

**International Doctorate in Architecture and Urban Planning (IDAUP)**  
International Consortium Agreement between University of Ferrara  
Department of Architecture (DA) and Polis University of Tirana (Albania)  
and with Associate members 2014 (teaching agreement) University of  
Malta/Faculty for the Built Environment

IDAUP XXXIII Cycle

Exploring Multi-Sensoriality in Architecture: Architectural Experience in Visual Deprivation

Keti Hoxha



UNIVERSITY  
OF FERRARA  
- EX LABORE FRUCTUS -



UNIVERSITY OF FERRARA  
department of architecture



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## Exploring Multi-Sensoriality in Architecture

Architectural Experience in Visual Deprivation

Candidate: Keti Hoxha  
DA Supervisor: Prof. Giuseppe Mincoelli  
POLIS Supervisor: PhD. Llazar Kumaraku

Cycle XXXIII

# IDAUP

IUSS - Ferrara 1391

International Doctorate in Architecture and Urban Planning



**Università  
degli Studi  
di Ferrara**



**INTERNATIONAL DOCTORATE in ARCHITECTURE AND URBAN PLANNING**

**Cycle XXXIII**

**IDAUP Coordinator Prof. Roberto DI GIULIO**

**Thesis Title**

**“Exploring Multi-Sensoriality in Architecture”  
Architectural Experience in Visual Deprivation**

**Curriculum Architecture / IDAUP (SDS ICAR14)**

**Candidate**

**Keti, HOXHA**

**(UniFe Matr. N. 139631)**

**(Polis Univ. Reg. N. PL581N060004)**

**Supervisor DA / POLIS**

**Prof. Llazar, KUMARAKU**

**Supervisor DA / POLIS**

**Prof. Giuseppe, MINCOLELLI**



Università  
degli Studi  
di Ferrara

Sezioni

## Dottorati di ricerca

Il tuo indirizzo e-mail

hxhkte@unife.it

Oggetto:

Dichiarazione di conformità della tesi di Dottorato

Io sottoscritto Dott. (Cognome e Nome)

Hoxha Ketii

Nato a:

Tirana

Provincia:

Tirana

Il giorno:

03/06/1990

Avendo frequentato il Dottorato di Ricerca in:

Architettura e Pianificazione Urbana

Ciclo di Dottorato

33

Titolo della tesi:

Exploring Multi-Sensoriality in Architecture: Architectural Experience in Visual Deprivation

Titolo della tesi (traduzione):

Esplorare la Multisensorialità in Architettura: L'Esperienza Architettonica nella Deprivazione Visiva

Tutore: Prof. (Cognome e Nome)

Prof. Kumaraku L Lazar

Settore Scientifico Disciplinare (S.S.D.)

ICAR14

Parole chiave della tesi (max 10):

Phenomenology in Architecture, Multi-Sensoriality, Inclusive Design / Fenomenologia in Architettura, Multisensorialità, Inclusive Design

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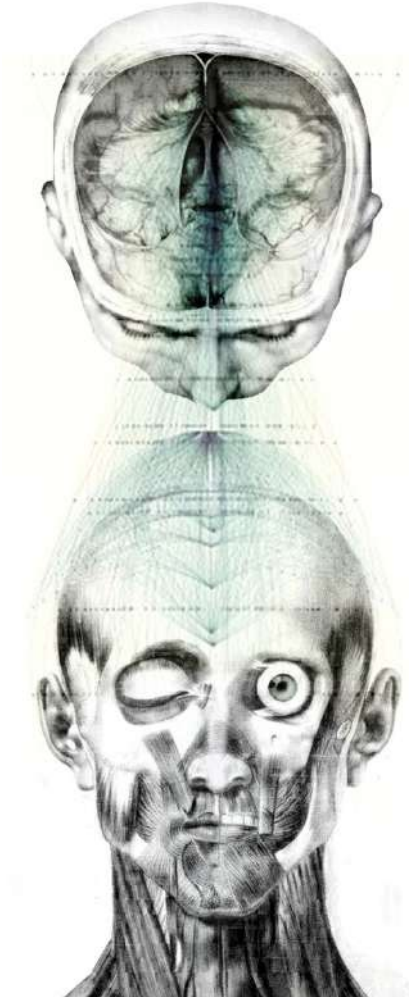
Firma del dottorando

Ferrara, li 02/09/2021 (data) Firma del Dottorando Ketí Hoxha

Firma del Tutore

Visto: Il Tutore L Lazar Kumaraku Si approva Firma del Tutore

**EXPLORING MULTI-SENSORIALITY IN ARCHITECTURE**  
**ARCHITECTURAL EXPERIENCE IN VISUAL DEPRIVATION**



**PhD Candidate: Keti Hoxha**

**Affiliation: POLIS University**

Curriculum: Architecture (ICAR13)

Research topic: 1.2 Inclusive design, design for all, accessibility to spaces, products and services, sustainable design.

Keywords: Phenomenology in Architecture, Neuroscience in Architecture, Inclusive Design, Multisensoriality in Architecture

**DA Supervisor: Prof. Giuseppe Mincoelli**

**POLIS co-Supervisor: Ph.D. Llazar Kumaraku**

## **ABSTRACT IN ENGLISH**

### **Exploring Multi-Sensoriality in Architecture: Architectural Experience in Visual Deprivation**

Architecture is a nonverbal language that provides multi-sensorial experiences, which involves the collaboration of the sensorial and perceptual experience. It is a tool for transmitting emotions and psychological effects through atmospheres created by configurations, elements, characteristics and shapes. Throughout years, architecture has been a product of focusing in form, aesthetic properties, function and technology, leaving aside the importance of the involvement of all senses as a contribution in designing architecture.

In architectural practice, vision is considered as the main sense of creating spaces and aesthetics of the buildings, leaving aside other sensorial modalities. This is a result of the considerable amount of sensorial information obtained by vision, which shifts perceptual attention to visual information preventing experience from other sense modalities. As a result, architecture tends to be considered a visual discipline, while being concerned with the aesthetic quality and visual harmony between composing element in the search of beauty.

One of the main concerns of the research is analysing the multi-sensorial nature of perceptual signals obtained by the architectural environment and the effects on human's consciousness. In response to this concern, it is required to obtain further analysis concerning the understanding of perception in spatial design. Such concern is addressed to a target group, which experiences architecture by not considering sight as the main perceptual means for spatial exploration and orientation. There is insufficient interchange of theoretical knowledge concerning the use of instruments that support the interests of visual impairments in architectural design. The perspective of the visually impaired could provide the knowledge of a different conscious level of exploring architectural spaces, which can be used further as not a typical perceptual model to be considered by architects when designing spaces. The research aims to provide knowledge for developing design parameters for people with reduced sensorial activities, which in fact are not taken in consideration during the architectural design process. Even when these spaces are designed, the method is through the use of guidelines, which in fact are standard architectural solutions that do not take in consideration their perceptual experiences. Their ways of perceiving space can become the starting point for the discipline of architecture to learn how to perceive space from another perspective point of view.

This research has an important impact not only to people with visual disabilities, but it is in the interest of all users in order to experience more accessible spaces, which provide multi-sensorial experience. The research tries to overcome the barrier of being directed by vision in design, bringing to mind that architecture is experienced by all sensorial modalities. An acknowledgment that may lead to designing with new architectural practices. The research can be a starting point for architects to start to implement phenomenological ideas in their design with the aim to enrich the architectural design and to be more in contact with human experience. Architecture should be designed to serve to the needs of human activity; therefore, to create meaningful experiences.

Keywords

Architecture | Phenomenology in architecture | Neuroscience in architecture | Interior Design

## **ABSTRACT IN ITALIAN**

### **Esplorando la multisensorialità in architettura: l'esperienza architettonica nella disabilità visiva.**

L'architettura è un linguaggio non verbale in grado di fornire esperienze multisensoriali, le quali mettono in collaborazione sia la componente sensoriale che quella percettiva. Attraverso l'atmosfera creata dalla combinazione dei suoi elementi, delle sue forme, e delle sue caratteristiche intrinseche, l'architettura si configura quale strumento per la trasmissione di emozioni ed in grado di scatenare precisi effetti psicologici. Tuttavia, durante gli anni, essa è stata sempre interpretata solamente attraverso le sue proprietà formali, estetiche, funzionali e tecnologiche, tralasciando la sua capacità di attivare ciascuno dei sensi umani al fine che anch'essi vengano consideranti parte integrante del processo progettuale.

Nella disciplina architettonica, la vista è spesso stata considerata il senso più importante nella genesi spaziale ed estetica degli edifici, anche a causa dello scarso interesse che è stato rivolto verso alle altre modalità percettive. La motivazione di ciò risiede nel gran numero di informazioni che siamo in grado di captare attraverso la vista; una quantità tale da aver spostato la nostra attenzione percettiva verso i dati visivi piuttosto che su quelli provenienti da altri sensi. A conferma di ciò, l'architettura tende ad essere considerata una disciplina 'visiva', interessata alla ricerca di una determinata qualità ed armonia estetica tramite una continua indagine della bellezza insita nella composizione delle sue forme.

Una delle principali investigazioni che questa ricerca si propone è l'analisi della natura multisensoriale degli stimoli percettivi provenienti dallo spazio architettonico e dei loro effetti sulla coscienza umana. Al fine di ciò, è necessario dapprima interrogarsi sul senso concetto stesso di 'percezione' in relazione alla progettazione dello spazio. Per rispondere a questo interrogativo, si è deciso di rivolgere prendere in considerazione uno specifico gruppo, quello dei non vedenti, che vive lo spazio architettonico non utilizzando la vista come principale strumento di esplorazione e orientamento. Partendo dalla constatazione che non esista un adeguato background teorico riguardo l'uso di specifici strumenti che possano favorire la componente esperienziale dei non vedenti in relazione allo spazio architettonico, proprio la loro condizione è in grado di fornire una nuova consapevolezza riguardo le modalità di esplorazione di tale spazio da poter utilizzare successivamente quale modello percettivo al servizio degli architetti come vero e proprio strumento progettuale.

Questa ricerca ha quindi l'obiettivo di ricercare specifici parametri progettuali da prendere in esame nella progettazione dedicata ad individui affetti da percezione sensoriale ridotta che molto spesso non sono tenuti in considerazione nei processi architettonici. Anche quando gli spazi sono 'pensati' per queste persone, gli unici riferimenti a disposizione sono una serie di linee guida che altro non sono che una serie di soluzioni standard completamente separate da una qualsiasi componente percettiva od esperienziale. Al contrario, proprio il modo in cui questi individui percepiscono lo spazio può rappresentare il punto di partenza per far sì che anche la disciplina architettonica possa

interrogarsi su quest'ultimo possa essere compreso proprio partendo da un punto di vista completamente differente.

Questa dissertazione non vuole rivolgersi solo ad uno specifico pubblico, quello degli affetti da disabilità visiva, ma prende in considerazione tutti i fruitori degli spazi architettonici al fine da offrire loro luoghi più accessibili e ricchi di esperienze multisensoriali. Per far ciò, la ricerca si propone di oltrepassare la convinzione che sia solo la vista a guidare il processo progettuale e che l'architettura stessa si offra a molteplici modalità di lettura sensoriale. Ciò che si vuole ricercare è quindi la possibilità per gli architetti di lavorare con nuovi, e più inclusivi, strumenti. Tramite questi ultimi, il fine è dimostrare come l'inserimento di specifiche componenti fenomenologiche nel processo progettuale sia in grado di migliorare non solo il risultato stesso di quest'ultimo ma anche di connettere sempre di più il campo dell'esperienza umana e l'architettura. Quest'ultima, infatti, dovrebbe essere pensata per facilitare le attività umane e quindi in grado di offrire esperienze significative.

Parole chiave

Architettura | Fenomenologia dello spazio architettonico | Neuroscienze in architettura | Design degli interni



## **ACKNOWLEDGEMENTS**

This research owes so much, to all the persons who made possible it in different ways to undertake the study. In the first place, I would like to thank all of those people that kindly accepted to be part of my investigations, who shared their inner perceptual world with me, by reinforcing the thought that the architect's work is incomplete if not accompanied by human sensitivity...

I would like to express my sincere gratitude to my DA, Università di Ferrara supervisor, prof. Giuseppe Mincolelli, for providing his valuable guidance, comments, and suggestions throughout the research. Particular thanks go to my POLIS University supervisor, Ph.D. Llazar Kumaraku, with his commitment gave me valuable aid and motivation to realize this work, a product that concretes the hard work of all of these years and a valuable experience for my professional and personal development. I am particularly grateful for the contribution and support of Prof. Skender Luarasi, and especially, for his precious advice and criticism in the search for a more courageous approach to my work.

