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# Ambience Formers in Built Environment: An Experimentation with Sound and Motion

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The visual dimension of space tends to erase other sensory dimensions (like sound for example) in our culture of design although they are so important in everyday life. To make more operative all the senses that architecture involves, our researches and experimentations investigate sensory approaches of urban ambience in a phenomenal and ecological direction. This direction of research get back to the experience of objects and spaces in usual conditions.

In this paper, after a short “flashback” about our laboratory, I will show an experimental research, which have particularly explored the relationships between sound and motion.

The cresson laboratory (cnrs mixed research unit 1563, created in 1979) focuses on the perceptible environment and architectural and urban atmospheres (“ambiance” in French). Architects and urban planners are designing and building spaces, but they create also “atmospheres” by which all our senses are in interaction and in which social or individual uses take an active part. From the beginning of our works, we advocate a qualitative approach capable of helping and possibly guiding the strategies and processes of architectural and urban design in a sensitive way. Based on a pluridisciplinary approach to architectural and

urban ambiances, we aim to articulate both physical dimensions (construction and environment) and the human one (sensitivity, practice, cultures).

Many works have shown how architectural spaces and social uses interact, but the role of ambient factors is not really taken into account, and it is often through the category of judgment (pleasant, unpleasant, bad, good, etc.). Our approach does not aim at showing the effects of environment on judgments or behaviours. In order to inflect our projectual thinking, we try to understand the modalities by which the reciprocity between man and environment is experienced in different architectural situations.

## 1. Sonic Effects

At the end of the seventies, the cresson laboratory initially focused on the sound space in a qualitative way to describe our ordinary experience. It must be said that it was rather difficult to escape to the main thinking about bad noise, the bad urban sound. It was just like if the urban sound was without quality and without any social use or signification. How, in these conditions, could it be a part of our imagination of environment ?

Investigating the sound space of everyday life, the “sonic effect” is the first pluridisciplinary tool that the cresson have developed. This analyzing tool allows us to describe ordinary perception and action in different urban or domestic situations. Some of these sonic effects can be related to spatial disposition and some not. The notion of effect (Augoyard, 1995) refers to a perceptual process that results from circumstances; it is the manifestation of a phenomenon, which comes with the existence of an object.

For example, the following spectrogram shows what we have called a “cutting effect” which is the result of the spatial disposition and the position of sound sources. This effect is felt while the passer-by is walking and crossing an angle between two buildings, the intensity of sound fall quickly. The quality of listening is modified: when the cutting effect is perceived, all the links between sounds are disturbed, and the listener can be more attentive for a while. In imagination, this effect creates a virtual door, in that sense, it is a former of discontinuity in the experience and it plays a role in the representation of space.

Other sonic effects have been described (about 40), some of them are difficult to link directly to build forms (for example “remance”, “sharawadji”, “crenel”) because they essentially depend on perceptual and active processes, so, it is more difficult to use as criteria of design at very first level.

After the investigation of sound dimension, the laboratory broadened the scope of its works to the many dimensions that are perceptible in situ. Research addresses the phenomena of light, heat, smell, touch and movement, always through an ecological and phenomenal approach and on original pluridisciplinary methods at the crossroads between human and social sciences, architecture and engineering science.

## 2. Perception and Action

Several researches we have made between the eighty's and now, aimed at understanding the ambient milieu in public spaces, especially through the eye and the ear. It gives more and more importance to the opportunities of perception and action that affords an object and by which the user can feel an appropriated environment : the way to BE in an environment is in part reflected by the way you move and you act. After several surveys and analysis of urban public spaces and housing spaces, we draw the idea that an atmosphere is not only a given physical environment. It is a process based on the active relationship we have when we experiment the built environment and use all its potentialities. If architecture affords spaces to be used, it modifies our phenomenal relation to the world. How these interactions between space, ambient phenomenon and uses could be taken into account in the design process and renew it ?

Walking, sitting, talking, all our practices of architectural space awake perceived ambient factors like sound, light and heat. While these factors are at the basis of our phenomenal relation to the world, they are meaningful for social or individual active uses. Then more than “shapes” given to be static, we experiment “former” that are changing and interacting with environment while we are using it. An architectural shape is not only a material device, it is a potential transformation of our sensitive relationships with environment and people. Our method is then to explore the categories we use to make architecture through the potential of sensitive transformation they involve.

