The Creation and Projection of Space-Source in Electroacoustic Music.

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ABSTRACT

This paper develops the notion of space-source in electroacoustic music. Space-source is one of the four spatial categories, drawn from the theoretical work of Annette Vande Gorne (the other spatial categories are space-ambiophony, space-geometry and space-illusion). It demonstrates the methods by which space-source can be integrated into the compositional process and in the projection of electroacoustic music in performance. It examines different ways with which space-source is perceived and deciphered. The influential role of the loudspeaker installation for the projection of space-source is also a preoccupation in this paper. The art of projection plays a decisive role in the perception of electroacoustic music and the space-source in particular. The way we compose and hear electroacoustic music is defined by a loudspeaker-based approach. Individual or pairs of loudspeakers project sonic images, which are influenced by the acoustic properties of the listening space and the projection decisions made by the performer. Five spatial figures (Accentuation, Glittering, Unmasking, Insertion/rupture, Appearance/disappearance) are introduced as potential templates for the projection of space-source.

1. INTRODUCTION

1.1 Space-source

If ambiophony[1] is the unconscious utterance of the environment we live in, space-source defines the intentional and conscious monologue of the environmental elements by specifying their location and emphasizing their characteristics. In everyday life, space-source is inevitably interlinked with space-ambiophony. They both carry the totality of meaningless and meaningful information for the deciphering of the environments that surround human existence and, in that sense, they are immensely important for human evolution. Space-source however, is differentiated from space-ambiophony due to the diverse mechanisms developed for its perception. Jean-Claude Risset explains: "The mechanisms for sonic localization are important for survival. They possess subtle indications, such as those that allow us to sense if a sound comes from the front or the rear, according to the symmetrical plan of the head"[2] [1]. These mechanisms reveal the source from which a sound originates and also define the process by which the energy of the sound or a sonic component enters the system of perception. For example, when the source of a sound is close, the detection of its location is accurate and the energy with which it knocks at the door of perception is high. On the contrary, a remote sound carries insufficient information regarding its location and therefore the power of its energy is diffused or lost.

1.2 An example

Close and distant thunders on a rainy winter night provide a tangible example. Although they are both partly sonic expressions of the same natural phenomenon, we perceive them as different due to the distance that comes between our location and the location of their source. It is easy for example to localize a close thunder because its source is very near to where we stand, and consequently, it enters our perceptual system with great energy - one can even watch it traverse a celestial space. On the contrary, a distant thunder provides no indications regarding location because by the time it enters our ears part of its energy is dispersed. This example also illuminates the importance of high frequencies in sonic localization. High frequencies have the tendency to betray their source and be directional, while low frequencies seem to have no localizable source at all due to their long wave period that occupies the space in equal proportions.

This is exactly the idea that Bernard Parmegiani uses in his “Points contre champs”, a movement of “De Natura Sonorum”. As shown in Figure 1, vertical events that contain abrupt attacks with high spectral content converse with and oppose to a long sustained and persistent ostinato in the low spectral area. Here, space-sources coexist, interact and confront ambiophonic environments. Ambiophony is here used to emphasize the space-sources and their theatrical character and it therefore has an important structural role. A source, after all, can only emerge from within a more global environment.

“Points contre champs” is a very clear example of the opposition between verticality and horizontality, repeti-

[1] From the latin word “ambio” (circle, embrace, go round) and the greek word “φωνή” (phone: voice).

[2] "Les mécanismes de localisation sonore sont importants pour la survie, et ils font appel à des indices parfois subtils, comme ceux qui permettent de distinguer, dans le plan de symétrie de la tête, si un son vient de face ou de l'arrière". (author’s translation)

tiveness and continuality, localization and dispersion and, eventually, space source and space ambiophony.

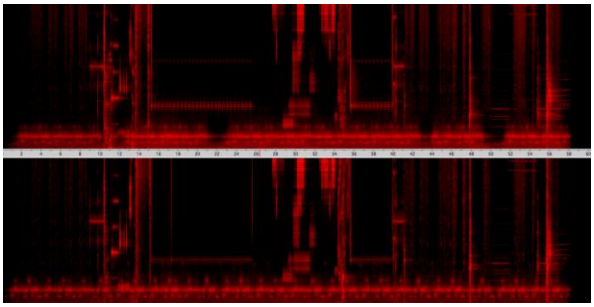

Figure 1. Sonogram analysis of the first minute of Parmegiani's "Points contre champs".

