VOCABULARY OF SPACE PERCEPTION IN ELECTROACOUSTIC MUSICS COMPOSED OR SPATIALISED IN PENTAPHONY

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GETEME
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ABSTRACT

This paper begins with a brief introduction of the GETEME (**G**roupe d'**Ét**ude sur l'**E**space dans les **M**usiques **É**lectroacoustiques - Working Group about Space in Electroacoustic Musics), followed by an overview on its past, present and future activities. A first major achievement was the completion and publication of the "vocabulary of space electroacoustic musics…", coupled with the realization of a taxonomy of space.

Beyond this collection and clarification of these words in general use, it appears necessary to begin to connect words and sound.

The goal of our present research is to clarify or elaborate a vocabulary (a set of specialized words) allowing to describe space perception in electroacoustic (multiphonic) musics. The issue is delicate as it deals with psychoacoustics… as well as creators' or listeners' imagination.

In order to conduct this study, it was necessary to develop a battery of tests, procedures and listening collection of words describing listening space, and then counting and sorting words.

The sound descriptions quickly overlap, the words coincide with the same listening situations. A consensus seemed to emerge, revealing: 5 types of spatiality and 2 types of mobility, as well as a variety of adjectives to describe or characterize spatiality or mobility.

Keywords: taxonomy, terminology, describing space, spatial perception, musicology of space.

1. INTRODUCTION: THE INVENTION OF SPACE MUSICOLOGY!

In 2000, Thélème Contemporary[17] published a first CD of electroacoustic music composed or spatialised in DTS 5.1 [25]. Probably the first realization of this kind (in France)!

Four years later, the publication of a second CD in 5.1 DTS is again considered. Ten French composers are contacted. Eight of them answered positively to the proposal of Thélème Contemporain. This second CD in 5.1 DTS came out in the fall of 2004 [26].

Beyond several aesthetic and technical innovations, a great step is done. The fixing of these electroacoustic works also leads to the fixing of their space discourses on the media. It is now possible to listen five or ten times to the same work, in order to understand how the composer has put his music in space; to listen five or ten times the works of various composers (Francois Bayle, Jean-Marc Duchenne, Jean-Claude Risset…), in order to compare space discourses strategies.

In short, the fixing of spatialised electroacoustic works on a consumer multichannel support opens the way for space musicology! i.e. to analyze a space discourse or compare two spatialisation methods becomes possible!

Before considering the formalization or the conceptualizing of spatialisation strategies, before talking about space writing or space discourses, a first step appears to be: describing heard space phenomena. To do this, one needs a listening vocabulary: connecting words and space perception!

2. THE GETEME

The GETEME (**G**roupe d'**É**tude sur l'**E**space dans les **M**usiques **É**lectroacoustiques = Working Group about Space in Electroacoustic Musics) was founded in late 2003 by Jean-Marc Duchenne, Bertrand Merlier and Hélène Planel (see http://geteme.free.fr). It is supported by Thélème Contemporain (Association for Creation and Distribution of Computer Music, http://tc2.free.fr). In 2004-2006, it was granted by AFIM (Association Française pour l'Informatique Musicale = French Association for Promotion of Computer Music).

The main objectives of this working group are:

- to locate and identify the actors involved or concerned by these activities: creators, acousticians, psycho-acousticians, computer specialists, musicologists…;
- to realize a state of the art of knowledge and techniques;
- to clarify vocabulary and practices.

Seven or eight articles were published between 2004 and 2007 in several newspapers or international conferences (see references [1], [6], [8], [9], [10]). A website has been opened to introduce the GETEME activities and publish the research results, in addition to the founding members Web sites of the GETEME (see [14], [15], [16]).

Finally, a first book was published in November 2006: "The vocabulary of space and spatialisation in electroacoustic music", published by Delatour France[7] editor.

Other projects are under way, such as a spatialised sound examples DVD or a second book about space in electro-acoustic music, in a more didactic and literary way.

3. "THE VOCABULARY OF SPACE…"

3.1. Content and objectives

This glossary is a research work on the vocabulary in use in terms of electroacoustic musics spatialisation or sound space. It includes 390 words and 1200 definition, in about 220 pages.

The main object of this study is the **music produced or reproduced through loudspeakers**, without any kind of constraint or musical aesthetic.