Special thanks go to POLIS University and Ferrara University, for providing me the possibility to undertake this research and explore more in my topics of interest. My sincere gratitude go to all of my colleagues, especially Ph.D. Valerio Perna and Ph.D. Artan Kacani, who supported and encouraged me by sharing their experience and perspectives.

I must express my very profound gratitude to my parents and family, especially my mother, for providing me support and continuous encouragement throughout my years of study. This accomplishment would not have been possible without their patience, commitment and compassion. Thank you!

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## 1. INTRODUCTION

Architecture is a nonverbal language that provides multi-sensorial experiences, which involves the collaboration of the sensorial and perceptual experience. It is a tool for transmitting emotions and psychological effects through atmospheres created by configurations, elements, characteristics and shapes. Throughout years, architecture has been a product of focusing in form, aesthetic properties, function and technology, leaving aside the importance of the involvement of all senses as a contribution in designing architecture.

In architectural practice, vision is considered as the main sense of creating spaces and aesthetics of the buildings, leaving aside other sensorial modalities. This is a result of the considerable amount of sensorial information obtained by vision, which shifts perceptual attention to visual information preventing experience from other sense modalities. As a result, architecture tends to be considered a visual discipline, while being concerned with the aesthetic quality and visual harmony between composing element in the search of beauty.

One of the main concerns of the research is analysing the multi-sensorial nature of perceptual signals obtained by the architectural environment and the effects on human's consciousness. In response to this concern, it is required to obtain further analysis concerning the understanding of perception in spatial design. Such concern is addressed to a target group, which experiences architecture by not considering sight as the main perceptual means for spatial exploration and orientation. There is insufficient interchange of theoretical knowledge concerning the use of instruments that support the interests of visual impairments in architectural design. The perspective of the visually impaired could provide the knowledge of a different conscious level of exploring architectural spaces, which can be used further as not a typical perceptual model to be considered by architects when designing spaces. The research aims to provide knowledge for developing design parameters for people with reduced sensorial activities, which in fact are not taken in consideration during the architectural design process. Even when these spaces are designed, the method is through the use of guidelines, which in fact are standard architectural solutions that do not take in consideration their perceptual experiences. Their ways of perceiving space can become the starting point for the discipline of architecture to learn how to perceive space from another perspective point of view.

This research has an important impact not only to people with visual disabilities, but it is in the interest of all users in order to experience more accessible spaces, which provide multi-sensorial experience. The research tries to overcome the barrier of being directed by vision in

design, bringing to mind that architecture is experienced by all sensorial modalities, an acknowledgment that may lead to design with new architectural practices. The research can be a starting point for architects to start to implement phenomenological ideas in their design with the aim to enrich the architectural design and to be more in contact with human experience. Architecture should serve to the needs of people and their activities; therefore, to create meaningful experiences.

The research is organized in four main chapters, which elaborate sequentially the main aspects related to architectural experience and concluding with design parameters for the visually impaired and for all users:

## **1. INTRODUCTION**

## **2. STATEMENT**

In this chapter is elaborated the main hypothesis of the research, subhypothesis and research question resulting from the problem of perception in architecture and its ocularcentric nature.

## **3. RESEARCH TRACK**

This chapter is a literature review of architectural experiences in architecture, considering the phenomenological perspective in order to interpret the essence of human experience in architecture as a result of the interconnection of body, space and objects.

## **4. EMPIRICAL TRACK**

In this section it is provided an interpretation of scientific findings, mainly neuroscientific and ophthalmologic, in architectural experience. Furthermore, this chapter includes personal interviews and on-site experiments with the visually impaired in order to come into a closer understanding to their relation with architectural spaces.

## **5. EVALUATION TRACK**

The chapter analyses results from the previous track and translates them as possible design parameters multi-sensorial in nature for the visually impaired and for all. The chapter gives further suggestions to architects for using such parameters in their further research and designs.

## 1.1. Aims and Objectives

Architecture has been a product of focusing on vision by considering it as the most important sense of designing and experiencing architecture, leaving aside the importance of all other senses and the meaning of body. Such approach results in an architecture that shapes human's body, where the perceiver needs to adjust to the built spaces. The research aims to analyse the bond between the built territory and the perceiver, by considering the body and consciousness as determinant components for shaping architectural spaces. Such consideration brings the need of understanding how each sensorial modality contributes to architectural experiences and exploring the meaning of multi-sensorial experience in architecture.

Architecture has been considered as a discipline focusing on vision, by considering sight as the most important sensorial mode of designing and experiencing architecture. Thus, leaving aside the importance of all other senses and the meaning of corporality in architecture. Such approach is due to the fact that human being is predisposed to be a visual being as norms implied by society also contribute to this "normalized" perception. The architect, is an example of using this "normalized perception, which elaborates further inside the discipline itself, through the use of image and visualization as the main communication tool. In this research "normal" and "normalized" perception, is perception as a conscious act directed by human sight.

The main intention of this research is to understand how perception, as an individual process in architecture, provides different levels of consciousness. For this reason the aim is to investigate how new experiences are manifested when "normalized" perception (sighted perception) is altered. The main objective of the research is to use the perceptual experience of the visually impaired as a different perspective to keep in mind for designing spaces that produce multi-sensorial spaces that promote mental, spiritual and emotional experiences to all users.

Aim: Investigate how new experiences are manifested when "normalized" perception is altered.

Objective 1: Use the perceptual experience of the visually impaired as a different perspective to keep in mind for designing spaces that produce multi-sensorial spaces that promote multi-sensorial experiences to all.

Objective 2: Provide a set of architectural parameters to be further applied in architectural design that enhance multi-sensorial experience in all users.

## 1.2. Hypothesis and Research Questions

The research addresses as the main question of how new experiences obtained from the destabilisation of “normal” perception are manifested in architecture. To this discussion, the main hypothesis of the research is that preventing “normal” perception generates new experiences that activate different consciousness levels, which are not active during “normal” perception. Such thing is manifested while we experience architectural spaces, where the attention is mainly focused on the visual sense data and in architectural discipline, with the visual consideration of designing architecture, represented by visual images. As a result, the research firstly addresses the question how architecture is visually experienced.

The destabilization of “normal” perception concludes with new perceptual experience, which is normalized by itself. If this destabilisation results in a new perceptual act, how it can be achieved in architectural spaces and how would the manipulation of “normal” perception affect architectural experiences. By considering the perspective of the visually impaired, as architects what is that we can learn from their experience in order to come into a different perspective of designing architectural spaces, which are capable of altering “normal” perception?

Main Hypothesis: The lack of normal perception influences in generating new levels of consciousness which are not active during normal perception, thus generating new spatial experience.

Question 1: How can the experience of the destabilized “normal” perception influence the definition of spatial qualities?

Question 2: What can we learn from the experience of the visual destabilized perception, in order to create a different architectural perspective in the process of designing architectural spaces?

## 1.3. Methodology

The research approaches several fields of study depending on the specific discussed topic, thus the research is developed sequentially. Firstly, an evaluation of the ocularcentric nature of architectural discipline is made, which is contradicted by using case studies of architects that do not have such approach. Secondly, focusing on phenomenological discussions concerning the relation of body, space and objects to answer the questions of perception in relation to architecture. This is obtained through literature review in the field of phenomenology, understanding perceptual processes, comprehending the relation between experience,



attention, perception and senses. This section focuses on analysing theories obtained by applying phenomenological principles in architectural theory and practice. By these theories, it is important to understand experience in architectural spaces and the existential meaning of architectural elements.

In order to provide knowledge of the perceptual experience of the visually impaired, scientific data is obtained from the field of neuroscience, which are further translated in the use of architectural approach. Such findings provide knowledge concerning the mechanism of the sensorial activity and mental image in people with visual deprivation. From this discipline, it is necessary to understand the consequences of the features of architectural spaces in the mental and emotional state of a human being, and how this information can be used for designing more accessible and multi-sensorial spaces. Furthermore, the understanding of the perceptual experience of the visual impaired is explored through experiments and phenomenological interviews concerning specific spaces.

The last part aims to evaluate results from observations made from the experiment and interviews with each subject and translate them in architectural parameters, in order to obtain results for designing spaces that promote sensorial experiences. The expected results are presented through qualitative models.

#### **1.4. Expected Results**

The research expects to provide knowledge to architects of a different perspective of experiencing spaces through all sensorial means and through the involvement of the body, which has to be considered as a crucial element for defining architectural spaces. This knowledge is interpreted as architectural parameters to be considered during design phase in the discipline of architecture.

#### **1.5. Stakeholders**

The research has an important impact to people with visual disabilities. It presents architectural parameters and approaches that promote an inclusive and accessible design in buildings. As a result, it is important for all users, since it proposes spaces that enhance the multi-sensorial inputs. The research tries to overcome this barrier by inspiring architects to put sensorial modalities and body to obtain new architectural practices. The research can be a starting point for architects to start to implement phenomenological ideas in their design in order to enrich the architectural design and be more in contact with human being's experience.

Furthermore, the research provides architectural spaces for people with reduced sensorial activities, which in fact are not taken in consideration during the architectural design process. Even when these spaces are designed, the method is using guidelines, which in fact are architectural solutions that do not take in consideration at all their perceptual experiences. Their ways of perceiving space can become the starting point for us, to learn how to perceive space from another dimension.

## **2. STATEMENT**

State of Art

## 2. STATEMENT

In western philosophy and in the discipline of architecture, vision has been considered as the basic sense of understanding space, its characteristics and dimensions. This dominance remains present throughout the design process in architectural projects, which is further reflected on how architects are concerned with the visualisation of the building and its final appearance. There have been previous studies that develop the idea of how other senses are very important in experiencing space and architecture. There are several approaches to this topic and in most of the cases, they tend to compare sensorial modalities according to their importance, neglecting that all of the sensorial modalities and body provide the exact knowledge of the perceptual space. However, the manner of perceiving architecture is related to the historical context, which is reflected in architectural representation that represent the techniques, method, architectural thinking of the time and demonstrate that perceptual experience changes with historical development.

### 2.1. Problem of Perception

Perception is a complex process of collecting information from the environment and interpreting it into a mental and physical experience. Such process is necessary to provide the adoption and interaction of the person with the living environment. It is provided by an important mechanism: the sensorial system, the body, and the mind. The selection of the input is provided by perceptual filters, which are further developed by previous mental patterns and experiences. Through the output of this complex process, we use and interact with space.

The word "Perception" comes from "the Latin words perception, *percipio* which means receiving, collecting, and the action of taking possession, apprehension with the mind or senses". (Shergill, 2012) However, there are many definitions and theories of defining what perception is. Most of these theories define perception as a process of selecting, organizing, reorganizing, and interpreting. This means to be aware of, to gather information and knowledge from the interaction with the sensory information and with the surrounding environment. The process of perception is far more complex than generating signals by human sensorial activity and resulting in mental representations. Due to its multiplex nature, perception has been the focus of discussion in various disciplines, concluding in different interpretations and approaches.

In Environmental Psychology, perception is described in two processing phases. Firstly, as a bottom-up processing. This refers to the process from which the information obtained

by sensory data is transferred to the brain and concludes with a mental representation. This mental representation is a result of only sensorial data. The second process is top-down processing, which occurs when the cortex transforms the information received from the thalamus, giving an attribution of meaning which is depended on the expectations and knowledge. This translation of information is mostly a cognition process, related to previous experience and expectations. Aiming to give significance to the surrounding environment, the brain is interpreting and reconstructing the information given by the senses.

In Psychology (Saks & Johns, 2014) the perceived reality can be shaped or sometimes distorted by some factors, which are divided into three categories: 1. The Perceiver – The interpretation of the perceiver is influenced by the personal characteristics, emotional state, motivation and experience. These components define what sort of information is processed and which not by senses; 2. The Target – The relationship of the object perceived with the perceiver influence the output of perception and the level of understanding of the target; 3. Situation - Time, position and other environmental and situational factors influence our awareness, as a result the level of perception. Along with these categories it is important to add a fourth component, output, which is the translation of the information coming by stimuli. This category is directly connected to the three previous mentioned components. Perception does not only mean to gain information from the environment, but the most important aspect is how to use and take actions of this obtained information. Different factors from the environment interacting with our behaviour sustain each other in a cyclic and dynamic way by shaping perception.

