# What If sound Perception Was a Matter of Touch ?

**Mohammed Boubezari**
boubezari@gmail.com
Parque EXPO and CAPS - IST, Lisbon, Portugal

## Abstract

Unlike the theoretical models of perception that separate the subject and the object and fill the distance between them with sound signal, is there another model based on contact and which reduces that distance to zero? In other words: what if sound perception was objectively an haptic modality?

Starting from concrete examples, observed in a survey of inhabitants and public place soundscape mapping, this paper shows that sound perception is a matter of touch and therefore, sound topologies.

The results confirm the intuition of Merleau-Ponty rather than Husserl (Dasture 1988) on the issue of touch in perception process and in particular in its relationship with vision. The concept of sensitive topology simplifies the model of perception beyond the sound phenomenon. Examples are shown with the questions and assumptions arising therefrom.

**Keywords:** perception, sensitive space, topologies, skin, touch.

## 1. Introduction

Starting from the premise that the perception is what provides the link with the environment, what interests us is the human environment, artificialized, urbanized, developed and built.

In this perspective, even if the human body remains the home of the sensory organs, the percepts and the representations of the perceiving subject, it is nonetheless that it is still the best instrument of capture, analysis and description of the environment that we are interested on. Then it is legitimate that the body be considered, here, the instrument of investigation on sensitive space and not its object.

In considering the subject-body-sensitive as well, the second postulate is that the body wrap becomes in its entirety the surface of contact with the environment. It is at it's level that the environment is seized or not. The modality being the junction, palpation, touch or contact. But in this case, what about the so-called "remote" senses as sight or hearing?

## 2. What if touching was not inherent in solid forms exclusively?

The question asked here is to say: can we consider the skin,self-envelope, as a single organ of sense, complex and specialized in some parts in line with the needs to be collected, or should we continue to separate the senses each in its category, each category inherent to a physical data of the environment, light, sound,... and to each sense its specialized organ, the eye, the ear, tongue, the nose etc, and consider skin as the rest of the sensitive envelope that is in charge of other data from the environment as heat, pressure, pain, etc....?

We will see below that the perception occurs at contact level with the overall self-envelope, all senses confused. Perception in distance is only a potential perception, a contact to become, and dependent of an action strategy to be fulfilled. But first, let us take for example the view. Far from psycho-physiological approaches,certainly interesting,on the organ of sense or the subject receiving, look us on this "dialogue" between two theoretical patterns of Husserl and Merleau-Ponty which best leads us to our topic of interest.

## 2.1. Réversibilité des sens chez Husserl et Merleau-Ponty

The visible body, to an observer, reveals the epidermal limit to which eye has accustomed us. This bodily envelope is the tangible topology in which the body is in space. Touchingone's body is browsing its topology. But for Husserl this reveals the dual function of touch, where touchieris himself touched, and where the touch sense acquires then the status of main sense in the constitution of the living body. In this way, the differentiation between oneself and the world can be. Reversibility thateyedoesn't have. Merleau-Ponty, basing on this principle of reversibility of the sense, doesn'tprivilege the fact that a sense can be the object of its own perception.

All in all, the reflexivity of the sense in Husserl is looped on the subject himself: only touch can verify this rule. In Merleau-Ponty, reflexivity is entered in the space of visibility and is open to others: *I am visible for me as well as for others, tangible etc.* Reflexivity is here in sharing space.

The first theoretical advantage that we draw is the issue of distance in the reflexivity of the senses.

For Husserl it must be zero and only touch is capable of this sensitive closure. Sight and hearing are apart from the object that they perceive. For Merleau-Ponty there is no distance between the perceived object and perceiving subject regardless of the perceptual modality. Vision, hearing, touching occurs at the place of the subject. In other words, objects are perceptible at the level of the skin and not at the place where their physical topology are.