This glossary has been mainly carried out thanks to a study and a compilation of words in use in terms of electro-acoustic music spatialisation in a large amount of paper or Internet publications.

The identification and analysis of the vocabulary in use by the community are expected to trig reflections about terminology and facilitate communication and exchanges between the various actors in these artistic or technical worlds.

3.2. Taxonomy of space

This word collection allowed to get a complete overview of the topic, and so to propose a systemic classification of space activities and means. This taxonomy allows to detect omissions or sense ambiguities (other than by empirical or intuitive means), as well as to explore more reliable multiple meanings of words.

The establishment of this taxonomy is presented in detail in the introduction of the "vocabulary of space". The interest and the use of this taxonomy were first presented at SMC06 ([8] in French), then a second time – in front of a completely different audience – at the EMS 06 conferences (Electroacoustic Music Studies) in Beijing (from 23 to 28 October 06) ([6] in English).

4. CONNECTING WORDS AND SOUND…

4.1. Two approaches: the composing vocabulary or the space perception vocabulary

This collection of words in use was a first step. The second step consists into refining this particular vocabulary and connecting "words" and "sounds".

The words included in the "Vocabulary of space…" clearly required sound illustrations or sound connections. Just as sound illustrations will certainly require the introduction of new "words" in order to characterize the "making" or the "hearing", le « faire » ou « l'entendre » (to quote Pierre Schaeffer's words).

Two approaches are possible, depending on whether one considers the point of view of the emitter (composer) or the one of the receiver (the auditor).

This paper investigates the question of space perception description only in the domain of pentaphonic electroacoustic musics.

The following paragraphs describe the testing process, the choice of sound examples, and then the analysis and sorting of words.

5. LISTENING TESTS OF PENTAPHONIC COMPOSED OR SPATIALISED MUSICS

5.1. Process description

Listening takes place in a room of average size (50 to 100 m2) audio neutral, equipped with a stereo 5.1 likely to read CD encoded with DTS 5.1. A group of a dozen people sitting around is at the centre of the room.

The collection of vocabulary characterizing listening to the "composed space" takes place in the following manner:

a) listening to a small music excerpt (of about one minute) on a 5.1 sound system;
b) individual thinking (not influenced), the result of which is imperatively written on paper by the auditors;
c) reading of written notes;
d) collective discussion, trial and search for clarification and possible consensus (not obligatory: differences may subsists);
e) possible re-hearing of the extract;
f) possible comments or words refining;
g) next example.

At the end of the test, the notes written by the auditors, describing each sample, are collected. These written individual notes (step b) guarantee individual reflection and stable information over time, and avoids collective influences.

The collective discussion and re-listenning process (step c, d, e and f) allow to improve vocabulary precision, as well as to write a brief synthesis note. It is also an opportunity for a didactic action: description of unknown psychoacoustics phenomena, as well as new words (or concepts) learning.

5.2. Sound examples choice

It has already been explained that our tests dealt with space perception of 5.1 musical compositions and not on acoustic space in general.

Sound examples were first selected among the two DTS 5.1 CD published by Thélème Contemporain in 2000 and 2004. Other CDs or DVDs were used to expand our choices to other aesthetic and technological processes:

- *Reverse* by French electro-jazz duet Orti & Sense [27] (this double CD offers the choice between stereo or DTS 5.1 versions);
- a demo DVD edited by the DTS company itself, including the group Eagles in a live concert, performing the famous tune: *Hotel California* [28].
- several examples made by the Swedish national radio and downloadable online: advertising jingles, audio reports, recordings of orchestral pieces in pentaphony [18].

A wide range of music spatialisation processes are used: multiphonic composition, spatialisation of stereo sources through hardware or software, reduction of an octophonic work on 5 channels, pentaphonic recording of instrumental performance, instrumental duet or trio put in space on 5 channels, and so on.

The "spatialisation strategy" criteria does not take part of the selection of works (or at least not directly). The musical works were essentially selected for their different perceptual effects. Table 1 presents this example list.

In this first step, we only looked at perception differences, without trying to characterize them.

