written in the score:



The level of six faders on the mixing desk should be moved simultaneously, sometimes very quickly and precisely; it requires several rehearsals with the soloist to be able to perform it comfortably.

4.4 Manoury: Jupiter

This historic piece is a seminal work in the "real-time music" repertoire. It happens to be played quite often since is premiere and it is certainly very interesting to consider that it is probably the piece that had the most hardware and software implementations.
For real-time piece it is very important that different instrumentalists perform it. Before having played it with several young flutists in the *Centre Acanthes* Academy in 2000, I had not realized the variability of the electronic part of this piece that I always played before with the same very virtuosic but predictable flute player. As the sound of the flute was always the same, the electronic part sounded identical (not so different from a tape) but when I happen to be confronted by other flute sonorities and interpretations, the listeners were able to feel that the computer was reacting in real-time.
Jupiter has had a lot of different technological implementations, from the first version using the 1987 experimental cutting edge IRCAM technology (the 4X) to the present day versions. It was ported to at least five different hardware platforms and five software versions: this is certainly a record!

1987: 4X
1992: NEXT
1997: SGI
2001: MAX/MSP
2003: PureData
2015: Faust, Web Audio ?

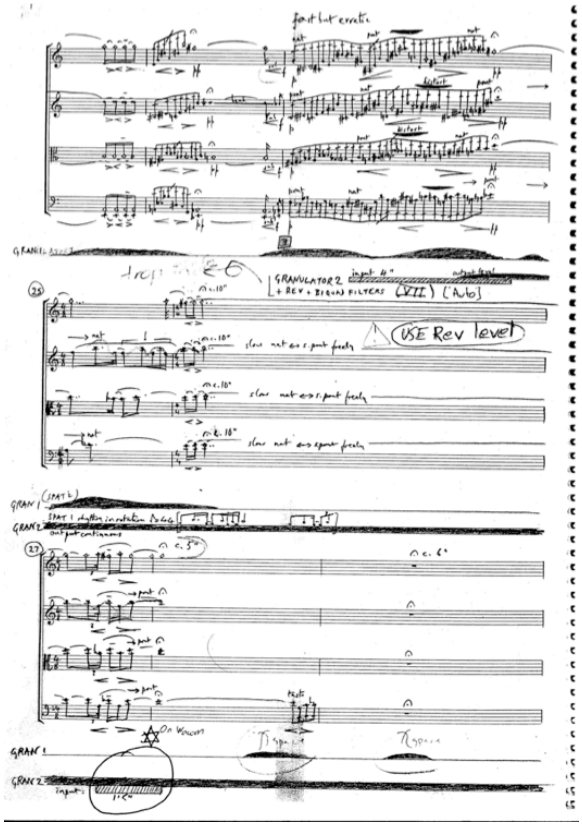
We can ask ourselves the question of authenticity: which version is the authentic? Is it the first one, or the last one? We can assess more certainly that they have all some kind of authenticity!

4.5 Harvey: *Fourth Quartet*

Jonathan Harvey was also concerned by the interpretation of the electronic part of his works. Since *One Evening* (1993), he requires the presence of two technicians to perform the electronic part.
I had the opportunity to play the electroacoustic parts in concert of *Madonna of Winter and Spring* (1986, requiring a total of 5 *operators*), *Soleil Noir/Chitra* (1994, 2

operators), and *Bird concerto with piano song* (2001, *sound "diffusionists"*) alongside the composer. He was very precise about the kind of effects required, but he was also always insistent on the musicality of the interpretation of these effects. It was always a very nice experience.

In the *Fourth String Quartet* (realized in collaboration with Gilbert Nouno), which represents a kind of achievement of all his previous experiences on the integration of electroacoustic media in his musical language, a lot of importance is given to the spatial diffusion of the electroacoustic transformations that can be freely drawn in space using a drawing tablet.



5. CONCLUSION

It can't be denied that electronic or computer music become a logical or natural part of contemporary music; and the integration of technologies in this universal art form is not without consequences on music practices. But for all that, it does not mean that music can be distributed directly to the listener. On the contrary, I have shown that computer music has created the need for new specialized musicians, not composers, not instrumentalists, but "interpreters", because any kind of music cannot live without an audience, in front of which music should be performed.

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