

Musical Virtual Instruments and Auditory Perception: Some Issues

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Abstract

In the current musical context, technological apparatus, usually digital, omnipresent even in traditional concerts, interfere with the spaces of musical listening. In a traditional concert this interference is generally limited to acoustic corrections aiming to improve the listening situation. However, a large volume of contemporary music integrates technological means from the very beginning: the composition stage. In this new toolbox we include musical instruments, electric analogue, digital, but also other equipment not specifically designed for making music with, as is the case of the computer.

According to the above framework, we will present some issues related to the use of "virtual instruments" in the current musical composition and performance, namely the idea of "hearing expectation" dealing with questions such as: What perceptual problems brings the act of visualizing music instruments? What kind of coherence or incoherence can be triggered by the relationship between "performance gesture" and the sound event generated by the machine? How to specify in this context the idea of a performance expression?

Keywords: Virtual instruments, sound event, technology, sound diffusion

1. Introduction

A concert situation implies, for most musical situations, an experience that is simultaneous auditory and visual. However, the evolution of sound diffusion and the development of music technology and electroacoustic music, including live sound manipulation in the electronic music improvisation, altered the actual reality of the concert.

The traditional relationship of cause and effect between the gesture of the performer and the sound result expected by the listener is broken: on one hand, the sound projected from a speaker, static and unimpressive, excludes perception of all relevant visual performative gesture; on the other

hand, even when there is the existence of a performer on stage, the sound result does not correspond to the gesture of the performer who manipulates in a live situation: the performer who plays and improvises on a virtual instrument installed on a computer generally performs simple and unobtrusive gestures, using the keyboard, mouse, or other interfaces. These gestures often barely noticeable from a distance cannot be overstated given the characteristics of interfaces used, and thus they can generate any type of sound: the more simple and understated, the more vivid, intense and rich in spatial movements.

This type of dissonance between the performative activity (visually weak) and the resulting sound (diverse), which can be comprised of any type of sound with any behavior, from the more unique to the more recognizable, generates a kind of conflict in the listener between what he sees and what he hears.

According to this scenario identified in the context of music produced in this way, composers begin investigating processes, from the composition stage to the public performance, that may overcome this shortcoming. It is following this awareness that one starts to invest in spacialization in accordance with musical assumptions as a way of valuing the performance. The spatial distribution would thus be a way to compensate the lack of expressiveness of gesture on the part of those who run for the expressiveness of sound in the context of space itself, thus making the concert gaining a supplement that values the direct presentation of the audio recording.

Following this breakthrough, it was found that the notion of space in music is quite complex and with variants and assumptions that determine how his consideration go far beyond the provision of sound diffusion systems. What we intend to show is that the consideration of this issue of space arises not only in the context of the diffusion of sound from the speakers, but also in the very conception of the piece including the consideration of matters that are inherently musical. I.e., the issue of space in music begins to be defined at the time of composition, including here the specific techniques, instrumentation and technical resources to be used.

2. Electroacoustic musical listening

2.1. External space issues

“L’espace externe, lié aux conditions d’écoute à chaque fois particulières de l’œuvre : profil acoustique du lieu d’écoute ; nombre, nature et disposition des haut-parleurs ; utilisation ou non de filtres et de correcteurs en cours de concert ; intervention à la régie du son d’un interprète humain ou d’un système automatique de diffusion.” (Chion 1991)

The musical outer space is generally regarded as the place where music is heard, be it personal or communal, in the case of the concert. Because the listening space is not neutral, each of these listening situations involves specific conditions that must be analyzed. “[...]parler de l’espace, c’est parler de l’interaction entre les caractéristiques acoustiques d’un lieu, sa disposition géographique, la configuration choisie pour les haut-parleurs dans le lieu [...]”(Vande Gorne 2002)

The space projection of works of electroacoustic music therefore has an influence on the perceived sound result. This influence, considered by many investigators as a phenomena of overlapping acoustic sound areas, happens because, as said Curtis Roads, “[...] l’architecture physique d’une salle de théâtre s’ajoute à l’acoustique virtuelle d’une composition musicale pour bande.”(Roads 1998) Indeed, since the decade of 1950, writings about the concert of electroacoustic music, show a

growing concern on the conditions for sound projection, that are connected to the room itself or the equipment used.