It is the symmetrical plan of the head, to which Jean-Claude Risset was referring, that Parmegiani exploits in another movement of "De Natura Sonorum" entitled "Incidences / Battements". This movement explores the category of space-source unfolding a series of repeated attacks on its temporal axis. The attacks follow one another with mimetic repetitions and delays from left to right loudspeaker that span from a few milliseconds over to two seconds (for the first 40 seconds of the movement), as shown in Figure 2.

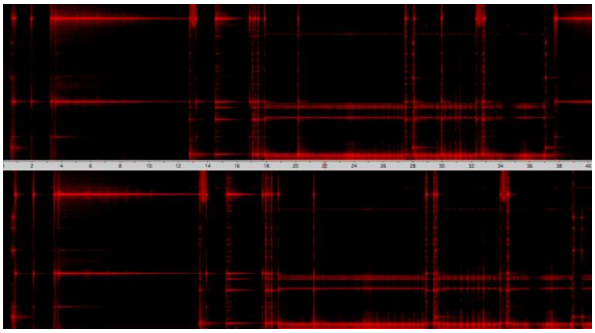

Figure 2. Sonogram analysis of Parmegiani's "Incidences / Battements".

The phase differences of the attacks structure distinct topographies both in the composed and in the diffused space. Such shorter or longer differences are perceived as shorter or longer distances in the topography of the concert hall, revealing thus virtual delays and imaginary echoes.

The spectral occupancy of a sound is only one of the aspects that allow the identification of its location. As Camilleri and Smalley explain, "In terms of location, we may not necessarily be able to delineate a self-contained unit or sound, but instead will need to highlight a prevalent sonic characteristic or a structural behavior; we may not necessarily be concerned with a discrete *unit* at a low level of structure but with a more global feature" [2]. Pertinent qualities, such as spectromorphological[3] [3] behaviors, that are "…intimately tied up with the substance of a sound and its evolution…" [4] also provide a workable method for sonic localization. For example, any type of gesture that sculpts the spectromorphology of a sound guides the perception of the listener towards a real or imaginary source and lends a tendency of direction to the sound. Parmegiani clearly underlines his spectromorphological methods for sonic localization. Panning, delays and echoes, mimeses and repetitions are all gestural tools that shape the spectromorphologies and engrave the spatial order. At the level of sonic typology, his composition abounds with distinct localized points, lines and trajectories, all elements of the space-source category (Figure 3).

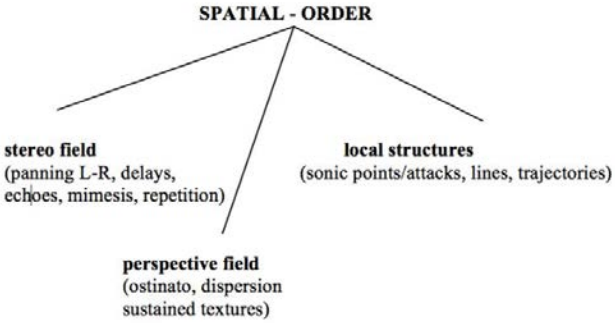

Figure 3. Spatial order in Parmegiani's "Points contre champs".

2. THE ACOUSTICAL AND PSYCHOLOGICAL SOURCES

Another aspect that differentiates the perception of space-source from other types of spaces is the temporal dimension in which it unfolds. Space-source is more likely to be perceived as a series of instances rather than a continuous temporal unfolding. Short percussive sounds for example, or any kind of morphologies that contain prominent spectromorphological features, emerge as temporal sparkles that structure the perception and offer to the memory fixed points of reference. This argument however, becomes cumbersome when we examine long sustained morphologies. The composer and researcher Leo Kupper declares that "A fixed sound source in space is never fixed psychoacoustically" [5]. He elaborates by giving the following example: "If we listen all night long to a single sound…this sound will constantly move in space. After a long period of time the source moves from the loudspeakers into the brain and cannot be extracted until the sound coming from the loudspeaker is stopped" [6]. This observation clarifies the difference between acoustical source and psychoacoustical source and highlights the importance of time in the process of localization. In the passage of time the "instant" of the source is fading, eventually becoming a faint memory.