Titre	repérage exact	CD
Bayle : *Arc, pour Gérard Grisey*	idx 1 ≥ 1'40	[25]
Bouttier : *Pianosphère*	idx 2 à 0'00	[25]
Duchenne : *D'après une brèche*	à 0'00	[25]
Merlier : *Ourania* (mvt.1)	idx 7	[25]
Favre : *Soufre noir*	à 0'00	[25]
Risset : *Resonant SoundScapes*	idx 10 début	[25]
Risset : *Resonant SoundScapes*	idx 12	[25]
Orti / Sens : *Ne pas arrêter - never*	idx 2 en stéréo idx 2 en 5.1	[27]
Merlier : *Fragulos*	idx 1 ou 6	inédit
Swedish Radio : Jingle de pub	idx 9	[18]
Mendelsohn ou Strauss	idx 10 ou 11	[18]
Swedish Radio : *Histoire sonore*	idx 12	[18]
Merlier : *Les chevaux de Ladoga*		[26]
Merlier : *Sillage*		[26]
Eagles : *Hotel California*	menu idx 5 ≥ 1'20	[28]

Table 1 : list of sound exemples

Excerpts lasts between 30 and 60 seconds.
Note: exact references of works and CD (references in brackets in column 3) are given at the end of this paper.

Excerpt title	Words written by the listeners	Collective synthesis written par B. Merlier
Bayle *Arc, pour Gérard Grisey*	on est au milieu de quelquechose, on est dans la soupière et ça bouge… bain sonore (avec quelques sons ponctuels), partout espace spécifique aux timbres utilisés ping-pong rapides, accélérés et ralentis petites choses précises, granuleux, mobilité chatoyant, dense, mouvant, envoûtant, flottant, irradiant de la profondeur on oublie les haut-parleurs	→ bain sonore / immersion / ambiophonie → trilles d'espace, scintillement
Bouttier *Pianosphère*	espace clos sans jeu de profondeur le son se déplace à la surface des membranes la musique se déplace autour de nous mouvements prévisibles ou évidents matériaux influençant le mouvement toujours en mouvement, espace géométrique mouvement circulaire d'un seul son à la fois, points qui tournent son qui part et qui arrive à destination, voyage prise de conscience des haut-parleurs	→ rotations, trajectoires → figures d'espace → lointain
Duchenne *D'après une brèche*	profondeur / événements sonores distribués dans l'espace les événements ne sont pas dans le même espace il y a du proche et du lointain, verticalité (on perçoit l'élévation) vraie composition spatiale, multidimensionnel superposition d'espaces, strates, grande diversité d'effets précis, clair et cinématographique grands espaces, circule partout parfois trajectoires, mais pas trop, joystick espaces dynamiques, du statique et du narratif plans sonores timbraux, plans d'espace dynamique paysages d'événements sonores, images d'espace phonographie, narratif	→ polyphonie d'espaces réverbération → mouvements / figures → images d'espace ou phonographies
Merlier *Ourania mvt1*	triangulation / à l'envers de l'habitude : plan proche au fond et plan lointain en face événements ponctuels / travail par points / du vide entre les points / des endroits inhabités déplacements imprévisibles, événements improbables, disparates, surprise, ping-pong, réponses espaces superposés : sources ponctuelles sur espace statique (elles ne sont pas dans le même espace) contrepoint travail sur les attaques espace géométrique événements proches drôle de feeling, le son est tout à gauche (l'auditeur en question est assis à proximité de l'enceinte gauche et ne perçoit pas le côté droit, contrairement aux autres morceaux écoutés)	création de mouvement par fragmentation discontinuité polyphonie d'espaces

Table 2 : collecting (French) words examples: « raw » version and summarized version

The here above corpus of words is part of all the words proposed by teachers and students of the Conservatoire Federal Geneva (May 06), during a Master Class on Space (5 professionals, 12 students in composition).
Words are not translated in English in order to keep all necessary precision.

5.3. The listening sessions

Several listening test sessions took place in front of different kinds of audiences, musically educated, but generally not space experts: instrumentalists, composers, acousticians, sound engineers, students…

- 15th of March 2005: lecture about Space in the composition class of CNSM de Lyon.
- December 2005: "space day" at Music Department / Université Lyon 2.
- 12th of May 2006: Master-class on space at CFM (Federal Conservatory of Music in Geneva), in the composition class. Commented listening of musical works and audio examples. Listening tests "looking for vocabulary allowing to describe space listening". In the presence of sound engineers of Geneva, teachers and pupils from CFM Geneva. Organizer: Emile Ellberger.
- 7th of February 2007: ENM of Villeurbanne, composition and studio technology classes.
- Other private meetings were held in the presence of friends, musicians and composers.