However, knowing the characteristics of the physical space where the work is heard may, as a result of acoustic phenomena, spectral filtering, reflection, diffraction, absorption, generated by reaction of the sound wave at the listening, entail substantial influence on the work itself. Both composers and technicians seek to improve the conditions of listening and responding musically to the challenges of this situation. On the other hand, especially composers, consider in an increasingly intensive way, these same aspects of the composition, to attempt an increasingly effective control of the whole chain from the composition to listening, passing through the registration.

2.2. Sound diffusion devices

A sound projection device is a set of equipment, more or less complex, and connected in various ways, which allows the sound projection of a work electroacoustic music, whether on fixed support or directly produced. This device should be able to reproduce as accurately as possible so that musical works, although as the physical space is not neutral, it exerts a decisive influence on the perceived sound result. Plus, the device must be designed so “[...] toujours essayer de tirer parti du lieu, de l’espace et du son acoustique [...]” (Henry 1977), as already said Pierre Henry in 1977. But, as several concert spaces engender various sound results for the same work, the devices installed differently from one place to another, as acting in concert, produce different level of resonance and radiation of the sound waves. In addition to these issues related to the relationship between the device and the physical space, we need to be aware that persists sometimes a common sense relative to a certain tendency to consider the devices and especially the speakers, as “[...]acoustiquement neutres, ce qui est évidemment faux: ils constituent des corps résonants avec des caractéristiques propres.”(Vaggione 1977).

The sound device used should therefore behave sufficient, in varied means well distributed in space, to allow a dispersion of sound waves reproducing as faithfully as possible the internal sound space inscribed in the musical work. Additionally, the awareness of the characteristics of the device and its diffusion in the physical space where it is installed, it is essential to good sound projection, i.e. the proper interpretation of the work.

2.3. The performance

The role of performance in the context of electroacoustic music, despite already abundantly discussed, points to a slightly controversial issue. Can a fixed electroacoustic music be effectively interpreted? What is a performance in this context?

These questions are derived directly from the fact that, historically, we associate performance, or musical interpretation, to a particular activity involving, specifically, the act of reading symbols inscribed on a score and translating these symbols into sounds through a set of instrumental gestures. But this association of the idea of musical performance as an activity of "translation" is derived not only to a cultural learning that acts that way, but, and perhaps primarily, the fact that instrumental music exists only through performance. In short, “[...]la musique instrumentale n’a pas d’espace interne au sens physique du terme : son support étant purement symbolique, l’espace interne est actualisé au moyen de l’interprétation, de la mise en sons.” (Vaggione 1977)

The electroacoustic music by his side, made of sounds fixed on support, seems to leave no room for an interpreter, for an instrumental gesture, for a performance, “[...]la mesure où il y a définition concrète de l'espace interne de l'œuvre. Le type de support utilisé véhicule non pas des symboles, mais des sons déjà « interprétés »”. (idem.)

Thus, the sounds of electroacoustic music, with all its characteristics determined by the composer and perpetuated in support, eliminate the translation of symbols into sound. This is comparable to recording an instrumental work: consider the recording of a Mahler symphony; it is appropriate to interpret through a performative act, a music already interpreted? The obvious answer would be "no"; just put the CD into the player and enjoy the pleasure of listening.

As Tiffon says electroacoustic music: “[...]se trouve paradoxalement mieux « révélée » par l'entremise d'un spécialiste de la projection sonore, nouvel interprète aux responsabilités sans doute réduites, mais néanmoins essentielles pour une perception entière des jeux d'espace qu'elle contient.” (Tiffon 2002)

What is the performative act within electroacoustic music? The act of sound projection in a concert hall, using a more or less complex device consisting of diverse and often different from a concert hall to another, when the part of the performer requires a set of skills and knowledge that are comparable to the "savoir faire" of any other instrumentalist. The scope for interpretation of a fixed work is thus reduced, sometimes leading to depreciating the work of the interpreter, however,