3. SURGERE

The Latin verb "surgere", from which the word "source" takes its roots, can be translated as "arise" and/or "emerge"[4]. Space-source is defined by the emergence of sounds that demand the listener's attention and point to-

[3] The term "spectromorphology" is coined by Prof. Denis Smalley. It describes the spectral evolution of sound in time.

[4] Source: Concise Oxford Dictionary (1999).

wards a topological perception, through which the listener can localize the sources of the sounds. The geography of diffused space and sources is very much dependent on the way the loudspeakers are placed in the listening space. Differences in qualities of the loudspeakers also play an important role in the localization process, since loudspeakers with different "color" qualities will project the same sound in completely different ways. A sound will emerge differently from different loudspeakers due to the specific qualities that each possesses, and consequently, source-perception will also be influenced. This is not necessarily a negative aspect, but one that the interpreter of electroacoustic music should take into account. For example, a pair of speakers that face towards the ceiling should not be used for the projection of a source because the listeners will perceive their reflections, an indirect image of the source, which is already diffused and therefore not localizable.

4. SOURCE LOCALIZATION VS. LOUDSPEAKER LOCALIZATION

At this point, it is important to differentiate source localization from loudspeaker localization. Although a sound emerges from one (or more) loudspeaker that does not mean that its source *is* the loudspeaker. For example, a sound that comes from a rear group of loudspeakers is located behind our heads and not in the loudspeakers themselves. This indicates that, although the localization of a sound source may be desirable, the interpreter should generally avoid the *mise en évidence* of the loudspeakers.

The different qualities of the loudspeakers that one usually confronts during a concert of electroacoustic music can be used for the illumination of one of the most prominent aspects of space-source: its theatrical character.

5. AN INVISIBLE THEATRE

5.1 Sources and Characters

In space-source, each loudspeaker can reveal a potential individual source. Taking into consideration the different qualities and "colors" that an "orchestra" of dissimilar loudspeakers comprises, one can assume that each speaker possesses an individual character. This aspect can be emphasized for the projection of narrative elements and structural repetitions. For example, if the interpreter uses the same speaker for the projection of narrative text, the speaker becomes a personality, an invisible theatrical character that impersonates and utters the meaning of the text. Very often, this role is played by the so-called "soloist" speakers[5], which are often placed asymmetrically in the listening space. More abstract sounds that possibly accompany the text, become the imaginary scenery within which, the narration unfolds.

5.2 Individuality

The key word for the theatrical nature of space-source is *individuality.* The perception of sources reveals the individual characters of the sounds, which in most cases, exist within a sonic context but do not blend spectrally with it. Short significant attacks and vertical events on a temporal axis demand attention before they fade and become traces in the listener's memory. Superposition of sequences that emerge from different points in the listening space, and contrapuntal voices, are all theatrical aspects that impersonate environments of pointillism and multiple dialogues. Density variations encompass all these forms, influencing their significance and transforming their electrical signals into sonic personalities. As in all narrative cases, memory, with its faint recollection of past incidents and its tenacious potential, restores the sources of the events and deciphers their significant role. In that sense, a loudspeaker, used to reveal a source, can trigger a series of emotions. After a number of "entrances" of a loudspeaker, the listener develops a level of awareness regarding its role and future participation. The loudspeaker becomes an "enemy" or a "friend", a cause for fear or complacency, a caricature of narration.

6. FIVE SPATIAL FIGURES FOR THE PROJECTION OF SPACE-SOURCE

The projection of space-source necessitates its unique and explicit language and technique during the performance of electroacoustic music. As a general guideline one can accept that space-source can be interpreted both with symmetrical and asymmetrical (or concentric and non-concentric) loudspeaker configuration[6] (Figures 4 and 5).

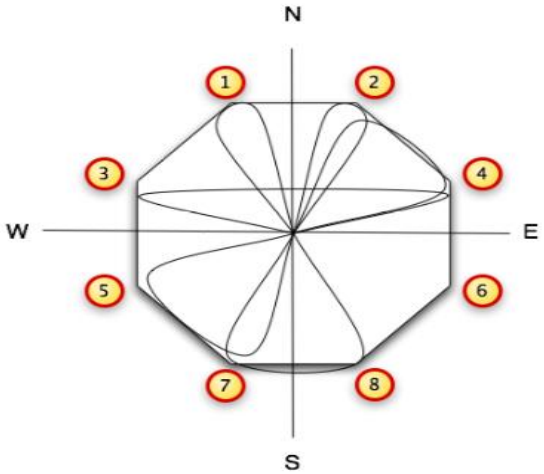

Figure 4. Sonic trajectories in a symmetrical (concentric) 8 channels set up.

