Why is comfort perceptible only when it misses?

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RÉSUMO: Um estudo interdisciplinar sobre o conforto acústico, que cobre os campos das acústica, arquitetura, das práticas do habitante e das percepções, foi conduzido. A hipótese que os habitantes são ativos no realizaçao de seu próprio conforto foi verificada. Concliu-se que o conforto sonoro não é um valor intrínseco do sinal acústico ou do dispositivo do espaço de sua propagação como uma boa isolação para o exemplo (mesmo se é necessário). O conforto sonoro aparece como um fenômeno dinâmico que harmonize as percepções e ações do habitante com as variações de seu ambiente sonoro. O conforto é realizado na interação e nunca percebido. Que sensação dos habitantes é o discomfort como uma ruptura de sua percepção do ambiente ou de sua ação nela.
Assim, a qualidade do uso prova tão importante quanto a qualidade acústica dos espaços construídos.
O método e o inquérito preparados para os habitantes e alguns exemplos serão mostrados e discutidos.

ABSTRACT: An interdisciplinary study of acoustic comfort, which covers the fields of acoustics, architecture, inhabitant practices and perceptions, was conducted.
The hypothesis that the inhabitants are active in the realization of their own comfort was verified. It was concluded that sound comfort is not an intrinsic value of the acoustic signal or the space device of its propagation as a good isolation for example (even if it is necessary). Sound comfort appears as a dynamic phenomenon that harmonizes the inhabitant's perceptions and actions with the variations of their sound environment. Comfort is carried out in the interaction and is never perceived. What inhabitants feel is the discomfort as a rupture of their perception of the environment or their action on it.
Thus, the quality of use proves as important as the acoustic quality of the built spaces.
The method and the inquiry prepared for the inhabitants as well as examples will be shown and discussed.

1. INTRODUTION

It is an evidence that most of complains about noise happen inside doors. But in the ordinary discourse of the inhabitants, the sound comfort is never evoked, but its opposite. When the satisfied ones are asked about their sound environment, the answers generally qualify it as silent even if the measurements are contradictory. Does it mean that what they call it noise is the non-domesticated sounds?

When one compares similar situations to some of the complaining persons, most of the inhabitants are satisfied with their sound environment. Does it mean that the embarrassment in these cases is not caused by the environment but by another part of the phenomenon? One supposed that the most of non-complaining inhabitants are active in making their own comfort in their every day's live, in every gesture, but in an intuitive way.

An exploratory method was used to study how the inhabitants managed to domesticate intuitively the sound space in which they live. One will state a few examples of observed

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[1] This work was conducted while the author was with CRESSON (Centre de Recherche sur l'Espace Sonore et l'Environnement Urbain), Grenoble, and was part of his PhD. Thesis.
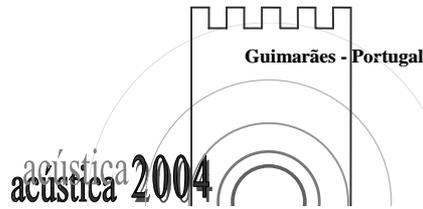
cases in housing that confirm the existence of a true ordinary sound culture. Our thoughts are related to the spatial aspect of passive acoustics, the dynamics of the sound environment, the sound perceptions and actions as well as the representations. The *in situ* method guarantees not to focus on physical aspects only. It enables one to understand how these interdisciplinary notions are articulated in the same dynamic of use. It allows a trans-disciplinary definition of the sound comfort. Contrary to the psychoacoustic methods that proceed by isolation of the phenomenon and by the test of most of its factors, one after the other, the *in situ* method suppose that there are some hidden aspects in the real situations that are lost in a reduced simulation.

2. TOWARDS THE ORDINARY SOUND CULTURE

In the housing, the limits of the visible space coincide with the limits of the built space [1]. This is different for the auditory modality, as the walls are only partially noisetight. In that way, the limits between private and public, inside and outside by the hearing modality goes beyond the built limit. These extensions enable one to say that the sound perception is perpetually mobilized. The question of the sound comfort and discomfort are continuously set out. The housing space is therefore a sound space *par excellence*. Beyond the acoustic culture of the experts, the normative sound culture and even the aesthetic musical culture, there is a forgotten ordinary sound culture elaborated by the every day's inhabitant actions to maintain their comfort.

How can one underscore and describe this ordinary sound culture? One must privilege an ecological approach of the sound environment, return the "subject" in his sound "milieu" with whom he has natural exchanges.

The first methodological hypothesis is that the control of the comfort depends on the device owned by the inhabitant. The device is defined as the whole means of environment control, including built space as well as the technical objects that contribute to change and the logic of their position etc.. This is an environmental hypothesis.

The second hypothesis is the existence of processes of transformation and manipulation of the device. Processes are simple gestures (like closing a door or opening a window or speaking louder etc..) or complex behaviors. The processes are directly linked to the sound signal.

The third hypothesis is the existence of strategies; that means that the inhabitant anticipate the variations of the environment and the forthcoming annoyance and then he defuses it beforehand. The strategies are not in contact with sound but anticipate it.