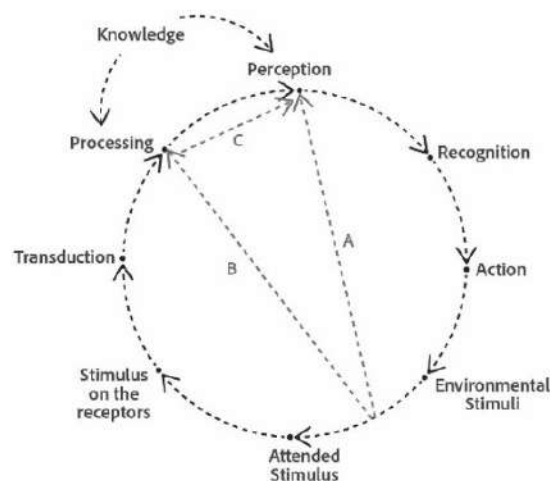


Figure 1 - Goldstein's Model of the Perceptual Process (Goldstein, 2002)

We might come up with a question from this categorization of components that define perception, in cases of hallucinations where there is no physical object presented to us,

which is the target. A similar approach can be found in the field of philosophy, in Naïve Realism, which supported the theory that senses provide through direct awareness the information of the objects as they are in reality. (Crane & Patterson, 2002) This phenomenon follows many discussions in the field of philosophy, which concluded to “the problems of perception”, as a contradiction to the phenomena of illusion and hallucination, when errors occur to provide the understanding of the physical or non-physical object. Such problem, relates us with the discipline of architecture, in terms of communication of design and ideas. Its primary means of communication are images, which are actually non-existent elements rearranged in scale and distance, redefining the correlation of time and space. Thus, it is necessary to pause in two key aspects in architecture: “norm images” and architecture as a visual discipline.

The necessity for objectiveness in architecture brought the need for invention of a mathematical and image infrastructure to represent the real physical world and events taking place. Such objectiveness were represented in architectural drawings, by which architects were capable to develop a design proposal in order to communicate their concepts with others, for the assistance of the construction process, or even creating a record of existing buildings. These drawings are a set of conventions, which provide “norm images”. The term “norm images” is related to the ability to see specific images and to process them as architects, painters, designers. In addition, an architectural language is defined, which determines a fixed relationship between sign and meaning, both applied to a corresponding object. In the case of architectural drawings, figures allude to specific architectural elements, which is actually absence in real world. As a result, this figure represents a thing in its absence and architecture proposes an alternative of syntactic interpretation of the concept of place and object. This language is determined by pragmatic, constructive and technical requirements.

According to (Barthes, 1977), regarding the meaning of sign in architecture, two planes exist related with the signification and signs, which correspond with “the plane of expression” and “the plane of content”. When these two are alternated, a sign obtains the meaning of connotation, which this last is “a system whose plane of expression is itself constituted by a signifying system”. (Barthes, 1977) When we are presented with an architectural image, we read an external expression, which is based on figurative and associative meanings defined as a “social contract”, norms, which provides us knowledge by a previous expectation. Such thing is related with the visual and the consciousness capacity to associate similar objects as a unitary object.

As (Arenheim, 1974) states, perception is associated with building of cognition, as a direct link of perception with thought. On the other hand, how it is perceived is designated by history. History of the discipline of architecture structures how it is perceived, defining a “normalized” perception for each of the historical period. As a result, each of the architectural styles provides specific representational images, which represent different norm images and perceptual knowledge. Drawings are a key source of understanding, interpreting architecture and the architectural perceptual experience of a specific period.

## **2.2. Representations in Architecture**

Throughout history it has been observed that humanity has considered the sense of vision as one of the most reliable senses for obtaining knowledge from the outside; as a consequence, leaving aside the importance of other sensorial modalities for perceiving the surrounding environment and the tendency for creating a hierarchy of senses according to their importance. The term ocular-centrism is used to express the tendency of the sense of vision to be considered as the most privileged from other sensorial modalities. Most of the knowledge from the built environment is gathered from vision due to the high number of rods, cones and nerves, which send impulses to the areas of the brain responsible for vision. As a result, we tend to rely to this sensorial modality and forget about the importance of other senses in perception of the context. This evaluation and hirearchization started from the beginning of humanity, exactly with the process of rising on two legs, where vision replaced the sense of smell, which was broadly used due its proactivity for surviving purposes. Such transformation in human being was considered as the basis steps of human civilization.

During the Classical Greek period, eyesight was considered as the noblest sense, by which the truth and knowledge was obtained. Such attitude was present on the writings of several Greek philosophers, such as Heraclitus, which in 500 BC, wrote: “The eyes are more exact witnesses than the ears.” (Levin, 1993). The sense of vision is not only suggested to be the most privileged sense, but also the supremacy to other sensorial modes. Aristotle in “*Metaphysics*” suggests the necessity of vision to obtain knowledge:

*“All men naturally desire knowledge. An indication of this is our esteem for the senses, for apart from their use we esteem them, for their own sake, and most of all the senses of sight. Not only with a view to action, but even when no action is contemplated we prefer sight, generally speaking to all senses. The reason of this is that of all senses sight best help us to know things.”* (Sir William Hamilton, 1859)

According to Aristotle, sight was appraised as one of the most virtuous of the senses “because it approximates the intellect most closely by virtue of the relative immateriality of its knowing.” (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2005). A considerable amount of knowledge is obtained from visual inputs due to the direct nature of information acquired from sight, and as a result, there is a tendency of ignoring other more indirect sensorial inputs. This propensity proves the ideology in human beings that eyes are the most reliable information source from the outside world. Such discussion continued with the Plato’s writings, which mentioned that sight was considered as the sensorial mode by which could be obtained the clearest knowledge since we perceive the principles of order and harmony found from the universe and nature. This ideology is found also reflected in sculpture, with the idealization of the body in the representation of perfection and harmony through a visual-cognitive approach.

The concern for visual perfection was also present in architecture since the Classical Greek period. The built forms had to be seen in the perfect sizes and features without the deformity caused from perspective views. Therefore, in the design and build process, they applied optical correction actions to refine the perspective images. Firstly, these actions were taken in urban level, whereas the relation to the context and nature was basic for the perfect built form, following the relief curves or using it to attract visual attention to specific objects, such as temples. The perfect example to illustrate this approach is Acropolis, which was positioned on top of the hill and surrounded by the city of Athens. This is as well present in the ensemble of Delphi, which is developed in terraces as a consequence of following the relief. From the writings of Doxiadis, in “*Architectural Space in Ancient Greek*”, vision was defined as the main element to build the ensemble of Acropolis, were it is observed the presence of analysis in two point perspective, along with the study of visual angles and sight distances.

*“The radii that determined the comers of the important buildings formed certain specific angles from the viewpoint, equal in size on each site. These fell into two categories: angles of 30°, 60°, 90°, 120°, and 150°, corresponding to a division of the total field of 360° into twelve parts; and angles of 36°, 72°, 108°, and 144°, which resulted from division of the total field of vision into ten parts.”* (Doxiadis, 1972)





perfect from different views of the context. In Parthenon, several manipulations were made in the columns and entablature, which were placed following the curvature of the stylobate that followed the terrain. This gave possibility to the objects to appear straight in perspective view and to avoid visual deformation. Furthermore, such manipulations were made in the space between columns, which were positioned in different distances in order to appear as equal in dimension and size from distant views.

*“All the members which are to be above the capitals of the columns, that is, architraves, friezes, coronae, tympana, gables, and acroteria, should be inclined to the front a twelfth part of their own height, for the reason that when we stand in front of them, if two lines are drawn from the eye, one reaching to the bottom of the building and the other to the top, that which reaches to the top will be the longer. Hence, as the line of sight to the upper part is the longer, it makes that part look as if it were leaning back. But when the members are inclined to the front, as described above, they will seem to the beholder to be plumb and perpendicular.”* (Vitruvius, VITRUVIUS The Ten Books on Architecture, 1960)

Such optical manipulations reflect the great concern of Greek culture for visual perfection and the presence of an approach towards ocular-centrism. These optical operations were obtained by considering human vision as a “pyramid” system which meant that the visual rays sent out by the eye were of a pyramid shape. “Visual pyramid” was part of the geometrical perceptual theories of Euclidian Greek School, which were crucial in perspective, during the Renaissance.

Later philosophers, such as Roger Bacon, supported Aristotle thoughts and approach to sight as the main perceptual mean by which the absolute truth of the universe was obtained. In Bacon’s theory, vision was not only considered as the most practical and authentic tool, but also it denied the importance of other senses in perceiving the world. “A blind man may find out by experience nothing that is worthy in this world.” (Summers, 1987) Following the theory, vision not only was considered as the basic means of knowledge, but also the perceptual world of a blind person was considered as a being that could not complete tasks due to the absence of sight. Such approach continued even in Renaissance period, which also lead to the reinvention of linear perspective principles by Filippo Brunelleschi, invented during the Classical Greek period, but was lost in the Middle Age.

*“Throughout Renaissance Europe the general opinion was that the eyes provided the most direct knowledge of things, based on the most distinctions and widest range; in functional terms, they were organs of power, liveliness, speed, and accuracy. Of all the senses, said the rhetoric expert Thomas Wilson, the eye sight is most quick and conteineth the impression of things more assuredly.”* (Clark, 2007)

Architectural representations may be categorized in several important periods, which correspond to different “normalized” perception phases and different visual subcultures in the discipline of architecture. Through these phases it is understood the focus of interest in architectural representations as a reflection of perceptual knowledge of the time. The key historical turns in architectural representations reflect how “normalized” perception changes and influenced by history, society, culture and technology.

The first historical point is related with linear perspective, whose practical inventor is considered Brunelleschi, which was firstly interpreted by Alberti. The interest of this period was to define mathematical visual regularities, where its main principle is the position and the character of the viewpoint of the perceiver, which corresponded with a monocular vision and not binocular. As a result, these perspectives expressed an isotropic and uniform space in order to achieve geometrical perfection and appeared to deal with problems of depth by presenting geometrical shapes deformed from perspectival projection. “The square becomes a lozenge, the circle an oval.” (Merleau-Ponty & Smith, *The Merleau-Ponty Aesthetics Reader: Philosophy and Painting*, 1993)

Architectural representation during this regime was of complicated and rational geometries. This was a reflection of the thinking of that time, where geometry was the delineation of the order of the universe. Such thinking was applied on perspective, which was a geometrical system which converged in a single or more vanishing points. Through these principles, it was possible to generate two-dimensional drawings, by creating illusions of three-dimensional spaces with the perspective centre conceiting with the eye of the beholder.

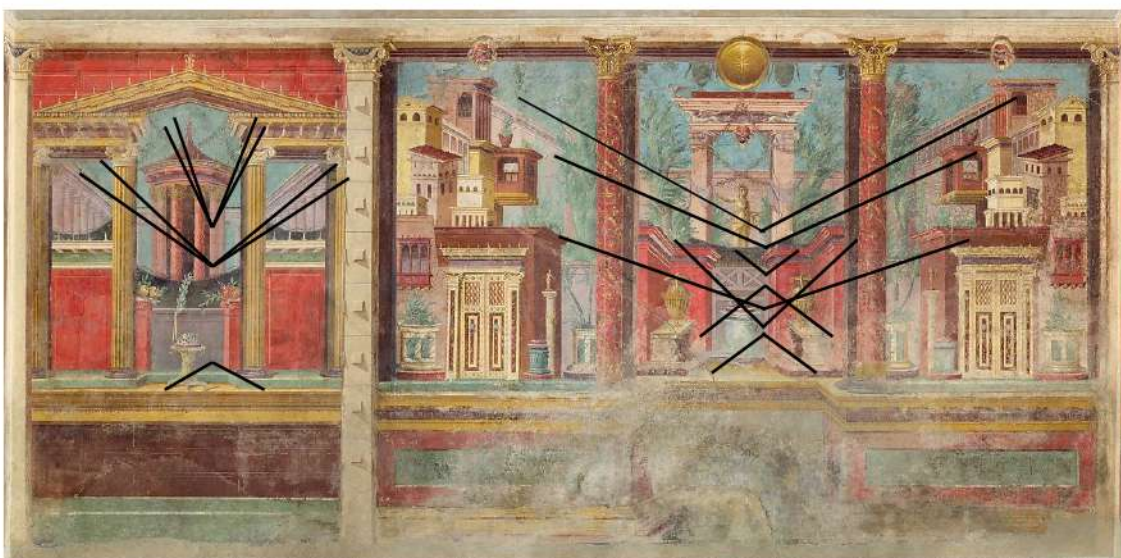


Figure 4 – “Cubiculum (bedroom) from the Villa of P. Fannius Synistor at Boscoreale” in the Metropolitan Art Museum, New York

Such form of painting in actual architectural elements, known as “Quadratura”, evolved. However; perspective appeared during Renaissance, as a new form for representing spaces and buildings. It emerged as a new creation for the visual world and the visual viewpoint was positioned in the centre of the painting. Brunelleschi conducted a series of experiments between the years 1415-1420 for achieving drawings with an accurate perspective. Such experiments were done through an instrument that he achieved to invent, which consisted of a wooden panel, with a hole where the eye was positioned, and a mirror, which copied what was seen square by square.

