The Perception Of Illusory And Non-identical Spaces In Acousmatic Music (v.1)

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This paper examines the perception of illusory space in spatial acousmatic music and develops Annette Vande Gorne's concept of e*space-illusion*.

All in the golden afternoon
Full leisurely we glide;
For both our oars, with little skill,
By little arms are plied,
While little hands make vain pretence
Our wonderings to guide.

Lewis Carroll (1995:3)

1. Introduction.

Illusory space is the *Alice's - Adventures - in - Wonderland - Through - the - Looking - Glass - and - What - Alice - Found - There* of electroacoustic music. In Lewis Carroll's book, speaking playing-cards, white rabbits with pink eyes and looking-glasses are not just speaking creatures, non-beings or unrealistic objects thrown together in a supposedly multi-dimensional world with a slightly bizarre *mise en scène*, but representations and mindscapes[1] triggered by the reader's mind's eye. The lively objects and characters of the tale have little significance other than to pull the trigger of a boundless imagination, personifying deceptive appearances and impressions, and false or unreal perceptions. One can argue, though, that anything perceived is real, and therefore, imagination, wherever it comes from, can fit into the restrictive limits of isomorphism that characterise human perception. Based on this argument, or rather sophism, a white rabbit with pink eyes is as real, although at a different perceptual level, as a white rabbit in the woods. The important issue however, is not whether such a creature can ever exist, but how we perceived it through the printed pages of a tale.

Seemingly, illusory space in electroacoustic music does not deal with sounds as Schaefferian objects, but Baylian images and representations. Sounds become i-sounds, or image-sounds[2], tools of perception that liberate the imaginary[3]. The stage director is no longer the composer but the listener. Jean-Claude Risset writes that, «...although the real sound sources, the loudspeakers, are fixed, the listener has the impression that the sound moves in a vast space which overflows the loudspeakers. This space is illusory: it is audition that establishes and

constructs it from signs detected in the sounds»[4] (1998:21, author's translation). He later states that «Illusory space is a mental construction, a conceptual projection in the midst of which, the mind (esprit) situates the virtual sources according to the ways it interprets the auditory experience»[5] (1998:21, author's translation). As Alice declared, «It's my own invention» (Carroll, 1995).

Gaston Bachelard in «La poétique de l'espace» suggests that, «Space, struck by the imagination, cannot remain an indifferent space...It is real, not in a positivistic way, but biased by the imagination»[6] (1957:17, author's translation). In that sense, space-illusion is a symbolic type of space. Thoughts and emotions derive not from acoustic properties or the function of the signal, but from the reverberant significance and archetypal allusions bared by the listener's perception.

It is also a metaphorical type of space because it provokes mental images, or mindscapes which emerge from the perceptual process. A recorded space for example, becomes illusory space, and thus a metaphor, when it is projected and perceived. The recording of a person walking in the woods, or the cries of the seagulls near the sea, both clichés in soundscape music, have little to do with the listening space in which they are projected. They carry, however, archetypal associative images, significant enough to be recognised by the listener. Camilleri and Smalley, although referring to acousmatic music in general, underlined that, «...in the invisible, spatial play of *sound-images*, there is often an ambiguous entwining of allusion to the real world, and an imaginative distancing from its realities» (1998:128). Symbolic or metaphorical, space-illusion is the fruit of an innermost audition, balanced between the realistic stimulation of the senses and seemingly unrealistic perceptions. In between the two, the curtain can be raised for the rabbit to enter the scene.

Space-illusion is not an originality or eccentricity of electroacoustic music alone. Even though with electroacoustic means and computer simulation and playback technology, the creation and projection of illusory spaces enter a new realm, instrumental composers have also been preoccupied by the allure of space-illusion. Claude Debussy was among the composers who integrated illusory spaces not as anecdotal elements, but rather as an essential parameter in his compositions. «La Mer» is rife with string waves, flute bitter winds, vast orchestral oceanic masses and glittering micro-spatial surfaces composed as illusory expositions of an impressionistic painting. All these mental images not only deal with anecdotal descriptions, but also transfer orchestral sound into a metaphorical realm with transcendental significance. I could go even further and suggest that Debussy, as many composers of electroacoustic music nowadays, intentionally applied the principles of spectromorphology in his music. «La Mer» is developed in a ceaseless and dynamic sculpting of the orchestral spectrum. Woodwind trills and string tremolos, fast modal scales and spectral glissandi are superimposed, determining spectral boundaries and resulting in an organic growth of form.