Theses researches led to extrapolate what I have called « formants » in French, (« former » or « formative » in English). This idea (notion) comes from phonology, it is a way to link elements of morphology to plurisensory ordinary experience and action, i- e :

what is rather static in architecture (material, permanence of space) to what is dynamic (sounds, light, motion) when we use a space or an object. For example an « angle » is a geometrical concept, a morphological element : but how can it be felt through sound or through gesture ? What makes it « active » in our sensory experience and what kind of use it could inflect ? The notion of former invites us to question what it means to think, in a sensitive way, for example, a door, a corridor, a passage, and a courtyard ? Of course this kind of question deals with all sensitive potentials and the categories of space.

This way of thinking could modify the cognitive design attitude in a multisensory way integrating the opportunities of action that are suggested. So a new way of research have been improved to test sensory intentions in design and to evaluate an architectural device. After several works which aim to highlight the sensory characteristics of different urban structures, it was necessary to study to a micro morphology scale, that is to say to the scale of body motion and perception. These experiments can participate to the development of a “sensitive ecology” of architectural devices.

### 3. An Experimental Approach: the Body Scale of Design

In this perspective, we are interested in working at the space scale of those ambient architectural compounds that involve a direct interaction with the human body. We think of ordinary urban objects such as doors, places to sit or to wait, shelters. Around such minimal spaces, a whole array of moving modalities linked to the use of voice and hear are identified : bypassing, sitting or leaning modalities going through, crossing a sonic area, rotating. This array of actions, which come close to, the will of movement

make the hearer’s immediate sonic milieu drift. This scale of design induces working on the proximity of walls and on the minimal movements implying modifications in the relationship to the ambient milieu and others. It incites us to imagine what one may do with one’s sonic environment, or more globally, with one’s ambience. Some of our researches - in housing, working places or public spaces, and especially around transportation system- had shown us that inhabitants are not only passive, they create their own environment to improve the listening of others, direct vocal communication or simply remain waiting, sitting or standing. That is why I explore a kinetic approach in public spaces and study how forms offer opportunities of uses relating to atmospheres. It is in order to test spatial compounds and potential of uses that we have build models at the scale of the moving an earring human body.

### 4. A Kinetic Approach

Space and sound are linked by motion. In the ordinary uses of space, we talk and hear in motion. Moving uses are, for a few of them, linked to their sonic environment. Sometimes, it is intentional : we move to improve the listening of something, or we move to talk to somebody. This evidence strongly influences our reflection about the sonic design of space. That’s why, we have to take into account the dynamic relations which couple listening and acting in ordinary uses. These uses are based on the skills of each inhabitant to act in different sonic situations. This active dimension is quite important to design spaces with sonic intentions. It is to be preferred to the passive conception of hearing in the sonic environment, which is usually considered in order to understand how it is appreciated or how it is “identified”.

The experimentation we will now talk about took place between April and May 2003 at the “grands ateliers de l’île d’Abeau”. These workshops near Lyon and Grenoble offer equipment as well as space to built for pedagogical and research activities in architecture.

The main points of our method and the conceptual tools we use to design experimental sonic spaces must be related.

Our precise goal was to model a device that creates a situation in which a lot of possibilities of uses and ambience are offered. More particularly, three categories were put through the test in different urban or architectural situations: «articulation», «limit situation» and «inclusion», that have been studied before in real urban contexts. Each of them implies different amplitude of motion. Articulation depends on a displacement between two distinct sonic environments. Limit situations imply the movement of parts of the body like the head or the upper body and also other displacements making the sonic milieu drift quickly. Inclusion does not imply movement, as it is an interpretative move: in a static posture one mentally connects a space to another. All of our qualitative program and our designed equipment aim at creating these kinds of situation in very small spaces.

In our idea, this kind of equipment could find its place in different situations: to create a passage between a building and a street, or to offer a furniture in such places as underground public spaces, or big atria where the sonic environment is usually too homogeneous with great reverberation and ubiquity. This equipment could locally offer possibilities to escape these effects. The prototype is furthermore transposable to other public contexts just like any public equipment where one is to wait, sit, or phone, particularly in ambient transportation a situation.