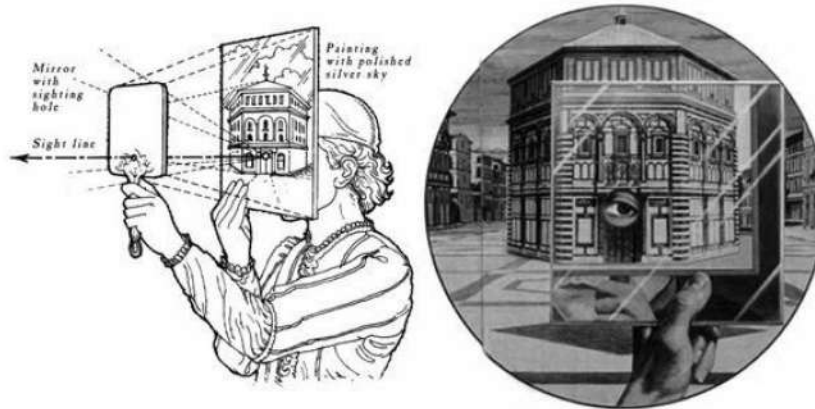


Figure 5 – Brunelleschi’s Perspective Wooden Panel

Strict laws of representation were implied, which resulted by constant efforts for finding the perfect perspectival model. Such effort sometimes was pushed to the extreme, such as through the technique of “Anamorphosis”. By this method a distorted image was produced from one point of view, while on other angles it disappeared and was not visible.

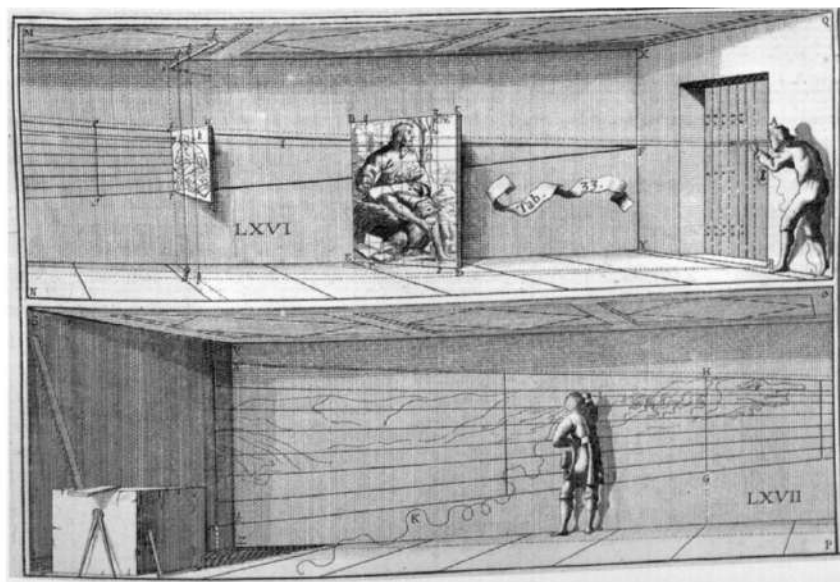


Figure 6 - "Anamorphosis" Method

The perspectival thinking during this period, although some of which remained the basis for architectural representation nowadays, had a tendency of distancing the viewer from



representation are the “Imaginary Prisons” drawn by Piranesi. The drawings represent architectural perceptual knowledge of the time and a visual representation of the reality of existing spaces. The images are based on the imagination of Piranesi but represent real space through the appearance of the building structure. The aim of these images was to provide a set of perceptual experiences through a set of scenes, which provided atmospheric situations through the use of a set of vanishing points and contrasting tonal shadows. In this case, the exact knowledge of space is not the focus, but providing the theatrical spatial experience of architecture. The metaphysical implication of light and the narrative function of spaces became the key aspects for representing architectural spatial conditions. As a result, atmosphere became an important theme in architecture, which mainly appeared as obscured by atmospheric factors and not clear visible objects.



Figure 8 - The Gothic Arch, from *Carceri d'invenzione* (Imaginary Prisons), ca. 1749-50; Designed by Giovanni Battista Piranesi (Italian, 1720–1778) Source: <https://www.cooperhewitt.org/>

After this period, a turn in geometric perfection occurred, especially during Cartesian perspective. Such perfection was reflected on the method used for producing architecture, involving the use of the orthogonal grid. Such method provided spatial configurations through modular units, as an approach to geometric perfection and precision.

Subsequently, precision of spatial geometry became the focus for architectural representations. This coincides with the required precision, especially on benefit of the wars of the time. One point perspective could not provide such preciseness as it did not

show the entire object or space. Some partitions of space disappeared due to the angular viewpoint. As a result, the axonometric and orthogonal projections appeared with an accurate sense of depth, providing more details concerning spatial geometry. During this period, perspective and orthographic drawings were invented as forms of representations in architecture, along with several inventions of instruments for the application of different representational methods. As a result, descriptive geometry was developed by Gaspard Monge, as a method in geometry which remains as the main method in use for visual representations not only to architecture but other related disciplines, such as engineering and design.

A different approach to precise geometry evolved during “Pop Culture” period in art that affected architectural thinking and theories. During this period the attention shifted from precise geometry to architectural theory and interpretation, producing a set of architectural representative methods, such as collage or montage, which were appropriate for expressing phenomenological interpretations of spatial configuration and perceptual experiences. The avant-garde era in the 60’s brought utopian ideas through perspectives or exaggerated scenes, which represented an ideology out of reality. In modern eras this type of approach has carried on along with the advance of technologies. The use of computer and CAD (Computer Aided Design) were a necessity for architectural representation and ease the feasibility of the ideas. Furthermore, it applies accuracy to the design process as a necessity in the architectural discipline to provide time efficiency and management of large scale drawing. Computer became the new tool to create architectural projects and images. In addition, 3D modelling programs were developed as the successors of perspective to understand and investigate architectural buildings. These technological developments provided more accuracy than sketches and better time management. However, they emphasize the supremacy of vision in architectural discipline. Selwyn Goldsmith defines these types of spaces as “architecturally disabled”, which tend to be less friendly and not accessible leading to “distorted spaces”. Vision is no longer the method for obtaining knowledge and freedom but a technology complicit with domination. What we should do to obtain the full experience from environments is to be “silent” and “listen”.

Nonetheless the computer is an important tool; it tends to create a distance between the creator and the object. Firstly, because the type of information it offers is not enough to perceive and to sense the environment; and secondly, the design process becomes a visual manipulation through realistic renderings. CAD development was followed with the production of architectural renderings that became the main instrument to be understood by the client, since they deal with the final image and atmosphere of the architectural creation, which are translated in images where the building is no longer the centre of

attention but the given situations, which are detached from reality. "The hyperreal world of stimulations means we have become seduced by images that are signs of nothing but themselves" (Baudrillard, 1994) Since architectural spaces tend to be seen as objects rather than spaces, building elements might be smaller or bigger when built because of the absence of human proportion, which by the use of computer causes a loss of scale during the design process. The intimacy level between the architect and the building during this process is lost through the intermediation of computer. Later on, construction engineer creates from his point of view an imaginative architectural object, through a visual, physical and tactile process. In the end, the architectural final product becomes different from what presented. Therefore, there is a distance between the concept and what is perceived further on, leading to a contradictory building.

There is a tendency in architecture of applying Virtual Reality (VR). It is a necessary tool in order to investigate architectural ideas, such as the relation to light, the human scale compared to architectural elements. Nevertheless, it remains a tool that facilitates the mental processing during the design phase. Furthermore, it is a tool that privileges sight and kills imagination. According to Pallasmaa the sense of "aura", the authority of presence, has been lost. These tends to brand the building by creating perfect manipulated images of a building that might be unlikely real, where the attention is brought to the surrounding environment and the context is represented with people doing improbable activities or giving non-realistic context characteristics. In the end, this sort of manipulation functions as a branding of the building itself and the client is fascinated by it. This is a great danger for architectural practice, since this type of design process results in a limited architectural creation focusing on visual information and ocular-centric in nature, precisely focusing on form and aesthetics of architectural objects.

Nevertheless, development of Computer Aided Design has provided the possibility for architects to find new means of generating architectural ideas and representations. Bernard Tschumi developed a set of experimental architectural representations created by a set of photographs and schemas, which represented a narrative technique of the juxtaposition of object-movement-event. His attempt was to obtain a more objective analysis of architectural program and events, resulting with an architectural interpretation of the reality through a set of architectural stages. Four are the main architectural sets he introduces, where are given e set of events by the interaction of people with architectural objects through their movements. "Alternation of perceptions caused by the fall is used to explore various spatial transformation and their typology distortions." (Tschumi B. , *The Manhattan Transcripts*, 1981)

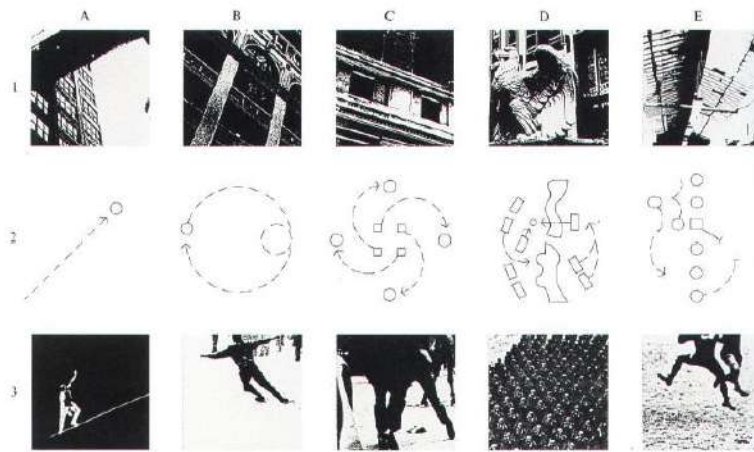


Figure 9 - MT 4 (The Block). "Five courtyards of a city block with contradictory events and programmatic impossibilities". (Tschumi B. , *The Manhattan Transcripts*, 1981)

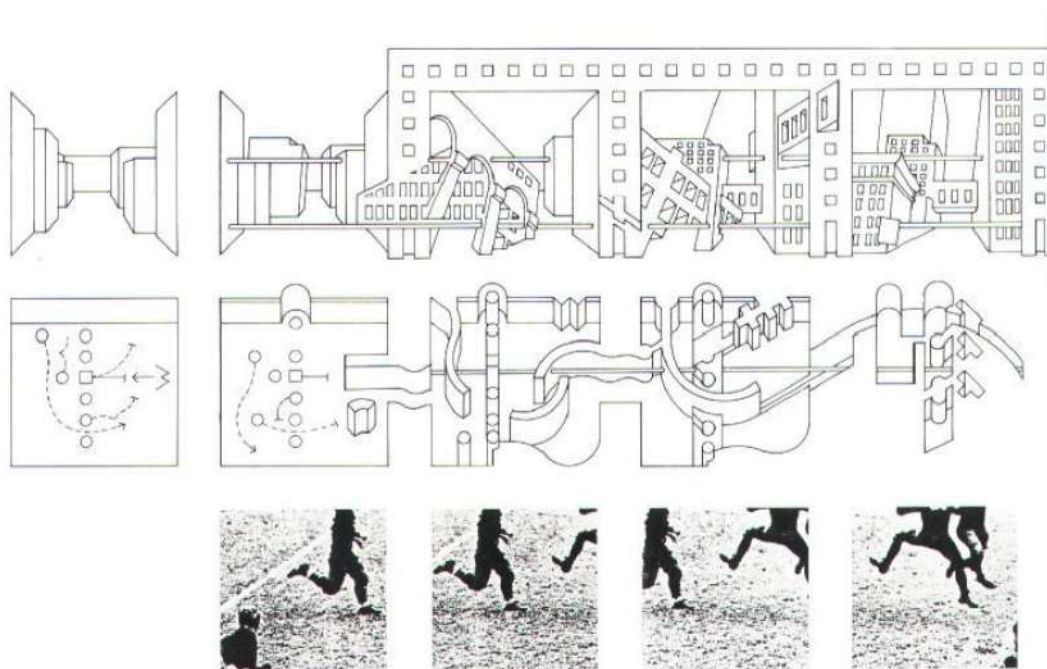


Figure 10 - MT 4 (The Block). Object + Movement + Event (Tschumi B. , *The Manhattan Transcripts*, 1981)