6. EXPLOITING THE LISTENING TESTS RESULTS

6.1. Recopy and cleaning words

Proposed terms were copied just as it is, slightly grouped by similarities. 10 to 20% of responses were suppressed due to off-topic (comments about the work itself or about timbre, poetic description uneasy to exploit…)

As an example, table 2 presents some results. It is a small part of the word collection conducted in Geneva.

6.2. Consolidation of words by "families"

Words presenting similarities are grouped together. These "families" then receive a title (surnames or category title), the best representation of their content.

Some words (or phrases) may appear twice in different families.

Currently, no deletion of words, nor any of rewriting attempt is done (or very few if so…). Some antonym word additions are made: when it clearly appears that a word is cited and that its opposite is not cited.

There is also no attempt to standardize the collected terminology. For the moment, operations simply consists in observations, draft classification and formalization trial.

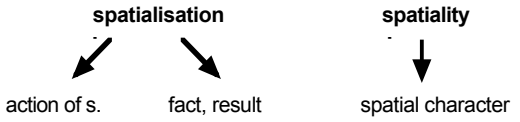
6.3. First analysis of the collected words

This vocabulary consists of collecting **nouns** and **adjectives**. This commonplace distinction will become very important in the following lines.

A) Nouns

The **nouns** describe:

- either a space state or a space situation ; we shall call this space character : "spatiality" (see box below);
- or a "space object", a phenomenon of space, action or the result of an action, which we will call "spatialisation".



It quickly becomes clear that one must distinguish the static situation (a more or less stable state) and the dynamic situation (state change or movement). That means making distinction between:

spatiality or spatial situation	spatiality change or perception situation change
spatialisation or « space object »	displacement of a « space object »

These words refer:

- either to spatial perception of the diffusion place (few occurrences) (see §6.4);
- either to spatial perception of spatilisation sound system (few occurrences) (see §6.4.b);
- either to perception of "spatiality" (most frequent occurrences) (see §6.4);
- or to perception of spatialisation (most frequent occurrences) (see § 6.4.d h).

"Spatiality" seems to be similar to the result of spatialisation perception (spatialisation action), or to the perception of an aesthetic choice (which would be a kind of "intellectual action".
Example: listening to a "soundscape recording" creates a typical spatiality sensation.

b) Adjectives or qualifiers

Adjectives bring several precisions about nouns, so about families. They characterize spatiality, spatialisation, movement, distance, and so on. (see § 6.4.d h).

Adjectives were often cited in particular situations: distant plan, large space, fast ping-pong…

We tried - as a first step – to decontextualize these adjectives (i.e. extract adjectives out of any context), hoping to give them the broadest possible terms. It does not work! A "sound bath" cannot be swift, a "sound plan" cannot be pinpoint or accurate, and so on.

This attempt to generalize made us aware of the necessity of contextualising adjectives and as a consequence of the various nature of nouns describing spatiality. We will come back later on that point.

6.4. Commented presentation of family clusters

As a reminder or as an illustration, some collected words are quoted in the insert and in italics in front of each family.

The arrow ➥ points observations, comments, procedural details on the sidelines of the main speeches.

a) Listening room perception

reverberation, room effect, ambiance
impression of an huge hall
event that sound within that space

Awareness (or not) of the listening room or of the loudspeakers seems rather rare and linked to specific space discourses (such as rapid movements of punctual events, lack of space polyphony, excitation of only one loudspeaker at a time, i.e. a unit space mass space).

b)Sound system perception

We forget loudspeakers
≠ awareness of loudspeakers
The sound travels at the surface of loudspeakers membranes

Once again, awareness (or not) of the loudspeakers existence seems to be linked to the existence (or not) of sound trajectories or movements.

c) Perception of the spatiality of sound events

Through the richness and diversity of this vocabulary spontaneously proposed by hundreds of people in order to describe a dozen of sound examples, five categories seem to appear quite distinctly to describe spatiality: the "sound bath", the "image of space", the "sound plan", the point and the "démixage" (see box below).