## 2.2. Distant sense or proximal sense

If the senses are localized on the carnal envelope, providing an interface with the milieu, it is commonly accepted that some senses are called remote, as vision and hearing, and others work in contact. Or considering the view, for example as remote sense, as suggested by Husserl, in reality it is remote only to the tangible object he observes. There is a bearing change in reasoning subtly from the sense of sight to the sense of touch. The distance referred to, is evident in the relationship between the seen and the potentially touched, hence the etymology of the word *con*-tact. In reality, the object is already visible at the place of the sense, the eye. The retina is also the part of the skin which function is to capture and seizure the visible world. Therefore the sight is not a remote sense, it occurs at the level of the skin, it works consequently on touch.

Is it the same for hearing?

If one considers the hearing as remote sense, we find ourselves in the same case as for sight, the same dilemma of change of register from the audible to the tangible.

What do we ear, in fact? Pierre Schaeffer responded cautiously, staying in the same area of the sound space setting the sound object. This unloads him of linking the sound object to the modality visible or tangible.

Far before everyone else, in the middle of the 17th century, Athanasius Kirsher (1673) defined the focus of a sound as a phonocamptique centre. Thus placing the sound source in a geometric space, this model is as prudent as that of Pierre Schaeffer, for in situ the phenomenon is much more complex because sounds fill up with information of solid bodies that they encounter in their journey, by transmission, reflection, resonance, reverb etc, and arrive to the skin, the eardrum, as gross sounds. What does one ears then?

Between the isolated singular sound source, the sound environment in which it is transformed and the sound environment in which it is registered, only the ear as an instrument and the perception as a process of connection with the milieu can make the semantic distinction between all these components and also between the sources themselves. The language expresses these different components. Despite the distance covered, it is clear that it is at the level of the ear that occurs the feeling that reveals the object and, in this case, the distance is null. The physical distance between the source and the listening point is a distance between a point in Euclidean space where solids are arranged, and the sound space where the sense of hearing operates. This follows two consequences:

- It does not listen to the sound sources remotely, it listen to sound “topologies” by touch through this specialized part of the skin that is the ear. Listening is not a distal perception it is well a proximal.
- Sound topology, all areas of equal sensation of listening in space, is an integral part of the sound object despite the distance that separates it from the central point,which is the source.

As you will see below, the sound topologies were observed and measured first in domestic spaces during an investigation on sound comfort among residents and next, in the public areas of Lisbon, including the public gardens.

## 3. Sound topologies in domestic and public spaces

There is a noticeable difference between the domestic and the public sensitive space. Because of the configuration of the constructed walls that obstruct the view, the sound has more far-reaching than the view. That is the visible topology is included in the sound topology. In the public space it is the reverse. We see further more than we listen.

### 3.1. In domestic spaces

In a survey on sound comfort in inhabited environment (Boubezari 2001, 2007), one of the first representations of the acoustic topology in an apartment has shown how the sound is shaped by the built space. This has allowed testing the constructed device as an attenuator of the acoustic propagation. (Figure 1)