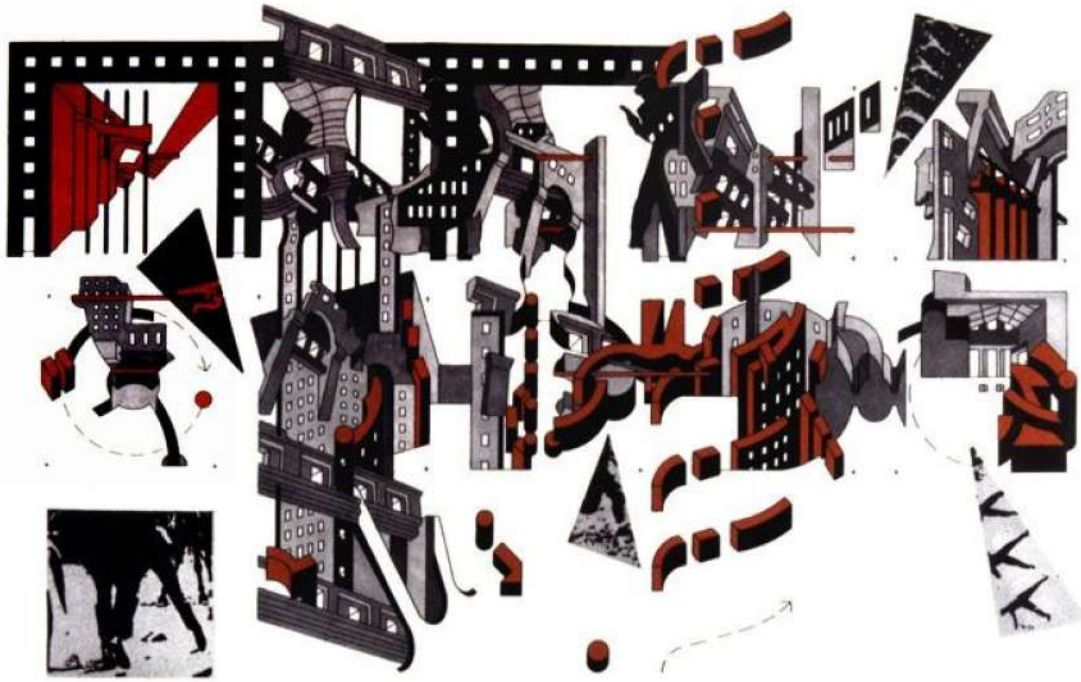


Figure 11 - Object + Movement + Event (Tschumi B. , The Manhattan Transcripts, 1981)

Through this experimental analysis Tschumi developed an architectural representation different from the “normalized” representation, showing that architectural representation are more than visual static images effective only for the final stage of design. These representations should be dynamic, represent users’ action and provide the interpretation of the immeasurable aspects of design, in order to serve as a tool of architectural design and reflect the process of architectural thinking, which promotes spaces of sensorial and embodied interactions.

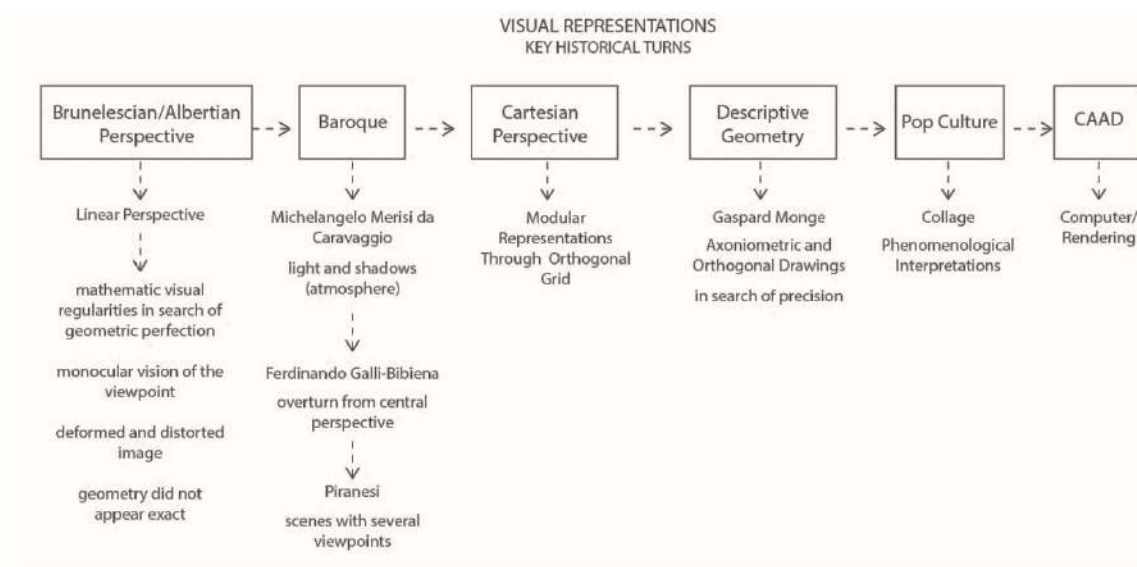


Table 1 - Visual Representations in Architecture, Key Historical Turns

### 2.3. Hegemony of Vision

During Modernism and Postmodernism, the hegemony of vision challenged even the architects that supported phenomenological aspects in architecture. The historical background of ocular-centrism provides knowledge for the start of this paradigm in the western architectural discipline. This paradigm has brought many discussions, especially in different disciplines, emphasizing the discussion about the hierarchy of senses or even leading to the suspicion of vision's hegemonic role. The start of the denigration of vision or the disbelief of eye is related with wars, periods of relating vision with the frightening visual reality produced by war and the insecurity of vision for defining the "invisible" enemy, including "camouflage".

Several theories were introduced, which did not consider vision as the supremacy of senses. Derrida considered ocular-centrism not a problem of hierarchy or competition of senses, but a problem of the dominance concerning the directness of the contact that all senses provide. This means that vision itself involves touching, which does not mean the supremacy of touching to vision, but involves the immediacy of intuition and contact. Through this theory, he considered as vision and touching as having an authority over other senses, bringing also the term "haptocentrism". However his discussion emphasized the hierarchization of senses concerning their power or dominance level.

As one of the first philosophers that criticized Plato's theories about the hegemony of vision, Nietzsche considered vision as the modality that did not provide the truth of the reality, since what we see is selective and more driven by the emotions or state of mind:

*"All seeing is essentially perspective, and so is all knowing. The more emotions we allow to speak in a given matter, the more different eyes we can put on in order to view a given spectacle, the more complete will be our conception of it, the greater our "objectivity"."*  
(J.Wininger, 1997).

Ocular-centrism was also a result of the hierarchization of senses especially in philosophical discussions. For instance, Hegel categorised senses according to their importance and function in two main categories, such as *primary senses* and *secondary senses*. *Primary senses* were considered those located in the forehead, such eyes and ears and were considered part of the spiritual sphere. While secondary senses, mouth, nose and chin, as part of the animal sphere, considered as senses that were related mostly with the instinctive behaviour of human being. In addition to this categorization, he considered the inclusion of another category, the vegetable sphere, which was represented by hair. On the other hand, Nietzsche denied the hierarchization of the senses by attacking ocular-centrism, but considered mostly the exploration of the independence of each sensorial modality. This independence is important but the most

important aspect in the case of architecture for providing a synaesthesia between all sensorial means.

However, in architecture there was a turn in ocular-centrism due to technological developments and digitalization in architectural techniques. These technological productions tend to lead the focus of attention to vision or rather define architecture through mathematical laws, numbers and symbols. Furthermore, frequently, built forms are designed with the primacy of visual appreciation.

*“Even for architects who believe in the significance of fragmentation and complex geometries, computers have contributed next to nothing toward deconstructing the hegemony of panoptic space and proposing a more meaningful and participatory urban space.”* (Pérez-Gómez & Pelletier, 1997)

Pallasmaa uses the term “narcissist eye” in accordance with ocular-centrism, as a term to express the main pathology in today’s architecture as a tendency of turning architecture in visual images and icons rather than focusing on stimulations for enriching the architectural experience. The “narcissist” eye is mentally and sensorially detached due to concentrating in self-experience. Architects tend to design buildings with the aesthetic concern in mind, following the technological developments. According to Perez-Gomez, this concern is seen as “the symptom of alienation of the world and man in the act of consumption and enjoyment.” (Nevlyutov, 2018) Furthermore, this phenomenon happens because architecture is expressed through drawings or images, resulting on the concern of becoming a visual discipline while being evaluated visually, following the risk that the image remains a visual information more than content and expression. The concern for the visual design of the project, the outside appearance of a building or the production of visual renderings that represent another dimension of the reality demonstrate that architectural image has obtained an ocular-centric approach in the present days.

*“Concept is divorced from percept, and thought moves among abstractions. Our eyes have been reduced to instruments with which to identify and to measure; hence we suffer a paucity of ideas that can be expressed in images and incapacity to discover meaning in what we see. Naturally we feel lost in the presence of objects that make sense only to undiluted vision and we seek refuge in the more familiar medium of words.”* (Arenheim, 1974)

Architects to design precisely and present their works to the clients use perspective drawings, photography and architectural renderings. These representations tend to create misconception of the perceptive reality in several aspects. Even if it is very necessary to find means for representing architecture, there is a great danger for the use of perspective to alter the way we perceive the world and reality. The perspective and projecting drawings give a reality frozen in space and time in symmetric lines. It may alter the way

we perceive the environment and alter our worldview. Perspectives tend to give realistic images of the environment with many details leading to perfectionism. These idealistic scenarios direct the viewer to ocular information and occluding imagination and creativity. This is probably why conceptual diagrams give the basic idea of a project and gives the opportunity to the viewer to interpret the information from his/her perspective.

People are predisposed to consider themselves as “visual beings” as they have difficulties in imagining the world around them without visual cues. Furthermore, there is a tendency of technology to transform human perceptual capability. For instance, “Eye Force VR”, is a headset that allows human to see with 210 degree of the visual field, which actually in human beings is between 94 to 110 degrees. This is something beyond human independent perception capacity and cannot be considered as extension of the human body but an accessory that tends to deform the perceptual human experience, which goes beyond the visual field’s capacity. Similarly to the case of the linear perspective that considered the viewpoint as one eye and not two, or the invention of devices such as telescope, microscope. Such inventions may be considered as efforts of expanding our visual capacities or as manners of substituting or compensating the imperfections of our visual experience.

Visual information is insufficient to perceive space and objects. It is the information we obtain from all the sensorial modalities and body consciousness that allows us to perceive and also create spaces. How the space sounds, or smells or the temperature that is created by light should be used in architectural practice in order to produce embodied environments. The process of creating architecture for the architect should not be not only a visual concern of the aesthetic of space, but how to create spaces of human events.

Following the concern of architecture considered as a visual approach, Juhani Pallasmaa considered as sensorial deprivation spaces those spaces that were conceived by the “industrial mass production of images for depriving architecture of emotional involvement and identification”. (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2005)

*“Our current obsession with the seductive visual image in all areas of contemporary life, promotes a retinal architecture, which is deliberately conceived to be circulated and appreciated as instant and striking photographed images, rather than being experienced slowly in an embodied manner through a physical and full spatial encounter.”* (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2005)

According to him, such phenomenon is more concerning in the case of residential spaces that are presented in images as void spaces with lack of atmosphere and human interaction. As a result, these images deprive other sensorial meanings while concentrating on visual input only. Reducing to only one sense spatial experience is

limited. In such case, deprivation space obtains another meaning, where the architect's role is to provide interaction with other sensorial modalities through architecture. From Pallasmas's perspective, spaces designed without the consideration of sensoriality and emotional aspects are considered as deprivation spaces.