## 5. Experimentation of a Wall

The “wall” we have build is a sort of ten meters long and three meters high “double sided” wall. It’s thickness varies from five centimetres to 1,6 meter, one can pass through or along it, on one side or the other. Placed along the existing building on a sort of platform, just as it would be on a sidewalk along a road or along a path, its two sides are designed differently. Along the building, wing-like devices are created, in these wings, the sonic environment is ambiguous. It combines the decrescendo of the exterior environment and the interior sound of the existing building. Open to the street, the second side is more concave, it hollows out a niche in the wall and offers several places to wait, standing or sitting, in cavities or inside a minimal room.

While digital and sophisticated tools are being developed, our experimentations are to a great extent hand-crafted (panels of wood and screws). Another aspect of these experimentations consists in sonorizing the object in order to create a situation : to re-contextualize it and arouse new potentialities of uses and listening. It does not aim at simulating a context but rather at generating an imaginary scenario. In the present case, sonic ambience is relative to an urban site connected to several modes of transportation.

## 6. Principles of design

In order to give a material form to this, our spatial language of design is based on operative deformations such as print, delimiting, and fold. In our idea, each of them calls different potentialities of uses and ambience, for example :

Print generates hollow in the solid and gives affordances to sit in variable depth so



that listening to the soundscape or talking someone sounds different.

The little space between different layers of wall (delimiting) offers limit situation depending on the angle and the distance of the ear, the oscillation of the head while one is walking according to the slits in the surface also rhythm the view.

Folds generate a continuity of the envelope, which offers surfaces of reflection near the head and other surfaces to sit or to lean on.

All these intentions depend on a great proximity of the passer-by with the wall, which defines his space.

A sonic regenerated context to create a usual situation

To explore more accurately these kinds of interactions between movement and sonic transformations, the experiment is also the way we can improve the element we have built. For this reason, an electroacoustic installation creates a sonic situation. It is composed of two parts. First, one line of sound is diffused in front of the element (3 sources approximately ten meters from the wall); it generates a global ambience with passages of trains, cars, tramways, etc. Second, sound (3 sources) is diffused at a low level inside the minimal room (we call it «inclusion»). This sonorization aims at reinforcing some of the sonic components or at encouraging a listening attitude (searching sound, going toward it, or inversely, staying to listen or to talk, etc).



Figure 1 & 2: Front side & ridge



Figure 3 & 4: Wings side & Installation with Speakers

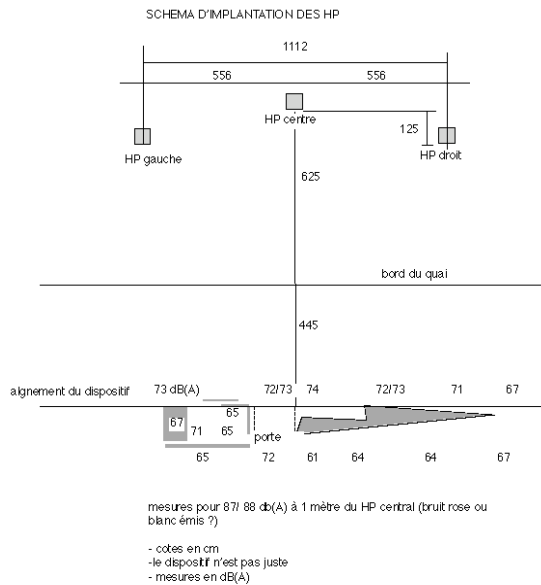


Figure 5

This schema (not at the right scale) shows the place of the speaker. Dimensions are given in centimeters. Measurements in dB (A) : 87 / 88 dB(A) one meter from the central speaker for a pink noise emitted to test acoustical performances. As it was predictable, there is 10 decibels loss behind the wooden “wall” in these conditions. At the beginning of their exploration, each one had to make the choice to go by the exposed side or by the other when he started from the “prow”.

## 7. Fictional use in a virtual situation

On a methodological aspect and with regard to our hypothesis, experimentation allows us to directly evaluate uses in a testing scenario with several persons (ordinary people, acousticians, partially sighted persons).

This apparatus allows us to test how one

acts in the sonic structure created by the space and the diffused sounds. To learn more about it, we asked seventeen persons to experiment a fictional use.