categories
sound bath, immersion, ambiophonie, surround, wrapping, holophonic *ambiance, noise everywhere, everywhere,* *we are in the middle of something* *feel like sitting in the middle of an orchestra*
space images, phonographies, landscapes of sound events, sound realism *wide open spaces / closed space ≠ open space* *sound realism ≠ imaginary space*
sound plans, space plans, layers *timbre sound plans, dynamic space plans*
points, pinpoint events, small precise things, pointillist, work by spot, gap between spots
démixage *n rather spot like sources, not mergings*

Table 3 : list of the 5 types of spatiality

Figure 1 : point, "démixage", plan and "sound bath"

A latter analysis will show that the existence of these five types of spatiality seems to be consistent: the listener perceives one of the following situations:

A. The listener is outside the space area and he perceives:
- one point source: the point;
- n not merging point sources: the "démixage" (see box below);
- a bulky object: the plan (or volume);

B. The listener is within the space area generated by the projection of music and he perceives:
- sound coming from everywhere: the "sound bath";

C .The listener finds space phenomena belonging to life reality: the "space image".

Note: the A and B situations rather seem to be issued from artificial treatments in the studio, whereas the C situation seems to belong to the field of sound realism.

The word « démixage » was defined in the « vocabulaire de l'espace… »[7], as follows:

i) process of not mixing; i.e. setting n "spatially" independent sources at a place (and listening as is) on n channels.

For example, in pop music, instruments are very often recorded one by one and put on separate tracks. Listening to that un-mixed record on n-speaker system is very often interesting (spatially more interesting than the stereo reduction). This listening situation improves intelligibility, comfort, pleasure, but does not generates encompassing or surround space nor space movement, neither space polyphony. The lack of correlation between channels and the "artificial" studio work do not generate a true "real soundscape".

ii) the perceived impression while listening to a multiphonic source whose channels are not spatially correlated and do not fuse.

This process is easily feasible at multitrack instrumental sources recording (or easy to recognize at listening), but it is by no means exclusive of instrumental music.

➥ After the presentation of the whole words families, the following question will appear: is "démixage" a real form of spatiality or is it rather a way of considering polyphony? Some answers we will get later.

Next, let us consider the study of adjectives or qualifiers. As announced in §6.3.b, presenting each family will be followed by a context study.

d) Sound position characterization: localisation

Plans can be: frontal or lateral, forward or backward, left or right, upside or down, in front or behind…
Sometimes it is possible to perceive verticality or elevation.

Contextualisation:

Those adjectives seem to be applicable only to a point or a plan or an "object". They may not apply to a "sound bath", nor to a "soundscape", neither to a "démixage", at least not as a whole. However, they may apply to a pinpoint sound that would be part of a "sound bath", a "soundscape" or a "démixage".

e) Geometry of a "space object" description: shape, size, space encompassing

Points can be spotlike or diffuse, focused or unfocused.
Or dense
One, two or three dimensions

Contextualisation:

Same remarks as above: it only applies to an "object": point, plan…
Note: For further information about the concepts of mass, area, site…, please refer to J.-M. Duchenne's writings [15] ou [7].

f) Distance characterization: close, distant

{point, plan, event} nearby, close, distant
depth, depth of focus,
sound events distributed in space
near and far (at the same time)
events are not in the same space
points in the same plan
points (sound spots) that remain on the same plan

{point, plan, event} getting closer, moving away
with / without depth work
The sound travels at the surface of loudspeakers membranes

wide open spaces / closed ≠ open space

➥ The concept of open or closed space is deliberately separated from the category "listening. place perception". Because listeners do not speak here of the real listening room itself (physical reality), but of the perception of an imaginary listening space (completely independent from the physical location). This notion seems rather close to the perception or the depth of focus notions.