In a perceptual experience, two are the important aspects: "openness and awareness" (Glendinning & Gaynesford, 1998). The first concept, openness, is related to mind-independence and presence, which leads to the understanding that perception is a process of opening to the outside world and creating assumptions of the perceived object through a previous knowledge and as a result, obtain immediate perceptual experiences.<sup>1</sup> Meanwhile, through awareness, perception is understood as a conscious state, which involves experiences<sup>2</sup>. The main functions of attention are to orient sensorial activity, to detect signals in conscious processes and to be vigilant. Through attention it is made possible the selection only of a limited amount of information, facilitating the perceptual process of the selected stimuli. Not all the stimuli receives the same level of attention, which makes one of the problems of the cognitive system of a human being. Such thing is defined as task-defined attention because it refers solely to the performance task. The process of task selection could be under voluntary control and automatic control. For instance, searching for a specific object and ignoring others is a voluntary act that depends on the subject necessity; and reacting to a sudden light signal represents the case of an involuntary action. Attention is necessary in cases when mental processes are not capable to manage the overload of stimuli presented. When we perceive there is always a background and a foreground. Depending on the level of awareness, the perceiver selects the objects of interest and narrows the field of perception while the other field is non-existent. Based on this fact, the shift of attention selects what is "visible" and "invisible".

<sup>1</sup> "We never ... originally and really perceive a throng of sensations, e.g., tones and noises, in the appearance of things...; rather, we hear the storm whistling in the chimney, we hear the three-engine aeroplane, we hear the Mercedes in immediate distinction from the Volkswagen. Much closer to us than any sensations are the things themselves. We hear the door slam in the house, and never hear acoustic sensations or mere sounds." (Heidegger, Martin Heidegger: Basic Writings , 1977)

<sup>2</sup> "Attention is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others." (James, 1890)

*“Phenomenology develops a complex account of temporal awareness (within the stream of consciousness), spatial awareness (notably in perception), attention (distinguishing focal and marginal or “horizontal awareness), awareness of one’s own experience (self-consciousness, in one sense), self-awareness, the self in different roles (as thinking, acting), embodied action (more or less explicit), awareness of other persons (empathy, inter-subjectivity, collectivity), linguistic activity(meaning, communication), social interaction (collective action) and everyday activity in our surrounding life (in a particular culture).”* (Dennett, 1993)

From these arguments, the process of perception integrates presence and absence at the same time. It seems to be dependent from the mental images created from previous experiences, level of attention and not all that we perceive is the reality but it represents individual realities. As a result, perception is not only the result of impulses in sense organs provided by the surrounding objects as they are presented in their truth, but a change in consciousness, resulting with a personal expectation. Such process is present in the case when an architect perceives architectural drawings, which are derived as a representational technique of three-dimensional objects on a two dimensional system in coordinates x, y, z, which is actually an abstraction independent from the actual world. According to Ignacio Araujo (Araujo, 1976) “an architect learns how to look when drawing”. By the process of drawing, the architect objectifies volumes, materials through hierarchizing with corresponding strokes of lines that correlate with reality; and through symbols, which can be considered as “figural factors”. As a result, an architectural building is presented in plans, facades, sections, by which an architect is used to perceive and imagine space. In this case, the nature of what is perceived is a norm to the architect, as a perceptual process which is postulated and considered as a “normal” perception, which is actually visual in nature. Even when we are presented to a space, the expectation about the perceptual experience tends to be affected by our previous knowledge and experience, which tends to be visual, because a considerable amount of information from the environment is obtained through vision. According to Damasio, there are two components of this consciousness: *core-consciousness*, which is “our moment-to-moment attention in the act of knowing something and *extended consciousness*, which begins with the core consciousness and incorporates memory.” (Damasio, *The Feeling of what Happens: Body and Emotion in the Making of Consciousness*, 1999) Related with the architectural experience, (Edelman & Tononi, 2013) mentioned two necessary concepts in spatial perception concerning the levels of consciousness: *primary consciousness* (“*sensory consciousness*”), which is simple awareness of sensations, perception, emotions and mental images and *the higher-order consciousness* (“*conscious of being conscious*”) which includes self-reflective and abstract thinking. When entering a space, mental images are created as a result of previous information in the memory system. In

this space, only some of the objects obtain our attention. This is due to personal “value system”, which is a system that is defined individually from intense past events that influenced the neural activity of the brain and therefore, changed its plasticity. In this form, a connection of past and present is created, which is personal to each perceiver. The value system that is created as a result to these interactions defines the higher-order consciousness. Most of these conscious scenes are visual in nature in a sighted person; as a result, architectural spaces are created with these experiences in mind, which is considered as “normal” perception. Such tendency of thinking of architecture as visual, the attention is focused on visual images, preventing being conscious to other sense-data<sup>3</sup>.

In perceptual psychology, the way human being perceives and experiences the world under the condition of sensory deprivation was a major interest. Sensory deprivation is the reduction of one or more senses and the removal of one or more sensorial input. By being deprived from sensorial input, perception is limited through the sensorial modes left and the person finds modes through mental processes to gather the information needed for interacting with the environment. This might lead in different effects in human’s psychology and as a result, affecting his behaviour. Such phenomenon is due to the different perceptual mode the perceiver experiences, which is different from the rules of the perceptual mode the person is taught to experience, which is visually directed.

### **2.3.1. Sensorial Deprivation Spaces**

Various experiments were conducted by psychologists in collaboration with artists and architects, in order to understand the importance of our sensorial modes for understanding the living environment and the psychological effects in human under restrained stimuli condition. Such experiments emphasize the linkage of atmosphere with sensorial intensities, their indication in spatial navigation, relation of space and time, relation to gravity, bodily awareness, and psychological and physiological interrelations. It is important to understand how the world is perceived under sensory deprivation, which is the contrary of “normalized” perception, causing different levels of consciousness and knowing new human perceptual capacities. This information may provide a different

<sup>3</sup> *Physical or non-physical stimuli are “sense data” or “sense datum”. This information is given to the perceptual experience but does not say anything about the nature of the object perceived. “When you walk into a café, the smell of the coffee, the redness of the awning, and the heat from the radiator are all examples of sense-data. Sense-data are the mental images (visual as well as auditory, olfactory, tactile, and gustatory) we receive from a given object in the physical world. The same object can produce variable sense-data.” (Russell, 1998).*

knowledge for understanding and creating spaces.

Following this argument, psychological behaviourism experimented through aesthetic works the subjective nature of perception and the altered state of consciousness. This was a subject of interest for various artists and architects in order to deal with a different manner of presenting an experience to the user, rather than the typical visual information given by their discipline. James Turrell, attempted to provide a different sort of perception, which is different from the considered “normalized” perception, creating a state of destabilisation. In collaboration with Robert Irwin and Ed Wortz, they created the anechoic chamber, which is a closed space without light and enclosed by sound and electromagnetic waves absorbing material. They repeatedly conducted experiments in this type of space emphasizing Irwin’s argument that “it is crucial to remove everything from the visual frame of an art work and instead to position the viewer at its core, so that he / she could experience all the marvel inherent in our perceiving of ourselves.” (Casavecchia, 2013) In this visually deprived space, where there is no echo, the visitor would feel the heartbeat, blood flow and even capable of experiencing hallucinations of lights. Such experience leads the perceiver in a full awareness of owning a body, hearing loudly the body functioning; and leads to an incapability of standing or walking. Such phenomenon happens since for human beings it is difficult to remain conscious without being overloaded with sensorial stimuli. Furthermore, the sensorial input obtained is persuaded by visual stimuli, as the mode by which is obtained an intense amount of information. Going out from this sensory deprived room alters the way of perceiving, by taking the information in a different level. The aim of the anechoic chamber was to find how a perceptual space affects the state of mind through giving a mediating state controlling alpha waves of the brain, which their cycle puts the perceiver in a meditation state.

A similar condition of perceptual deprivation is the “Ganzfeld” effect, which is caused by depriving the visual input and by obtaining only auditory information through the amplification of neural noises, which are interpreted from the visual cortex and leading to hallucinations and an altered sense of consciousness. This effect is also obtained by visual information of one uniform field of colour, which results in seeing black, very close to blindness. Similarly, James Turrell’s works are mostly related to the concepts of visual deprivation through the use of light and colours. Some of his installations, such as *Wedgework, New Dimensions* (2016), is a corridor in form of a maze with black light which makes it difficult to access or exit, and leading to other rooms with intense light of colours. The only information remains light which give a sense to the space and remain the only information to perceive, giving an altered conscious space. The use of darkness is not coincidental. Being exposed to light, photopic vision occurs (from cones of the



retina), while exposed in darkness is made possible by scotopic vision (rods). When the shift between lightness and darkness occurs, human vision becomes colour blind and in darkness other senses are stimulated and along body awareness. Furthermore, through these manipulations, the perceiver becomes blind from other characteristics of space, and everything is removed from the visual frame, except from the focused information given.



Figure 12 - James Turrell's Works (Turrell, 2021)

James Turrell created a series of autonomous structures, focused on the process of seeing through natural or artificial light, by creating a connection of the inside empty spaces with the sky or providing only artificial coloured light inside the structures. The displace of visual attention in relation to light and colour becomes the central perceptual focus of space. The power of light is not the focus but the physicality or materiality of light. His work is based on perceptual experience rather than on objects. By creating narratives through the use of light, it is given an understanding of how it shapes space. Furthermore, Turrell's work is a form of alerting the perceiver to the surrounding and shifting his/her attention to awareness, by giving an awareness to the process of "seeing". In the end, seeing is not only the process of light passing through the eye lens and creating a visual image, but is a series of visual fragments gathered and collected by the movement of eye pupils. Through the nature of this sort of new landscape, the subject is faced with the capacity of testing the limits of human perception by challenging his/her belief of reality in a space with no limits.

By affecting the perceiver's frames of mind perceptual destabilisation is caused. The means for achieving this, is by bringing the experience of light not through the illumination of objects, but by experiencing its own substance. Visual perception abandons physical objects and becomes haptic, by which the perceiver experiences the power of light through the atmosphere that occupies space. The use of light intensities, creating light atmosphere and dark spaces, provides different psychological states to a perceiver. Adaption in a dark space requires a time interval of 20 to 30 minutes or even one hour. This is an ability of the visual system to adjust in the dark, going from photopic to scotopic

vision. This adjustment results in the phenomena of “The Purkinje”, which is of high interest to Turrell. “The Purkinje” effect is a shift in human vision to a high sensitivity to the colour blue while adapting to dark spaces. As a result to this, the red colour will appear darker compared to other colours as light levels decrease. This is a phenomenon occurring during the transition of photopic (cone-based) and scotopic (rod-based) vision, precisely in mesopic state, which is characterised of dim intensities of light and other colours disappear. As a result to this, red light is often used to activate both photopic and scotopic vision in order to remain adjusted in dark spaces.



Figure 13 – “Purkinje” Effect, Source: <https://www.hisour.com/purkinje-effect-27153/>

To bring this effect to the perceivers, Turrell presents them with dark and quiet rooms with unknown boundaries, which is an experience that lasts 20 minutes to one hour, while presenting the perceiver with few information of light from time to time.