Être aux commandes d'un instrument de diffusion – ou de projection – spatiale, nous donne quelque chose de plus que la possibilité d'agrandir une image sonore : c'est également celle de recréer son mouvement virtuel. C'est ainsi que le son se met à vivre, que les plans – les multiples degrés d'énergie contenus dans les morphologies composées –, se manifestent à la perception. La « lisibilité » des morphologies découle de leur mise en mouvement, d'une cinématique de la projection sonore.”
(Vaggione 1977)

Thus, as in a concert of instrumental music, the interpretation is essential to the work, different each concert, different for each performer or ensemble. A given work of electroacoustic music,

[...] n'a pas qu'une seule vérité. On peut un jour souligner ceci, un autre souligner cela, à condition que le total reste le bon, c'est-à-dire que par l'articulation des contrastes, le contenu formel et symbolique ouvre chez l'auditeur une symbolique correspondante, par la grâce imprévisible d'une mise en relief des formes concrètes exactement ajustée aux conditions acoustiques et psychologiques d'un espace et d'un groupe d'auditeurs.”
(Bayle 1996)

The interpretation of an electroacoustic work is therefore a necessary condition for the understanding of the work by the listener. The instrumental gesture, often discrete, as previously stated, in these works is often replaced by the gesture of the sound.

3. The concert: performance of virtual instrument

“Ce ne sont là que quelques aspects du métier d'interprète spatialisateur qui répond, comme toute autre discipline instrumentale, au couple compétence/performance : la connaissance technique de son instrument, la connaissance analytique et mémorisée de l'œuvre, et le désir de la transmettre en suivant le « feeling » du moment, l'émotion vécue au concert.” (Vande Gorne 2002)

In fact, what we have seen in these last 50 years of evolution of electroacoustic music, is that the work of the musician or composer / performer in a concert situation has changed substantially. Let's clarify a little better.

The first aspect to consider is that actually, in the context of music assisted by technical means, such as electroacoustic music, in a concert situation, it designed an absolutely specific role of the interpreter, which is not associated with the entire symbolic burden involved in a situation of performance of a musical instrument, for example. Situation that also conveys to the spectator.

There is not a noticeable identification, made by those who watch the interpreter, between the gesture and what is heard. But this lack of expressiveness and its symbolic dimension, does not mean, contrary to what one might naively think, that the interpreter does not fit an active role. The interpreter is much more than someone who is just there to press certain buttons in a neutral and passive way. I.e., the interpreter performs a specific function during execution and this function has implications on what one hears. This is how we say that the interpreter has interference (positive or negative) in the final result. Its function is not neutral, meaning even the development of a level of complexity that makes their function to behave like that of virtuosity and excellence in interpretation. This then leads us to the conclusion that this type of interpretation-music, can we say, can also be made in a good or bad way.

The second aspect to consider is the idea that the composition also happens at the time of presentation. This means that the presentation, in a certain context of a certain piece, under certain conditions, points to the sheer size of the composition of that piece. Of course we can establish a comparison with the music presented in a more traditional way, using musical instruments in which the perception of expressiveness associated gesture is much more evident. But this comparison should be based primarily on the assumption that electroacoustic music, as other more traditional music, also implies an interference of someone at the time of the performance. "L'interprétation d'une œuvre acousmatique tend à enchaîner diverses figures spatiales qui renforcent l'écriture de l'œuvre, mettent en relief les figures existantes ou en créent de nouvelles." (Vande Gorne 2002)

This means that this kind of performance does not reserve a part of simple neutrality to the performer, but an active one for those who make this presentation. And what we mean by activity here? Especially reinforcing the idea that whoever performs this type of music is a full interpreter as one who performs a more traditional instrument. Although in a different way, the interpreter of electroacoustic music is someone who has a level of interference to the proper piece of music what one hears in a concert presentation. "L'œuvre est faite pour être à chaque fois remise en jeu (ou en valeur) pour de nouvelles oreilles." (Bayle 1996) And to that extent, we should then proceed with the idea that electroacoustic music, by this possibility, what has made is to take this aspect at the stage of the composition itself. That is, the composers rely increasingly on this dimension of interpretation in the creation of its music. Not only because they can make use of increasingly versatile diffusion systems, allowing this spatialization varied, but also stressing such dynamic sound to replace the absence of gesture that we just spoke. As well as the composition itself, this dynamic sound is increasingly regarded as the most effective way to direct the composer to the space issues, not only at the time of diffusion, but also at conception itself, as we shall see in the next section.