First, they have to walk around the built element and explore it in order to know all its sides, each participant starts from the same point (what we called the “prow”). Most of people (that is to say 16 on 17) prefer to go by the side which is exposed to a greater level of sound, but the difference was not so high : during their experience, the kind of sound diffused by the speakers was an ambiance of a railway station, so the level was not so loud. We have not experimented this survey with pink sound, but it could be tried. Our goal was to understand how people move around the object and use its potentialities.

Second, 4 minutes after start, they have to answer a phone-call and were asked to read us a text on the phone. In the meantime, the sonic environment is made to change and we suppose the reader tries to find a place, or to take a particular position.

This evaluation shows us interesting sorts of adopted behaviours, which illustrate our hypothesis:

The participants walk all around the built element, rather near the walls. When they had this experience with another person, they speak to each other near the walls rather than away from them. It is very rare that they step back, they sometimes touch the walls and they seem to “listen” to it when there is a void. As they have to choose between the left side (wings side) and the front side, the great majority chooses the front side where sound is louder (but the view is open and there is more light). Sometimes they are looking for the origin of the sounds they hear, especially in the “minimal room”. It shows they are aware of the changing sounds when they move. After the experience (a short survey is leaded), they tell that

they felt the holes, the apertures in the element thanks to the sound when they passed in front of them.

The following pictures illustrate the different kinds of attitude that make interact form, environment and active uses:



Figure 6: Trying to sit body bent toward the outside. This kind of little moves illustrates the sensitivity to the limits of the sonic environment depending on the sitting depth.



Figure 7: Turning the back to the sound front and facing the wall, the speaker uses this position to talk : the body and the wall make a niche and the whole allows speaking. The first sonic reflections of his voice on the wall give a return to it. During the whole reading, the speaker doesn't move while the ambient sound increases.



Figure 8: A void between two walls offers a position using the phone and speaking : the body and the head are between two walls. This position shows a particular way to form an envelope all around the head ; the position is precise because it changes very fast if the head and the ears are too far from the

limit where sound increases.



Figure 9: A corner offers another form of inclusion in the room, the body is settled in this corner to speak on the phone.

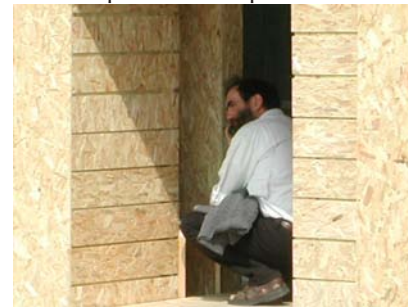


Figure 10: This man stays inside the passage between the sides of the wall during all the phone conversation, the head is orientated perpendicularly to the sides

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This man stays inside the passage between the sides of the wall during all the phone conversation, the head is orientated perpendicularly to the sides

All these attitudes show diversity but also the kind of observation we can do to understand how this "micro architecture" affords places to hear or to talk and how its sensitive structure is revealed.

In this idea we can notice « formers » of the wall depth on several sensory aspects and scales :

The distance from the variable depth of the wall seems to be felt through sound when one is walking all along it at a short distance

Moving the body in a solid when sitting and feel the sound change is a former of depth.

Get in shadow or in a less lighting ambience to read the text.

Get a less noisy exposed place when all the body go inside (the minimal room).

We can notice formers of continuity on several sensory aspects :

Changing ambient light modify the perception of continuity but others sensory formers can give it :

When one follow the material surface with the hand,

The proximity of folded surfaces reflects sound close to the head with better first reflexions

Formers of porosity in ambience are perceived at several scales :

The emptiness between surface is to evaluate with the body if one can pass through the empty space (affordance of passability) and if one can feel the thickness of the wall

It can transform the sound which is audible when one approach to the void : when the void is a little one, as we know, only high frequency are deviated but it is an important part of information

Porosity in light and sonic environment are interesting to filtrate events, ot make them less present.

## 8. Short conclusion

The results of this work which associates research and design bring some ideas to develop a sensory approach of architecture that would be attentive to uses in a phenomenal and ecological way.

As we have seen, this experiment doesn't concern only the propagative laws of sound in space, but the potential of action one can get in ordinary local sonic environment. It shows how an architectural form is incorporated as a former through the variations of the ambient flows that accompagny ordinary uses. Of course it is necessary to do more experiments that could give a way to explore an architecture that would not be only visual and that would be more attentive to the perceived qualities in use. On this point, we hope it highlights modestly some of theoretical questions and could inflect the sensory design of space.

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