2. The illusion of motion and Zeno's paradox.

Motion, or the illusory perception of motion, serves as the vehicle that guides the listener through spatial sights. To understand how sonic morphologies create spatial environments means to probe into the mystery of motion behaviour and kinetic properties. One should realise, however, that the perception of motion may be based on illusory aspects and deceptive information processed by the human senses, as one of the most famous paradoxes regarding motion suggests. Zeno's[7] paradox of the flying arrow (Ray, 1991) reveals the dilemma: take a high-speed photograph of a flying arrow (Figure 1).

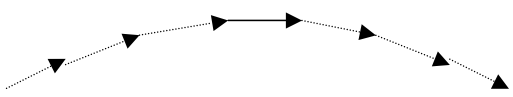

Fig. 1: The paradox of the flying arrow. The image of a moving object.

At each moment of time the arrow may be considered to occupy a specific region in space. Zeno asserts that the arrow occupies exactly that space which is equal to its own shape and size. This poses the following problem: if the arrow is in a particular point of space at any given moment, then how is it moving? And if it is not moving, how does it get from point to point in the passage of time? How can an apparent motionless object move? The arrow becomes a static completed entity. Therefore, one can argue that physical motion does not truly exist and is just a very convincing illusion: the *image* of a moving object.

3. The imitation of motion and musical space

If we transfer this paradox into the sonic world the contradiction remains the same: we have to wonder whether we create physical motion or the *illusion* of motion.

Still, as many listeners of electroacoustic music can verify, the perception of motion and therefore of space is quite tangible. How is this feasible? Let us examine two compositional methods for the imitation of motion and space, shown in Figure 2, both derived from Denis Smalley's work on compositional processes:

1. The alteration of the **spectromorphology** of sound events. Spectromorphology refers to the dynamic shaping of a sound or sound structure over time (Smalley, 1986).

- within the pitch field (glissandi, spectral transpositions, filtering). Applying spectral changes to a sound results in the imitation of motion within the pitch field.

2.The alteration of the **spatiomorphology** of sound events, that is, the reinstatement of the same sound event in different spatial environments. For example, if a sound is transferred from a spatial environment A to a spatial environment B, then the focus of perception is the spatio-morphological change (Smalley, 1991). These alterations take place:

- within the stereo field (panning L-R, delays, multi-delays, mimesis[8], repetition). The beginning of «Etude élastique», in «De Natura Sonorum» by Bernard Parmegiani, demonstrates the application of panning. Although panning does not necessarily reinstate a sound in different spatial environments, it results in motion or spatial occupancy within the stereo field. Other sound examples from «De Natura Sonorum» («Incidences/Battements»), deal with mimesis, which is applied in order to reinstate the same sound events in different points within the stereo field[9].

- within the perspective field (background to foreground and vice versa, reverberation, echo, chorus). The application of reverberation alters the spatiomorphology of the sound and creates illusory motion (i.e. foreground-background-foreground).

- within geometric structures (sonic planes, lines, trajectories, spirals, spheres). In «Points contre champs», also taken from «De Natura Sonorum» short and often percussive sounds shape geometric structures, such as lines, planes and spirals, which co-exist within different perspective fields. The process of shaping geometric structures in time results in imitation of motion and space.

Geometrical structures can be either static giving the impression/illusion of a determined fixed space, or non-static thus resulting in a space frame with elastic boundaries.

Spectro- and spatio-morphological changes are interdependent. Spectral alterations always result in changes in the perception of space and vice versa.

If we compare, making due allowances, the «motion» of an arrow with the «motion» of a sound we can conclude that what is perceived as motion is not only, or even primarily, the actual displacement of sound in space but a rather complex interactive system of functions which relates the spectral characteristics of a sound object with its spatial dimensions. By exploring this interactive system, the composer not only succeeds in moving the arrow in straight lines but also in creating multi-dimensional virtual environments within which sound events form the illusion of motion and musical space.