Contextualisation:

Same remarks as above: it only applies to an "object": point, plan…

g) About the movement notion

Many auditors in very different circumstances used the terms: "mobile" or "movement". An attentive second-listening of the concerned excerpts clearly shows the need to distinguish an internal and an external sound mobility.
In the case of **internal mobility**, there is no sensation of movement, or geographical relocation, while **external mobility** is clearly associated with the perception of a movement or with a sound movement (virtual movements, as neither the loudspeakers nor the actual acoustic sources do move).

h) Sound internal movement characterization: "entretien", grain, internal agitation

internal mobility of sound
granular
shimering or sparkling (chatoyant), radiating (irradiant), moving, mobile, bewitching (envoûtant), floating, changing, enveloping
space trill, scintillating
moving everywhere, always in movement

➥ It does not seem that this distinction is linked to trajectory dimensions or spatial cluttering; it seems that these two phenomenons are of different natures. I would venture the following hypothesis : a timbre modification triggering a modification of distance perception or of spatial mass.

i) Movement characterization

fast, slow, accelerating, slowing
discrete, continuous movements, trajectories with or without accidents ≠ fragmented movements
predictible or evident ≠ unpredictible movements
unprobable, disparate, strange, surprising
movements bound to sound materials
dynamic movements, always in movement
stability impression ≠ un-stability

g) Trajectory characterization

points moving inside a plan
points turning, points moving everywhere
music is moving everywhere around us

points into the same plan
points that stay in the same plan
static ≠ dynamic space, fixe ≠ mobile space
mobility
movements, trajectory, space figure
envelopment, encompassing, surrounding
growing, spreading ≠ contracting, squeezing
sound that leaves and reaches a destination
pan, ping-pong, response, joystick, travel
points that turn, rotation, circulary movement of one sound at a time
music is moving all over us
geometric space

Contextualisation :

Once again, these movements can only be applied to points or « objects » less voluminous than the listening room. It has no sense for the "sound bath", nor the "soundscape", neither the "démixage" (except if one only consider individual elements composing them).

j) Space polyphony and depth of focus

At least, the following words characterize spatial superposition or encompassing of several « objects ».

counterpoint, space superposition, stacked spaces, layers
near and far sound (at the same time)
sound bath (with some ponctual sounds)
events in different spaces, sounds ditributed in space
ponctual sources over a static space (not in the same space)
multiphonic discourse
static and narrative events
large variety of effects

« Depth of focus » should be linked to the geometrical occupation of space (in the depth axe): only one sound object doted of an important spatial mass or several distinct sound objects spread over space.

« Space polyphony » underlies something more conceptual, such as simultaneous perception of several spaces or several spatialities or several space discourses.

Both terms partly recover, but are not synonyms.

Contextualisation:

These words do not characterize any of the five space categories, but in fact how several spatialities may combine together.

k) Musical discourse et space discourse suitability

layers crossing space

movements creation by fragmentation
space specific to used sounds
materials influencing movement
figures uncorrelated with sounds, with timbre

➥ It seems that space movements « work better » when coinciding with sound attacks and when sound timbre owns a rich spectrum. Counter-example : a synthesized flute sound generates a strange feeling …

➥ In the same way, hyper-complex and fast movements generate a kind of « stroboscopic » perception of movement.

➥ Reverberation and « distant » effect also jam movement perception.

7. ANALYSIS AND REFLECTIONS

7.1. Relations between nouns and adjectives relations between spatialities and qualifiers

Through the study of our word set, it appears that it would exists:

- 5 spatiality categories,
- 4 or 5 families of adjectives or qualifiers.

they are gathered in the table below.

sound bath	
sound scape	
sound plan	localisation geometry distance
point	internal agitation movement
démixage	

It appears that adjectives or qualifiers only apply to two spatiality categories. This particularity leads us to think that these five spatialities might not be of the same nature.

➥ In a quite similar way, the following sentence poses a problem : « *Les images d'espace peuvent être : narratives, cinématographiques* ». « *Space images can be: narrative, cinematographic* ».These qualifiers are evidently belonging to another level than those displayed above. Probably a metaphorical level

7.2. Different natures of spatiality

The study of this here above table is full of lessons.

a) Finite or infinite encompassing

Spatialities having a finite encompassing would rather receive geometrical-like qualifiers (localisation, geometry, distance, internal agitation, movement…). We shall call these spatialities: « **space objets** ».

Spatialities having an infinite (or huge) encompassing do not seem to own qualifiers. We shall call these spatialities: « **space environments** ».