*“If you get up in the middle of a dark night and look at a blank wall, it will be very easy to observe the flickering and noisy appearance of the wall. Some of the noise is inherence in your system...But if the room is not absolutely and completely light-free, much of the noise is actually a manifestation of quantal fluctuations. When the intensity of light on the wall is just about at the threshold for seeing in the totally dark-adapted state, each rod in the retina absorbs an average about one quantum per hour since a flash is visible when about nine quantum are absorbed by nine rods within about 10’ of each other and within about 0,1sec, than a visual event should be expected about one every three seconds in each square degree of the wall.” (Adcock & Turrell, 1990)*

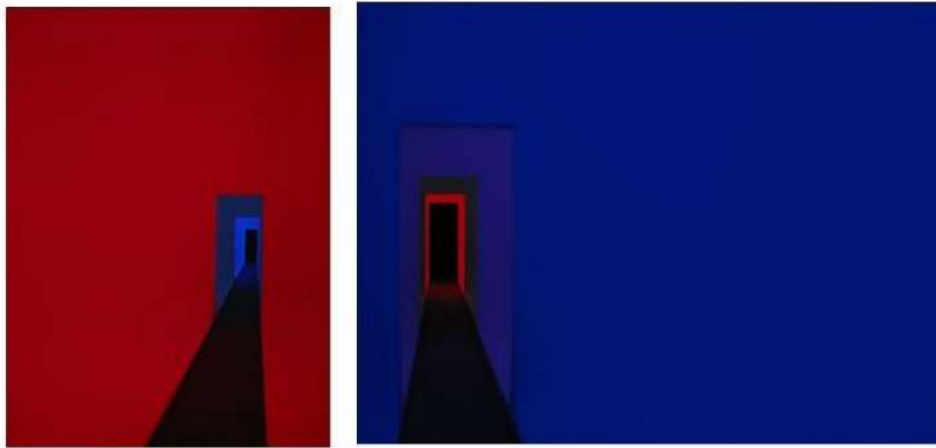


Figure 14 - James Turrell "Purkinje" Effect

Creating such atmosphere creates a Glanzfeld effect to the visitors, which is provided through using white plaster on walls, floors and ceilings and providing subtle light atmosphere and projected light across the spaces, which creates confusing guidance to the visitors by giving unclear perception of the boundaries of space. Such light projections are created through a quartz-halogen light machine and used xenon projections, which allow images to appear sharper and larger. For instance, in Ronin 1968, fluorescent bulb was positioned in the intersection of perpendicular walls, or cutting the borders of spaces to use them as light sources. The use of light gives the idea to the perceiver as if there are openings on the walls, while actually those are just walls. One of these manipulations is creating solids from light, which enhance the confusion of the perceptual experience. For some visitors this is confusing, leading to accidents due to the visitor's perceptual expectations. Many of the visitors crawled in spaces on hands and knees due to the insecurities caused by these effects. For some others light serves as a sequence of spatial information, as landmark for not getting lost. "It was a very quiet show; the work isn't hazardous. The intention is to change one's thinking about seeing. I'm not responsible for how someone else takes care of his or her sense of bodily awareness." Such confusion happens because people are not used to experience light, but illuminations on objects. Seeing light as pure source is an unusual experience. To Turrell light is associated with near-death experiences. People that describe such experience or experience it through a lucid dream they use the vocabulary of light or colours.

In Turrell's work, light is the key element for destabilizing perceptual experiences. Another important component for his works is the relation to the sky. The relation of sky and the perceiver becomes the focus for the experience in one of his biggest project, "The Roden Crater Project". The project was a production of a series of spaces in the American Desert as a Grant from Guggenheim Museum. The project was finished in 2020. The main

function of this complex is to experience a natural site and the presence of the sky. Turrell's art is about exploring limits of perception, which is actually a perception which is learned from childhood and prejudiced, making us unaware of the presence of physical things and phenomenon which are perceived in a taught way. The aim of Turrell was to point out the presence of the sky and cosmos, the way it actually exists. The project traces the path of the sun and the moon, which are those that define the location of functions. The cycle of geologic and celestial time is experienced in sequences, where each of the spaces offers different perceptual experiences.



Figure 15 - "The Roden Crater" by James Turrell (Bright, 2014)

Sensorial deprivation spaces can be found not only in art or architecture, as the last example, and can be achieved not necessarily only through visual or auditory perception but through challenging one's body capacity. For instance, a spacecraft is nothing more than a sensorial deprivation capsule where the sense of gravity and balance is missing and leads to discomfort to human but creates a different manner of understanding human body's capacity and its kinesphere<sup>4</sup>. In this case, the person becomes much more aware of its limits while gaining weightlessness. The bond of space and person becomes stronger, while he/she is more strongly related to space and its limits of exploration.

These types of spaces may be considered as disturbing, but actually these are to be considered as a revelation of a new way of thinking about space and body's capacities to perceive the "world picture" as defined by Heidegger in his essay "The Age of the World Picture" in 1938. According to Heidegger, the "world picture" coincides with the world

<sup>4</sup> The notion of kinesphere will be further elaborated in Chapter 3 – "Research Track".

formulated as a system revealed to the subject, where all of its components belong to each other, not a picture as imitation of things. When a human being experiences himself as “subiectum” the world becomes picture. By “subiectum”, it is understood that “man establishes himself as the measure of all measures with which whatever can count as certain.” (Heidegger, *The Age of the World Picture*, 2002)

*“As soon, however, as the gigantic, in planning, calculating, establishing, and securing, changes from the quantitative and becomes its own special quality, then the gigantic and seemingly completely calculable become, through this shift, incalculable. This incalculability becomes the invisible shadow cast over all things when man has become the subiectum and the world has become picture.”* (Heidegger, *The Age of the World Picture*, 2002)

“Philippe Rahm Architectes” created a prototype of a house *Domestic Astronomy* (2009) where the most important sensorial input becomes the “thermoceptive”. There is no detailed visual information to be perceived. Each of the composing elements of space does not have any colour or texture. The interior is created in such way that different heat zones are created inside the space, which are indicated by the source of artificial light, body and activities in specific areas. These serve as heat sources which determine the heat zones through radiation and convection. Furthermore, this effect is provided by elevating the furniture and by not having support from the floor. As a result, the lower space allows air circulation, which according to the laws of Archimedes, the hot air rises and the cold one descends. By assuring the lower area of the space is not full of obstacles, creates the possibilities to provide heat disperse throughout the room. This space not only provides experiencing atmosphere through passive touch, but also creates a sense of loss of gravity or balance control through visual input, due to the connection of the visual system with the vestibular system.

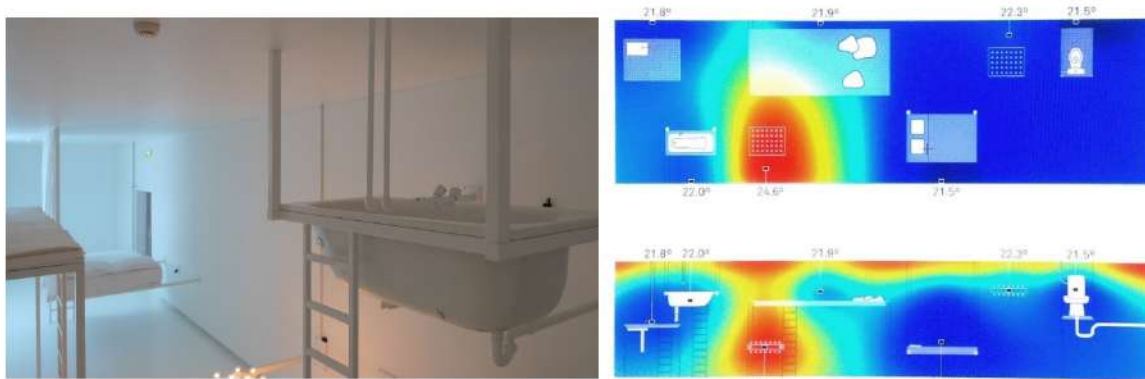


Figure 16 - Project "Domestic Astronomy" by Philippe Rahm Architectes (Rahm, 2009)

Furthermore, through the lack of information of the objects present in the room, the frame of “image” is not the visual, but the focus becomes the bodily sensation. This approach represents methods of designing interior spaces through shifting the subject’s attention

from the perceptual reality he/she is used to into a different reality. An environment that causes anxiety since it provides a new perceptual form he/she does not possess any knowledge of.

Considering the ability of such spaces to provide changes in the consciousness of the perceiver, leads to questioning the perceived world, without or with an altered sense of vision. Similarly, the experience of the visually impaired, which is a matter of sensorial deprivation, provides potential knowledge for understanding space from a different viewpoint. In this perspective, the perceptual experience and knowledge of “world image” of those lacking visual input can be considered as a form of a different knowledge of perceiving reality and as potentials coming from limitations of bodies experiencing the sensory realm. It is important to consider the capacities of all bodies’ activities to inform architectural design by intensifying the sensorial abilities of our bodies. The case of the visually impaired presents the diverse forms of sensing architectural spaces. It introduces to architects an altered state of experiencing space and time, which can be used by architects as potential knowledge for creating spaces that enhance body awareness.

#### **2.4. The Case of Carlos Mourão Pereira and Chris Downey**

Carlos Mourão Pereira and Chris Downey are both architects who lost vision, but continue their practice in the discipline of architecture. Their perceptual experience without vision is a reflection to their practice and the manner they consider architecture, towards multi-sensoriality and towards less ocular-centric through their design. Their architectural practice prove that architecture is not only a visual discipline, but there are different manners for obtaining architecture towards expression and experience.

*“Everyone assumes that architects draw and that it is a very visual profession. I tend to disagree. Architecture is first and foremost a creative endeavor. We think, we consider, we research, we study, and we take it into form via tools like drawing and modeling.”* (Downey, Architect Chris Downey Finds Second Sight, 2011)

Losing the sense of sight has changed Downey’s and Pereira’s perceptual experience, by becoming more conscious about other sensorial inputs and by considering their mind as more active while being in space. It is interesting that both architects have compared the state of becoming blind to childhood. On the other hand, childhood may be considered as the purest perceptual world and the most active level of interacting with space. Child’s experience of space and objects, according to Piaget, is considered different from adult’s experience, due to the nature of child’s consciousness, which is considered from the Piaget’s observations as “non-dualistic”. In other words, it means that a child “does not know much about the distinction between mind and body, self and others, inner and outer

world.” (Piaget, 1929) By interaction with objects and movement, he/she begins to recognize their properties and the relation of his/her body towards the objects. The experience of the world is depended to their body, as the main instrument to obtain knowledge. Location of other objects is egocentric, which means that is depended on the position of their own body. A child is an active user of space, while he/she starts to explore the surrounding through sensorial interaction. This is the reason why most of us are nostalgic to childhood spaces and obtain high detailed memories of them. John Ruskin refers to childhood as the “innocence eye” to define the power of perception in this stage of life as significant for one’s being-in-the-world. Furthermore, the “naïve” manner of perceiving gives place to development of fantasy. The most interactive sensorial mode is touch, by which they obtain a more direct contact with the world. Later, with the development of sight, they become more visual and obtain more detailed information through this sensorial mode. Later on, they are introduced with “normalized” perception, as a set of rules taught by the society.

Apart from being more active in terms of sensoriality, as part of the “non-dualistic” nature, “time and space form an inseparable world in child’s mind.” (Piaget, 1929) Coordinates of space and time are different from an adult. Nevertheless, time and space concept differ even for a blind person. Along with perception of space, time’s perception changes when a person loses sight. For this reason, spatial experience and knowledge of the blind, can serve as a form of expertise for rethinking architectural spatial experience.

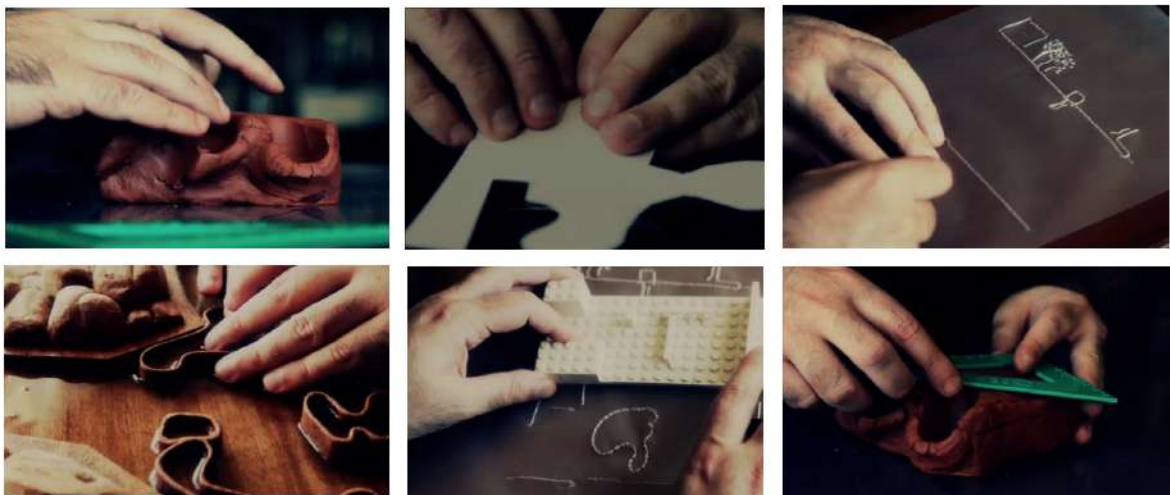


Figure 17 - Design Process of the Architect Carlos Mourão Pereira (Pereira)

Downey and Pereira have found their own methods of thinking and expressing architecture, which are multi-sensorial in nature, considering also vision, since they

already obtain a visual memory. Their method of creating architecture, especially in Pereira's case, requires a lot of tactile interaction, making physical models the main focus of their practice of thinking architecture. Pereira's technique includes creating holes on a special paper, creating a relief for understanding his sketches and creating models with cutting papers or using plasticine for creating much more complicated shapes. In addition, he uses legos for creating models and for having an idea about scale, since they permit him to attribute to each lego a metric value/module. He includes water on his models for creating a better idea of the context and understanding the relationship of the matter with water. Apart from his haptic experience, he also uses his visual memory to provide visual qualities to his works, such as using colours. In "The Sea Bathing Facility", which remains an unbuilt project, but it is necessary to take in consideration for the multi-sensorial qualities, in the way it is conceptualized with the involvement of all senses. It is designed in a natural context of the Atlantic Ocean, Paimogo Beach, which is a site that is exposed to winds but a more protective environment compared to other sites. A concrete wall serves as a barrier to the sea water and winds, providing barrier and along tactile interaction. The presence of water is acoustically felt and the presence of seaweed provides an olfactory experience. The itinerary would allow the perceiver to experience water in all these aspects, but also providing direct body contact to it through the presence of water tanks. Most of these design approaches are based on giving sensorial experiences to the users through architect's personal childhood memories and experience with the specific context. For instance, having previous visual memories, acoustic information provide him visual memories of ocean, apart from giving a sense of familiarity with the context.