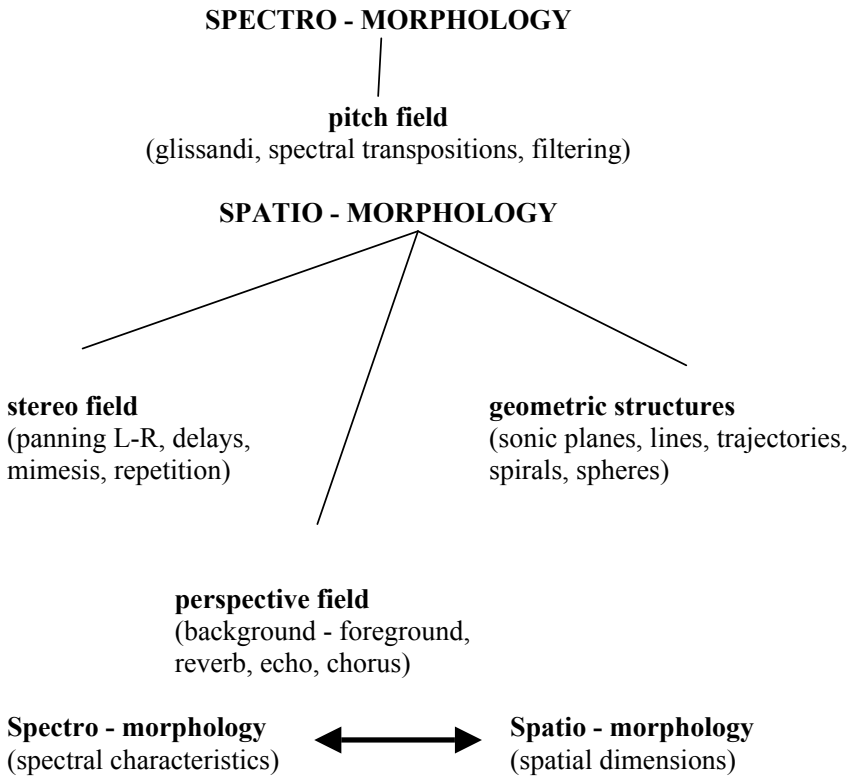

Fig. 2: Compositional methods for motion and space.

4. Propositions for the projection of space-illusion.

The sound displacement between the loudspeakers, either by amplitude panning or movement of faders, creates illusory motion which results in illusory space. The choice and positioning of the loudspeakers in the listening space, from the tweeters to the subwoofers, determines the possibilities of motion and consequently the precision or not of the spatial articulation. Most of the fifteen spatial figures proposed by Annette Vande Gorne (2002) can be used during projection for the reinforcement of illusory spaces. I shall, however, concentrate on three of them. *Explosion* refers to sudden and dramatic changes between different sonic spaces, such as from a narrow or directional space to a large or environmental one. Explosion is produced with sharp releases of the faders and brings out eruptive sonic masses or agitated morphologies. The spatial figure of *accumulation* is used for gathering together a number of sonic quantities. It is characterised by proliferation and, according to Vande Gorne, «...addition or superposition of points and planes in order to create a spatial tutti» (2002). *Invasion* refers to a very fast accumulation, or a rapid trajectory towards the public. One of its musical functions is to create motion which results in aggression (Vande Gorne, 2002).

5. Mixing material...

...with allusive implication, such as wind-like sounds, with non-recognisable sounds, such as sustained abstract textures, «... implies visual and acoustic juxtaposition» (Barrett, 1997). Because allusive sounds often trigger images and consequently possess real-world links, they influence the way we hear abstract textures which are juxtaposed with them. For example, when a wind-like sound, which seems to move within the perspective field is mixed with other non-recognisable sounds, we tend to associate the latter sounds with the image triggered by the former. Hence, the juxtaposition of

non-recognisable sounds with the wind-like sound will possibly trigger a unified image, establishing a real-world link.

6. Superposition of spaces: non-identical spaces.

" When I look through the density of the water, at the paving in the depths of a swimming pool, I do not see it in spite of the water and its reflections. On the contrary, I see it through the reflections, because of them. If these deformities, these stripes of the sun were not there; if I was glancing at the paving's geometry without the interference of this flesh, then I would stop regarding it the way it really is; there, where it really is: beyond every identical space."