These three hypotheses are based on the Pascal Amphoux [2] theory of listening.

A qualitative enquiry was conducted in twenty different houses with some thirty inhabitants. Their environment was observed, measured and the space configuration was reported. Their sound processes were tested by immersive questions that simulate a panel of sound situations. The questions were formulated on this model: "*if [sound situation] then what do you do?*". At last, their strategies where tested by questions like: "*As you know that [sound situation] is imminent what do you do before?*".

About 200 sound situations where collected, analyzed and classified. Devices, processes and strategies where extracted. Some remarkable examples are presented next.

2.1 The environmental shapes of the ordinary sound culture

The diversity of the device obtained shows, above all, the countless possibilities of combining the spatial, acoustics and use criteria, which define the device. We quote here some typical examples:

• **Shift device (relay)**: consists for the user in dividing the sound space that he produces into several sound spaces, multiplying the same source in the whole accommodation (several radio sets connected to the same radio station, for instance) in order to cover the widest area of use: "*that is to say that the clock radio wakes me up but I can't hear it if I'm in the kitchen eating my breakfast. So, I turn on the second one, without turning off the first one because it is the same radio station*".


S   = Source (radio)
Aé = Listenning Area
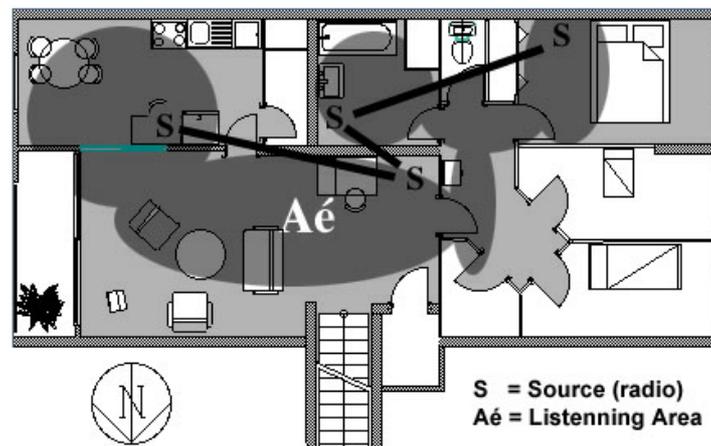
Figure 1 – *Shift device(Relay)*

In this shift device, the intention of the inhabitant is to maintain a good and continuous listening to the radio even if he is moving from one room to another. He realizes unconsciously and without intention a device that did not disturb the neighbors because the relayed sources are not loud. They just diffuse inside the area of the room. A similar one-source device should diffuse through the walls of the appartment, with a higher level that can annoy the neighbors.

• **Electroacoustic pocket**: it is a device, which consists in isolating someone with headphones, while somebody else is listening to music, for instance. The two persons share the same physical space but not the same sound space.
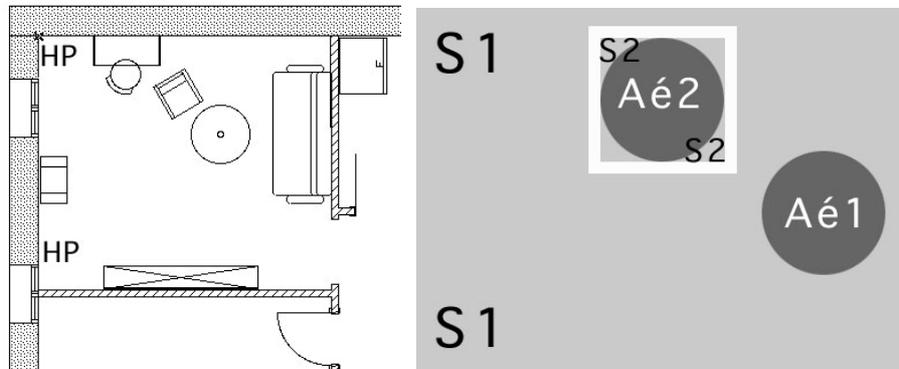
Figure 2 – *Pocket Device (using headphones)*

• **Device of guided listening**: it consists in configuring the built space by closing some doors and by opening windows for instance, in order to guide the listening towards a specific noise (a child playing in the garden, or a forthcoming visitor etc.). It reminds us of the very old idea of Athanasius Kircher [3] who considered the built space as an extension of the ear.

2.2 The medial ways of the ordinary sound culture

We have highlighted several kinds of processes, which stand out by the object of their action. Indeed, the action can be based on:

• The sound level of the source, by processes which change the sound level when the interface of the "sonorous" object enables it : "*sometimes, I ask to turn the volume down and when she leaves, I turn it off*", "*we turn the volume of the TV up in order to hear it in the other room*".

• **The source location** by a process of relocation. This is the case for small transportable radios, which are often moved in a flat.

• **The space configuration** around the source by the mere procedure of isolating or not, by closing or opening the doors and/or the windows : "*in Paris, I can not answer the phone when a window is open*".