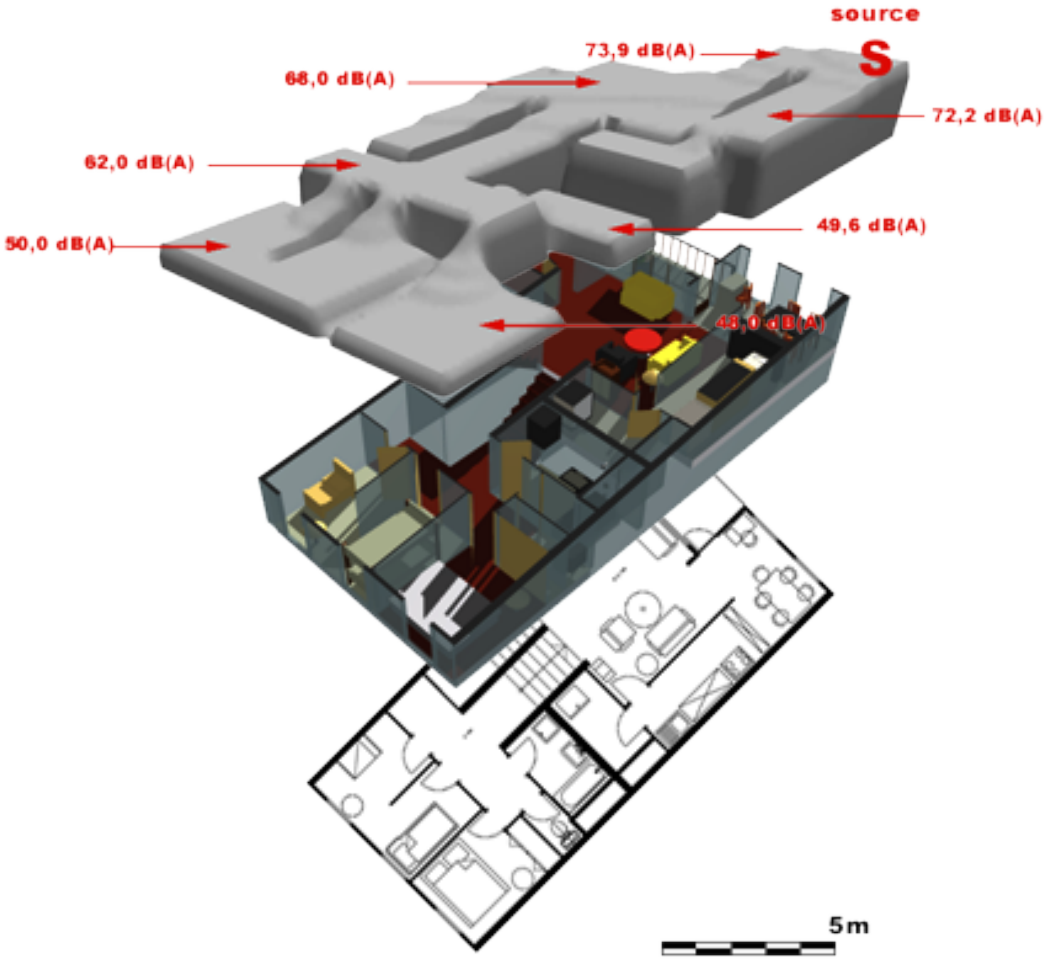


**Figure 1.** "Noisy" diner in an apartment, Grenoble.

This first case is simple and measured noise is the noise level of the “S” source, at different places in the apartment. This is an acoustical topology because it is not yet a matter of perception.

In a second step, the limit of audibility of a source emitting a known music was measured in an atmosphere surrounded by white noise in a confined space. The first case with a white noise of 56 dB and the second with 6dB less gain. Then, we got two curves corresponding to two sound topologies of music, as the background noise is high or low.

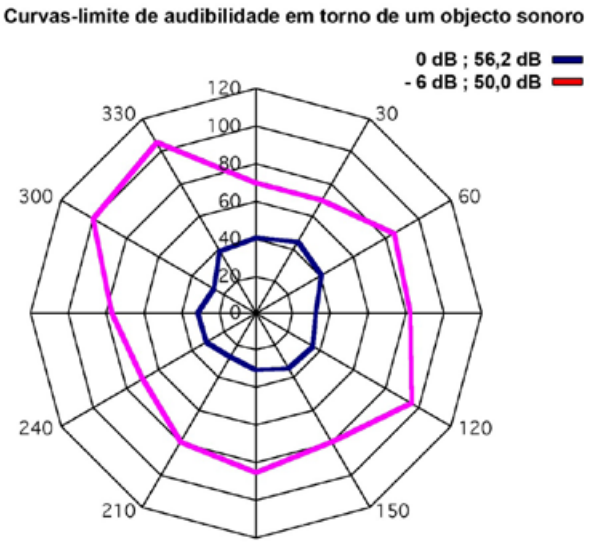


**Figure 2.** Sound Topologies in Housing, first test.

The sound topology is therefore Shaped also by masking noise in his presence.