8. SYNTHESIS TEXT: CARACTERIZING SPACE LISTENING (IN ELECTROACOUSTIC SPATIALISED MUSICS)

As a synthesis of our study, we emit the following propositions:

1) **Space** is the environment in which we are listening to (electroacoustic musics) and in which we can locate « objects ».
2) The **environment** covers the whole space, or at least, such a huge part of it that it becomes difficult to find limits. Environment can emcompass (or surround) the listener (**sound bath**) or be external of him (**plan**, **soundscape**) ;
   Soundscape or sound image notions refers to sound reality or sound realism.
   This perceptive environment is generated by a sound system located into a listening room.
   The perception of this spatial environment (or **spatiality**) can be independent (or not) of the listening room; The sound system can be perceptively « transparent » or « revealed ».
   being aware (or not) of the listening room;
   being aware (or not) of the recording room;
   being aware (or not) of the sound system.
3) « **space objects** » occupy a finite portion of space.
   The space part occupied by a "space object" is called the **area** (l'**étendue**). Several **dimensions** allow to measure this area: volume, size, length, wide, height, depth, *etc.*
   The area of an object can be idealized: point, line, surface, volume.
   Localisation is the fact of situating an « object » in a **place** or its relations to a specific environment or another object..
   Orientation allows to situate objects in relation with other objects, according to special relatiopnships axes **verticality**, **horizontality**, **frontality**, **laterality**.
   frontal or lateral, forward or backward, left or right, upside or down, in front or behind…
   spotlike ≠ diffuse, focused ≠ unfocused, dense
4) **Distance** is the interval that separates two « objects ».
   near, far
5) If an « object » is time dependant, it becomes a **space event**.
   Movement is a space position change of an « object ». This event lasts a certain amount of time. There are several types of movements:
   (a) the **internal movement** of an object;
   (b) the **deformation** of an object;
   (c) the **displacement** or location change.
   The movement nature can be made more explicit thanks to several characteristics:
   fast, slow, accelerating, slowing movements,
   discrete, continuous movements, trajectories with or without accidents ≠ fragmented movements
   predictible or evident movements ≠ unpredictible movements
   bound to sound materials
   dynamic movements
   always in movement
   If coherent and predictable, a movement can be idealized:
   Some movements or displacements can be identified and formalized.
   line, pan, rotation, zig-zag, expansion, contraction…
6) **Space polyphony** or **space superposition** :« Objects », « events » and environment(s) can combine together, without merging (i.e. staying spatially distinct one from each other).
   Depth of focus allows to describe superposition of several objects or events —

or of one object (or event) in relation to its environment — in the depth direction.
Cohabitation of several motionless « objects », set all around the listener and not merging together, is called **démixage** (referring to some studio practices). A more explicit word would better be found in the future.

9. CONCLUSIONS

The aim of the present study is to clarify vocabulary of space perception in electroacoustic musics (composed ou spatialised in pentaphony): a link between words and sounds. To do so, a set of listening tests, processes and word collection have been developed and realized between 2004 and 2007 on hundreds of people. These first tests and word collection appear to be really interesting and fruitful: a great amount of crosschecking information has been gathered.

A first classification was realized, separating nouns from adjectives, proposing five types of spatialities and about half a dozen of qualifier families.

An analysis of the relations between nouns and adjectives, as well as a study of the adjectives contextualisation allowed us to clarify the situation and to propose a synthesis text of our whole observations.

In order to consolidate those first observations and to refine this vocabulary, other test sessions should be realized; probably with new sound examples specially realized on purpose.

Perception description of space in spatialised electroacoustic musics now owns an embryonic lexicon, written words that attempt to describe the listening spatiality. This « writing process » — probably unperfect or uncomplete — is however fundamental for further communication and reflection.

For over 60 years, composers have been putting electroacoustic music in space. However, very few documents describing space composition techniques (by instance: [1], [2], [10]) or spatialisation methods or spatialisation gestures [13] have been elaborated and published. But it seems that nobody ever tried to really describe and formalize spatial listening processes. That is now done!

As already said in the introduction, fixing spatialized musics on a consumer multichannel support (CD or DVD) and proposing a spatial listening vocabulary might be at the origin of a new discipline: space musicology!

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[20] http://www.cddts.net/

[21] http://cddts.free.fr/ offre un petit tutorial qui vous permettra de réaliser assez facilement des CD Audio 5.1 DTS à partir de vos MP3 favoris, un chat, des liens, ainsi qu'un annuaire de ceux qui pratiquent le DTS.

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