Maurice Merleau-Ponty
author's translation.

Within the frame of illusory space also lays the notion of *non-identical* space, as described by the french philosopher Maurice Merleau-Ponty in his book «L'Oeil et l'esprit». Non-identical spaces appear as deformities of objects due to the interference of other objects or causes. If the shape of an object is altered, then the perception of its spatial dimensions is also influenced. In Merleau-Ponty's description, non-identical spaces are the result of light interference on water, which causes the alteration of original shapes and contours. Stripes of the sun reflect on the water illuminating an «unrealistic» image of the «paving's geometry». The philosopher suggests that this «unrealistic» image is indeed the most genuine perception of «the depth of a swimming pool». Taking his argument a step further, he argues that it is the deformities caused by the interference of light and water that show the swimming pool's true colours. Without this interference, the real world would seem unrealistic and its spatial dimensions imprisoned within limited topological barriers. We perceive the real world through its constituent's deformities, through «curtains» of obstacles, such as the water between the eye of the observer and the depth of the swimming pool, which act as reshaping filters of contours and shapes. Substantial, or illusory creatures of our own imagination, these deformities reveal non-identical spaces which influence the way we perceive everything observed.

Similar approaches can be found in recent painting. In Mark Rothko's «Centre Triptych for the Rothko Chapel», the notion of non-identical spaces is dominant. All grades of black and red colour are mixed together in a pandemonium of shades and different degrees of density, creating non-identifiable illusory spaces. Does the colour black define a space? If so, where are its boundaries? Does red offer a juxtaposed space? There are no clear shapes defining a spatial continuum, except, possibly, the edges of the canvas. The eye can shift around the composition of colours receiving red hues beneath black clouds, or black shades beneath grades of red. The whole painting seems to be a spatial cluster, an amalgam of colour juxtaposition, as if the painter put layers of coloured transparencies one above the other: starting from the top, one can see the last transparency at the bottom and perceive its colours through the layers that come in between.

In another painting, «Ad Parnassum», Paul Klee creates a hugely impressive environment of non-identical spaces. Windows within windows, square units of construction, create «melodies» of colourful space. Clusters of colours are juxtaposed in such density that the observer perceives them through other superimposed layers. Patterns of colours act as translucent «curtains» which reveal other patterns hidden beneath them. According to the painter, a polyphony is thus created due to the simultaneity of several independent themes (Januszczak, 1996). The density of colour juxtaposition blurs the shapes of the patterns, deforms and eventually reveals them as non-identical spaces which, however, are parts of a more global space. The mountain of Parnassus is represented through juxtaposed and superimposed patterns of non-identical spaces. The two definite lines on the canvas, the contours of the mountain and a gate leading to it, although offering a more pragmatic view, emphasise this observation by contrasting definite and identical with blurred and non-identical spaces.

types of spaces and, therefore, categorised. However, an attempt to describe it is shown in Figure 3:

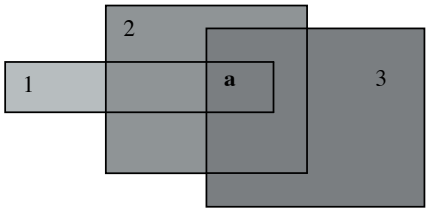

Figure 3: Non-identical space

Three different spaces, 1, 2 and 3, are partly superimposed creating areas, such as space *a*. Is space *a* part of space 1, 2 or 3? Or is it a space on its own? With which of the three spaces does it identify, and with which spaces does it share boundaries? Which, if any, of the three grades of grey is more dominant in space *a*? Which of the three spaces is above the other and which beneath? Many more questions of sophistry can be raised without apparent answer. Space *a* can be described as non-identical because it is questionable whether its boundaries and colour content are autonomous or the result of superposition of the three spaces. Therefore, it can be perceived both as an individual entity and a component of a larger-scale composition.