However, outside experimentation, and in the presence of “naturally domestic” sources these only mask themselves only rarely between them. They add to define what the inhabitant mean. So, we have distinguish three types of configurations of the sound topologies in the domestic sound space:

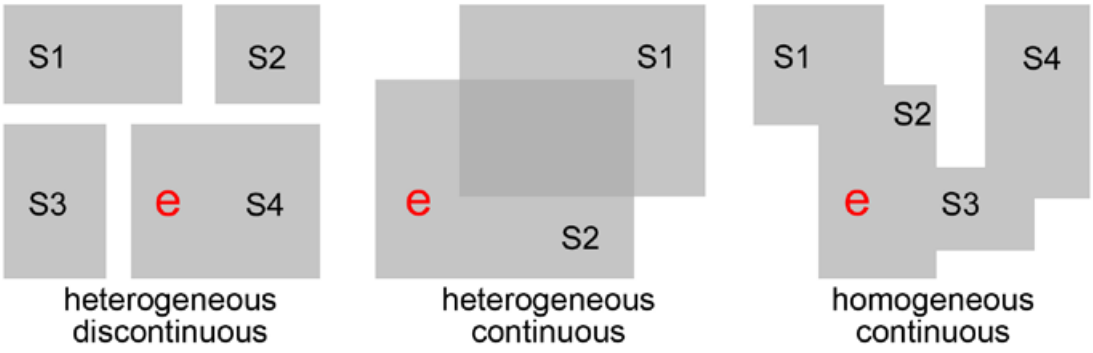


**Figure 3.** Sound Topologies in Housing, schematic representation.

1. The sound space is heterogeneous and discontinuous. Each sound topology “S1, S2, S3, S4,..” is separated from others, the inhabitant ‘e’ can only listen to one at a time.
2. The sound space is heterogeneous but continuous. Topologies are separated but they share a portion of the domestic space where they mix.
3. The sound space is homogeneous and continuous. The ear is in permanent contact with all topologies everywhere in space.

In the third case, the inhabitant can designate the topology sum of all and consider it as a single topology, as for example ‘a party ‘. He can also designate grouped topologies separately as for example focus on listening to music while other sources parasitize selective listening. In this third case we clearly understands the importance of the language by its faculty to nominate things for expressing an intention of perception. It is in this way that language and perception are linked.

## 3.2. In public spaces

Detection of sound topologies experience was repeated in public space, (Boubezari 2004) here at Rossio, in Lisbon, around the source “public fountain”.

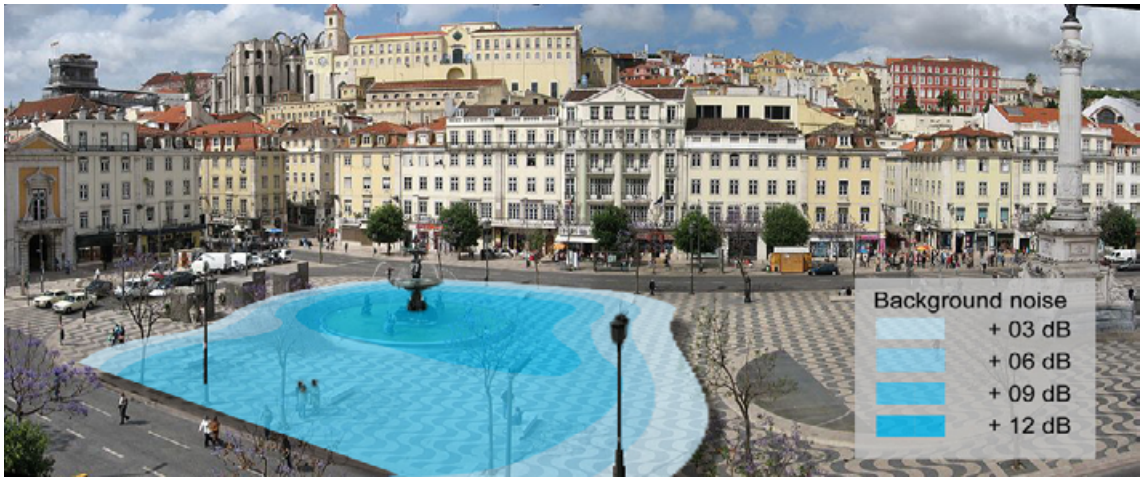


**Figure 4.** Water sound Topologies in Rossio Place, Lisbon.

It has been shown that it was sufficient that sound of ‘water’ exceeds of 3 dB the background masking noise to become audible. Several topologies corresponding to the variation of ambient background noise were represented (Fig.4)

The experience has been reproduced in the Jardim da Estrela garden in Lisbon where there are a variety of sources all far from urban automobile traffic masking.