• **The individual location** by a process of moving from a space to another in order to get closer to the noise or to move away from it "...*we were both in the kitchen and when I go to the living room, I get into the habit of moving away speaking louder and louder*".

• **The very body of the inhabitant**, by a temporary sealing of his ears to protect himself from a noise which reaches the threshold of pain or to avoid the interference.

2.3 The soudscape shapes of the ordinary sound culture

As for the processes, the strategies are different according to their aim. The difference is that their object is time; the characteristic of their action is the avoidance and roundabout ways. Indeed, the strategy is based on:

• **The sound level** of the source or the source itself, by a strategy of previous choice or selection of the sonorous object before its acquisition: choice of toys not very noisy or of units displaying the sound level. Other cases consist in turning down the sound level of a switched

off unit, before somebody else turns it on: "*when I'm very concentrated, I turn on the answerphone and I don't answer the phone, so I can forget it, above all if I adjust the ringing very low*".

• **The source location**: All the logic of the source distribution in the living space relies on it. A unique case in our study is that of a student who put the alarm clock at the other end of his room, three meters from his reach, in order to be forced to get up the morning to turn it off: "*depending on how tired I am, I move it in order to be forced to get up, to get out of the bed*".

• **The previous configuration** of space around the source by closing or opening doors and/or windows.

• The acoustic qualities of space by the choice of absorbing materials: the fitted carpet in bedrooms is a good example of it and is often used. "*...and here, it's quiet because we have a fitted carpet*".

• **Transport of the potential source**: for instance, the new mobile phones are frequently moved in all the use area of the dwelling and even outside in some cases. This object is always at reach; it does not leave the individual area.

• **The individual location** by a strategy of previous choice of the place he takes up in the space, when a sound situation is imminent: thus, the inhabitant will be near the window if he hears an external call - centripetal figure -, or far from the place where the annoying noise will be produced.

• **The verbal or written strategies of prevention**: as to avoid the neighbor's complaints by informing them of the possible nuisance he can create, or by inviting them after the party that he organized. As they are informed, the neighbors can better accept noises or at least they will not complain.

3. DYNAMIC PROCESS OF COMFORT.

The analysis of the ordinary sound culture shows that the inhabitants are sensitive to the distal ratio to the sources but from the acoustic point of view. One means a ratio of sound distances that compose the soundscape planes of listening from the nearer (the louder) to the far ones (the unheards). Thus, the device allows a specific composition for each situation: such as close a window and open another one for a better control of one side of the environment without being disturbed by the other side. During the length of an activity, a process which maintains an atmosphere tending to disappear, brings it to a standstill, in spite of the movements of the sound environment, by replacing the device by another one. That is possible if the device allows a new spatial configuration or soundscape composition. The sound distance is the common denominator of processes and devices.

Representations play a role in the anticipation and in the planning of intelligent strategies. The strategies have a slow pace, that of intellection, for they are not linked to the sonorous objects but their representations. They proceed in the field of what is possible and imminent. For this reason, the strategies depend on the sound rhythms of the environment sound events that must be known by the inhabitant.

Usually, annoyed people are those who do not have possibilities to act in order tochange their environment or whose actions have failed. They finally recover to complain as a final solution.
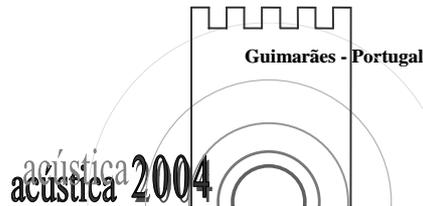
The new inhabitants generally are very annoyed or annoying because they have not experienced the rhythms of their new environment. The same phenomenon happens in hotels and unusual places. The new inhabitants have to take time to cumulate knowledge of the sound environment and develop the adequate actions to manage it. New arising sounds in the environment are generally annoying because they are not awaited.

What one learns from the observation of the inhabitant sound practices is that the comfort is not only and exclusively an attribute of the material and acoustic objects that are the built space (with a good isolation) and the sound objects owned by the inhabitant. A part of the success of a comfortable space of life is the possibility to transform the sound space continuously depending on the changes of the environment. The inhabitants just have intuitively the competence [4] to be active in realizing their own comfort. They act on all the elements of the sound production system from the sources until their listening.

The image of passive inhabitant nicely protected behind good isolating walls is not a realistic one.

4 CONCLUSION

The domestication of the sound space goes through the learning of apprenticeship of the sound environment and by the appropriation of these rhythms. It goes through the use of the potential of comfort that is offered to him, and by which he settles the devices that will condition the atmosphere he wants. It goes through these processes, by which he will maintain this atmosphere, as this atmosphere will go away. And by these strategies, he will anticipate the slower changes to divert them. There is (a) comfort, when a possible situation, while actualizing matches with the awaited reality. The same as when the real situation matches the representations that the inhabitant makes of it. When there is a break in the movement controlled by the inhabitant, there is a discomfort. Comfort is paradoxically not perceptible. It is revealed by its absence.

ACKNOWLEDGEMENT

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