"Thus our laptop artist who played *solitaire* to fool the audience during a 'live' performance was not truthful, yet this did not necessarily deprive the audience of a genuine pleasure in perceiving choices taken, pathways avoided, intentions fulfilled or unfulfilled which were already in the (pre-recorded) sound." (Emmerson 2007)

4. Compositional strategies: composing with space

[...] cet espace qui porte le corps du son l'anime d'une lumière intérieure, va constituer le champ de l'image et renseigner aussi sur ce qui se passe hors champ, que l'on peut subodorer, reconstituer. Autour de l'image flotte une aura. (Pires. Bayle 2008)

In electroacoustic music, as indeed in instrumental music, musical sound consists of a set of manipulable elements of possible different time levels, and the presence of sound in the perceptual space operations. The process of musical composition includes intra and extra musical elements that allow the production of schemes or processes at various temporal levels, ranging from the purely intellectual conception of the project until the full completion of the work in concert.

Realizable operations during the process of musical composition of an electroacoustic work are of various types, from the production of algorithms for the generation and manipulation of the physical variables of sound, until the construction of the perceived forms of sounds and all other intellectual mechanisms or materials contributing to the design of the sounds in music. In fact, these operations can be, for the most part, comparable to the act of composing music in the traditional sense, since the composer works the sounds, creating their instruments, developing musical ideas with the aim of obtaining a particular sound result it has set. And if in electroacoustic music one « [...] ne peut pas composer directement avec ce que l'auditeur est supposé entendre, puisque ce que l'auditeur entend résulte aussi d'opérations » (Solomos 2003) will be audibly that the composer will evaluate the operations performed during the compositional process, as Vaggione says about the purpose of Jean-Claude Risset's work: « [...] faire un son par synthèse numérique, ensuite l'écouter, déceler les saillances perceptives, afin d'affiner l'opération subséquente. [...] [et] valider perceptuellement les produits des opérations de synthèse » (Vaggione 2003), porque « [...] difficile, en musique, de séparer le formel du sensible. L'opération est du formel qui est aussi du sensible. » (idem.)

In the field of musical composition, the smallest action which has the aim of transforming an element - the creation of a gesture, a sound motion in space, a spectrum of a sound - whether a concrete action or solely intellectual - is already a compositional operation. The creation of spatial sound gestures replaces to some extent, in the time of the performance, the instrumental gestures, not in the sense of anticipation as the traditional hearing in traditional concert, but in the sense that « L'espace intervient surtout dans le souci de clarifier le son. » (Solomos, 1996).

Slightly detailing this situation, we must consider that space, quickly elevated to the level of other musical elements since technology has allowed to handle it in a reliably way, became a key compositional element in electroacoustic music. Particular care is given to the current sound space from the moment of conception of the musical work: the composer works each sound element imagining their disposal in the room, and the movement that will result ideally within concert. Thus, determination of musical gestures according to a particular arrangement of the sound projection systems, will generate new sensations in music based in fixed support, such as that which, in one or another way, depends on the diffusion technology to be perceived by the listener on concert.

This composition of sound space seems to eliminate or decrease the possibilities of the electroacoustic music performer interference. However, the performance, carried out from a diffusion system, more or less simple, or by using a virtual instrument programmed into the computer and using more or less number of other interfaces, will always be comparable to the act of interpreting a traditional score, in which well-defined symbols must be translated into well-defined sounds, also limiting the player to interpret certain, strictly composed music represented in score. "Mais restera, encore et toujours, à "l'interpréter" c'est-à-dire faire au public le don de la

musique. Jamais un nouveau format ne réglera le problème du don de la "vie de l'écoute".
(Bayle 1996)

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