**Figure 5.** Ducks, musicians, bells and children in Jardim de Estrela, Lisbon.

By a Predictive method (Boubezari 2012), tested in advance, sound topologies of each source were represented taking into account the intermasquage between them when it occurs.

Each source has been represented in one layer separately. The superposition of layers gives a representation of the soundscape of the garden of Estrela. (Fig.6)

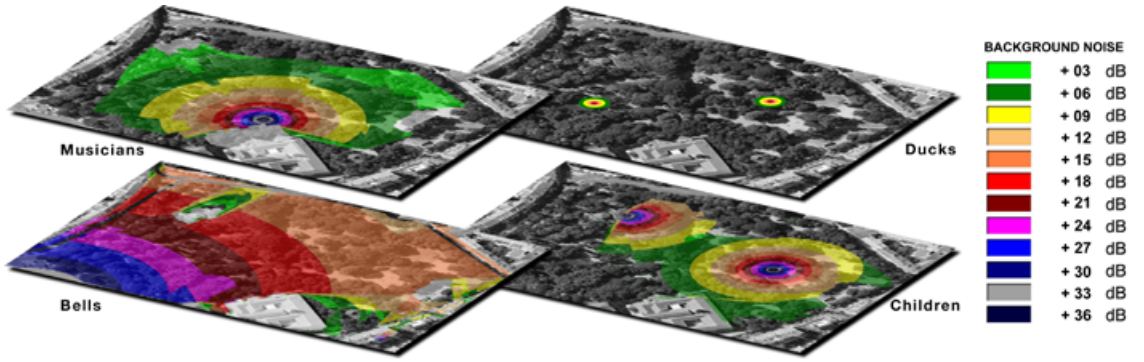


**Figure 6.** Soundscape Topologies in Jardim de Estrela, Lisbon.

All these topologies represent the spatial limit from which they are noticeable. Outside this limit there is no sensation of the sound because there is no contact. Within this limit, perception or more precisely the feeling intensifies itself. The acoustic pressure increases.

This allows us to say that the sound perception is a matter of touch. The ear being then that specializedpart of skin.

Given this result, a question arises: what is touched? The sound of an object? Or the object itself?

## 4. The way that sensitive objects are shaped.

First answer by which it is commonly attempted to answer is that we listen to the sound of an object that is potentially touchable. The object boils down to its solid topology and the sound to the signal which emanates from as is the case of vision. However, there arevisible topologies that contradict this 'rule '.

**Figure 6.** Visuo-haptictopologies of a candle flame and of water surface.

The potential haptic topology in the eyesight offers the possibility of detecting solid forms without making the effort to touch them. Even better, it offers the possibility to reveal the forms which are not solids (fig. 6) and that the touch cannot confirm. The surface of the water or the halo of flame are topologies that occupy the space, visible from far away but never close.

However, as visual topologies, they are manifested at the level of the retina. The visual topology boundary is where the retina can ‘see’.

But all topologies are not visible as for example sound or thermal topologies. For the flame, there is anaureole that is perceptible to the touch but it corresponds to a thermal topology. This is the way that a birth blindperson knows a candle, certainly not as pictured.

Arranged concentrically, these sensitive topologies are certainly configured specifically for each object. Is this configuration measurable? Quantifiable? Certainly as long as the distance between these sensitive topologies remains itself measurable and the intensity of the signal on the skin“pressure” is also measurable.

How these topologies interact in the sensitive space? By intermodal masking? or by solid masking?

Certainly these questions open up interesting hypotheses about the architecture of the sensitive space.

## 5. Conclusion

Solid topologies are not sovereign in the architecture of the sensitive space. They appear for touch in the same way they are described by language from far. They seem to be important because the human body is itself solid. But in fact, space is filled with sensitive topologies that are all pertinent.

The study of the human environment and particularly the soundscape can not settle for only physical measures from energy sources. They shall relate sensitive topologies and how they fit together and configure this if singular form that we call ambiance.

Sensitive topologies fill the epistemological gap between physical world and the sensitive one? Or, they show us that the world is still sensitive even when it is quantifiable?

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