7. Melodies of space.

Let us imagine a piece of acousmatic music that deals with the notion of non-identical spaces, which are created by superimposing a series of sound sequences. Each of the sequences possesses different spectral characteristics and spatial dimensions, due mostly to filtering applications and amplitude automations. Consequently, when mixed together, they create superimposed spatial layers within the perspective field. Although the sequences may have been created independently as autonomous musical units, their function in the piece is to form contrapuntal «melodies» of space by blending their individual spectromorphological and spatiomorphological characteristics. According to their spectral density and spatial position, each of these melodies, or sonic layers, acts as a sonic «transparency», or «curtain» through which, the next layer is perceived. The co-existence of individual spatial layers, consisting of sound sequences with different spectral characteristics and amounts of added reverberation, creates transparent sonic «curtains» through which the listener can perceive non-identical or deformed spatial environments with blurred contours and contents. The co-existence of such different spaces results in a vast perspective occupied by individual spatial bodies. Each of these bodies is perceived through another one, which has less reverberation and therefore acts as a sonic «curtain» in front of the listener. Hence, the more reverberant the spatial bodies are, the more distant and deformed they become. The overall spatiomorphology is thus constructed with the means of perspective (occupation of the foreground, middle-ground and background) within which, spatial «melodies» consisting of sonic planes and trajectories create illusory motion.

The question as to whether non-identical spaces are illusory spaces remains unanswered. Although deceptively unrealistic, they provide a view that combines cause, interaction, and a flair of imagination, and they are, therefore, genuine aspects of reality. If Merleau-Ponty's statement concerning the interference of light and water (1991) reflects anything, it is that **non-identical spaces define what is perceived as reality**. Still, they abrogate the Euclidean notion of space-continuum by offering a spatial view with no clear or blurred boundaries, totally dependent on the influence of external causes, such as the interference of the sun, the motion of water, the colour of an object or the spectral appearance of a sound.

8. Summary.

Illusory spaces have been examined not only for their musical applications but also in relation to perception. The ideas presented here are based on a theoretical approach combined with subjective judgement.

However, it is through the practice of spatial projection that music is perceived and

comprehended, a factor as important as the process of composition itself. Ignoring or underestimating the impact of the spatial element means that a blind eye is turned to the innumerable meaningful possibilities that acousmatic music has to offer.

(1) For a complete discussion on mindscapes see Lotis, T. (2003) *Space and Light in Electroacoustic Music* (Ph.D. Thesis. City University. London).

(2)According to Bayle, *i-son*, or *image-sound*, refers to realistic or unrealistic image/s that can be extracted from a sound («on prend un son et on tire une image», 1991:131), creating a utopian world (1998:25). I-sound describes, at the same time, the sound itself, and reflection of an absence («à la fois son et reflet d'une absence», 1991:132). A detailed description of image-sound can be found in Bayle (1989).

(3) Bayle (1989) associates the depiction of form with the cognitive rather than the symbolic faculty. According to him, the trichotomy of the audible is:
a) Hearing and presentification (activating audition),
b) Listening and identification (activating cognition),
c) Comprehending and interpretation (activating musicalisation).

(4) « ... les sources sonores véritables, les haut-parleurs, sont fixes, mais l'auditeur a l'impression que le son se déplace dans un immense espace qui déborde largement les haut-parleurs. Cet espace est illusoire : c'est l'audition qui l'instaure, qui le construit, qui l'infère à partir des indices qu'elle détecte dans les sons ».

(5) « L'espace illusoire est une construction mentale, une projection conceptuelle au sein de laquelle l'esprit situe les sources virtuelles en termes desquelles il interprète l'expérience auditive ».

(6) « L'espace saisi par l'imagination ne peut rester l'espace indifférent...Il est vécu. Et il est vécu, non pas dans sa positivité, mais avec toutes les partialités de l'imagination ».

(7) Zeno (circa 450 B.C.) was a famous mathematician from Elea, a Greek city on the Italian coast.

(8) *Mimesis* is the imitative representation of the real world in art. Emmerson argues that mimesis is a process that denotes the imitation not only of nature but also of aspects of human culture (1986:17).

(9) The sound examples I am referring to do not demonstrate spatiomorphological alterations. Their function is to show how Parmegiani applied panning and mimesis in order to create motion within the stereo field.

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