[5] Loudspeakers that are not part of a usually symmetrical configuration are called "soloists". They are often placed near the audience and their function is to project prominent sounds.

[6] The same applies to space-illusion. The other two spatial categories (space-ambiophony and space-geometry) need exclusively symmetrical or concentric loudspeaker set-ups for their projection.

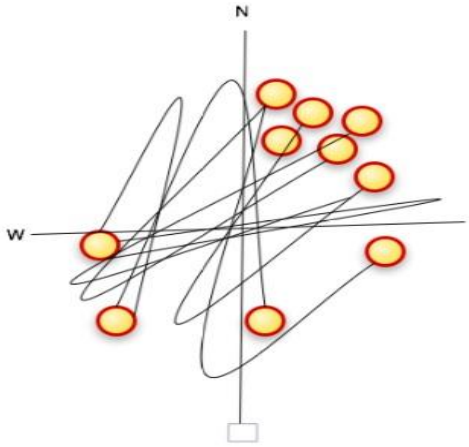

Figure 5. Sonic trajectories in an asymmetrical (non-concentric) set up.

Five spatial figures, drawn from Annette Vande Gorne's work on spatial interpretation [7], are introduced here as potential templates for the projection of space-source.

6.1 Accentuation

This figure emphasizes particular points of a piece according to their structural role and can be applied to specific moments of the projection or to a more general strategy of projection. It can be used in order to "emphasize a precise localization…or a group that forms a particular space or volume, simply by increasing the amplitude of certain loudspeakers"[7] [7].

6.2 Glittering

Glittering refers to rapid accentuations within a sonic mass. It can be aleatory, revealing random sources and usually applies to changes in amplitude and spectrum. It underlines dynamic or spectral fragmentations and "…reinforces compositional techniques such as micro-montage and pointillism"[8] [7].

6.3 Unmasking

This type of spatial figure results in the emergence of a pair or a group of loudspeakers from a sonic mass. From an "orchestral" tutti, this spatial figure guides the perception to a focused and localizable sonic structure. The mute buttons[9] can also be used for a sudden change of spatial perspective.

[7] "Mettre en évidence une localisation précise … ou un groupe formant un espace particulier, un volume, un nouveau calibre, simplement en augmentant un peu l'amplitude des haut-parleurs choisis…". (author's translation)

[8] "Mettre en évidence un moment d'écriture par micro montage, ou pointilliste". (author's translation)

[9] The mute buttons on a mixing desk allow to abruptly "turn on" and "off" the loudspeakers.

6.4 Insertion/Rupture

Insertion/rupture refers to a dynamic passage or incorporation of a space within a space, which is already established. Rupture, the more dynamic of the two, can be used in order to breach an established spatial environment. Its musical function is to create rhetorical figures. A rupture, for example, can be used as a sudden appearance in a diffused sonic mass or a contrasting entrance to a diffused state.

6.5 Appearance/Disappearance

It has a similar function to insertion/rupture, and refers to "non-prepared eruptions" [7] of different spaces. Sudden use of mutes can be applied to create surprise and alarm.

7. CONCLUSIONS

Ideas concerning the composition and projection of space-source in electroacoustic music have been presented in this paper. Space-source has been examined not only for its musical applications but also in relation to perception. The ideas are based on a theoretical approach combined with subjective judgment and illustrated by musical examples. One of the main issues considered is the importance of projection of space-source during performance. The art of spatial projection and the development of a methodology for its practice were preoccupations of a great part of this paper. It is through this practice that music is perceived and comprehended, a factor as important as the process of composition itself.

Space-source, expanding from mono to multi-channel configurations, enables a detailed exploration of the plasticity of the sound material, which unfolds in the concert hall. Projected by symmetrical or asymmetrical configurations, space-source needs to be meticulously articulated to emerge with clarity.

8. REFERENCES

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[4] Ibid as [3], pp. 127.

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