Chris Downey, on the other hand, is more concerned in creating an appropriate way-finding system, multisensory in nature, for all the users, especially for the blind. The use of easily identifiable signage system and landmarks is important for creating an accessible and safe environment. Such as in the case of San Francisco's Lighthouse for the Blind, which was designed by Downey, the skylight in the staircase serves as a landmark, while the warmth of the light coming from the skylight can be identified by blind users in order to understand their arrival in the staircase, but also to provide a pleasant experience through the contact with natural light. His main method of designing spaces remains drawings with relief and braille system. He mentions also the use of technologies in architectural practice, such as tactile sketchpads, which can ease the work of blind architects and make this process more interactive.





Figure 18 - Design Process of the Architect Chris Downey (Downey, [www.elportalinmobiliario.com](http://www.elportalinmobiliario.com), 2019)

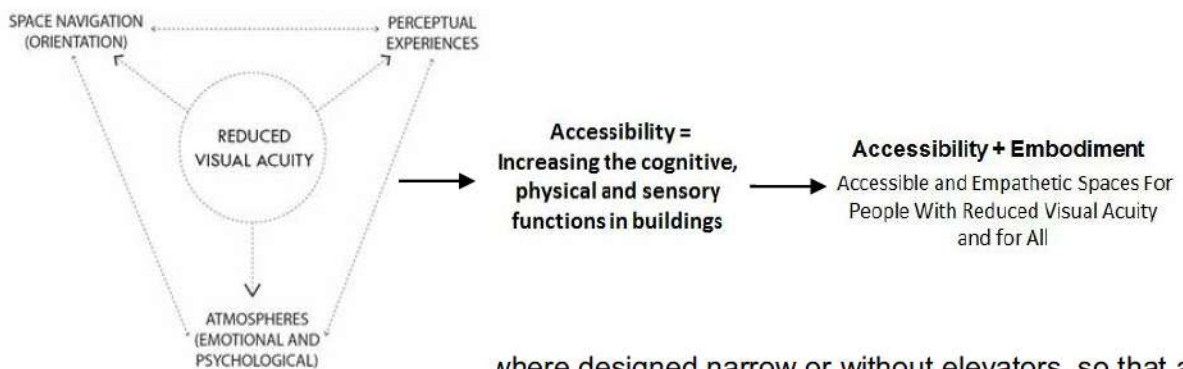
As also illustrated in the photos, it is evident that the main practice for these architects for designing spaces is through the use of touch, as a primary source of information. This is also reflected on the level of their interplay with physical environments and going through a process of exploration of non-visual qualities of spaces. Losing sight changed their way of exploring spaces and thinking about architecture in two main foundations: inclusivity and sensoriality.

## 2.5. Architect's Possibility

The experience of Chris Downey and Carlos Mourão Pereira, proposes various methods and ways of thinking and representing architecture, not necessarily only through visual image. In order to be capable of understanding the experience of the visually impaired, architects should take in consideration and understand the relation of every type of body with space, the perceptual capacities of the visually impaired and their needs for obtaining accessible spaces. The experience of this target group is necessary to be analysed in order to overturn the ocular-centric nature of architecture. Thinking about spaces that are accessible to the visually impaired through multi-sensorial qualities, offers an embodied experience to all of the users. In Albanian context, there is a lack of consideration for not only the visually impaired, but also even other users who need accessibility outdoors and indoors. According to the law no. 8098, 28.03.96, Article 2, in Albania, is mentioned firstly the necessity of creating appropriate spaces in residences for blind people. Actually, the only guideline available for architects in Albania is "Guidance for Architects in Architectural Design for People with Special Needs". Architects, while dealing with public buildings, should accomplish the standard design for people in need. There is a tendency of ignoring these standards, mainly because they are considered as "tedious" for architects. Furthermore, there is a lack of interest to design through different observers' point of view. The standards in fact are only functional and mainly oriented to physical disabilities. It does not promote architectural spaces to be functional in long term, but spaces just to be easily accessed. There are not architectural elements that promote sensorial stimulation. The architectural elements as stairs, ramps, windows and doors remain the standard model and the minimal solution for accessibility, with lack of variety and low level of

aesthetics to promote sensorial or body interaction. There is no suggestion about the use of materials, or about the spatial qualities that determine architectural atmospheres.

Furthermore, the standards are concentrated mostly on physical disabilities. There are suggestions about residential spaces, workspaces, toilets and recreation areas but only dedicated to physical disabilities, even though these solutions tend to give dimensions about spaces and not to promote interaction with architectural elements. About visual disabilities, the only solutions proposed are the use of relief materials on floors, especially in entrances and in the signage system, which actually is not part of the architectural composition, but additional accessories. The problem about these standards is firstly that considers such conditions as disabilities and they do not tent to understand their experience on another perceptual level. This culture in architectural discipline has been present even in buildings during communism.



where designed narrow or without elevators, so that a  
 Figure 19 - Key Concepts to be Considered During Design Process for Providing Accessibility in Architectural Buildings

“For an architect, more important than the skill of fantasizing space, is the capacity of envisioning situations of human life.” (Pallasmaa, Tullberg, MacKeith, & Wynne-Ellis, 2005) More detailed study should be conducted concerning the perceptual experience and accessible needs of the visually impaired, in order to learn from their experience and

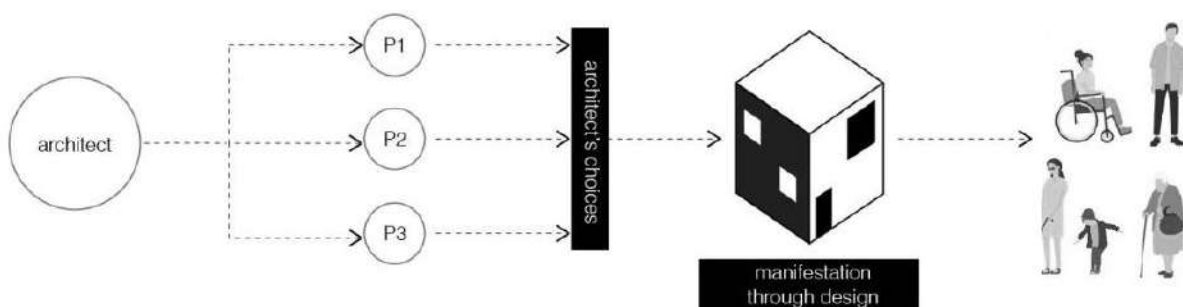


Figure 20 - Architect's Possibilities

provide possibilities for independency in movement and to enhance the sensorial and embodied experience in indoor spaces. Accessibility should not only be considered as

physical in terms of circulation, but involves space navigation and orientation, perceptual experiences and atmospheric situations. In other world, in this research, providing accessibility means to increase the cognitive, physical and sensory functions of a building. As a result, the focus of this research is to provide qualities, universal in nature, to be used by architects, which provide accessibility and sensorial experiences for all users. An architect has the opportunity to combine various architectural solutions, which depended on their use in design, can be manifested in such form to provide possibilities for different people / bodies and to engage them as true participants in architectural design.

*“...materialistic and technological alternatives for architecture...do not answer satisfactorily to the complex desire that defines humanity. As humans, our greatest gift is love, and we are invariably called to respond to it. Despite our suspicions, architecture has been and must continue to be built upon love...true architecture is concerned with far more than fashionable form, affordable homes, and sustainable development; it responds to a desire for an eloquent place to dwell, one that lovingly provides a sense of order resonant with our dreams, a gift contributing to our self-understanding as humans inhabiting a mortal world.”*  
(Pérez-Goméz, 2006)

### **3. RESEARCH TRACK**

Architectural Experience

### 3. ARCHITECTURAL EXPERIENCE

Recent findings in neuroscience emphasize the multi-sensorial nature of architectural experiences, giving also ground for architecture to use such information to obtain better building environments. “Most importantly, the recent discovery of mirror neurons begins to help us to understand the origins of empathy and emotion, and how we can experience emotion and feeling in material and spatial phenomena.” (Pallasmaa, *Towards a Neuroscience of Architecture: Embodied Mind and Imagination*, 2013) Architectural experience is not only provided by sensorial information, but it deals with the relation of human being with space, between self and mental space, world and physical world. Understanding how the sensorial system works and analysing the relation subject-object and space, leads to a better understanding of perception, sensations and emotions, allows us to understand what is architectural experience and how to use it as the key element in architectural practice. Design should provide emotional reactions and experiences in order to provide an interaction between self and physical world. When abstract space becomes an emotional space in conscious and spiritual level provides a true meaning of architecture.

It is necessary to study perceptual actions in architecture concerning multi-sensoriality and embodied experience. Such thing is important for several reasons. Firstly, understanding the nature of perceptual experiences, gives an understanding of the issue of embodiment and the interaction of human beings with the built environment. This is related to the subject’s body possibilities and level of interaction with the environment. Secondly, focusing on the concept of embodiment we can understand the influence of human’s presence in the built environment and vice versa, the influence of the architectural environment to the cognitive and behavioural actions and physical well-being of the subject. Thirdly, architectural experience is related with the phenomenological conception of architecture.

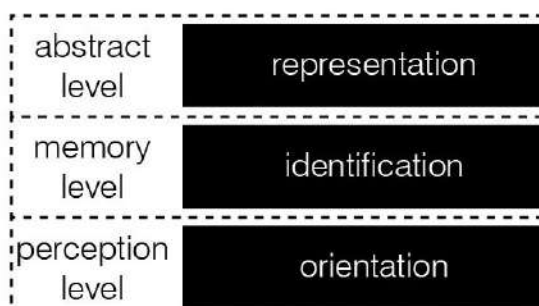


Figure 21 - Three Levels of Mental Processes according to (Stenros, 1993)

Perception of space is provided by three levels of mental processes: “the perceptual level (orientation), memory level (identification) and abstract level (meaning).” (Stenros, 1993)

1. The perceptual level (orientation) means that through stimuli found in the environment, the body is capable to orient

itself. Two main aspects provide this level: the condition of the physical reality, stimuli from built and the natural environment.

2. The memory Level (identification) is related to the concept that the built environment is depended on personal background and experience that triggers images and feelings. This level depends on the personality of the perceiver and his emotional memories.

3. The abstract level (meaning) is the phase of figuring the environment and the appearance of affection. This is specified as “Mimesis”, which according to Theodor Adorno, it is a relation of affinity between a built environment and person based not from rational knowledge but it is a creation of embodied experience. This perceptual level is direct and a conscious process depended on memory. These are the three main levels of cognition for providing spatial experience, which are directly depended by the body and its relation to space.

As a result, in order to comprehend the architectural experience, in this chapter will be analysed the perceptual processes and the phenomenological aspects of perception in relation to architecture, the relation of cognitive action with experience, the possibility of human body in sensory motor aspects and perceptual levels, interaction of body with the built environment and through body schemata. These experiences may be presented in different forms, such as experiences related with perception, memory, imagination, emotion, bodily awareness and social activity. According to Husserl, the structure of these components that provide an experience create “intentionality” which provide the structure of consciousness and different states of awareness, such as temporal awareness, spatial awareness, attention awareness, self-awareness, other person awareness consciousness. Providing the theoretical framework focused on architectural experience brings a better understanding of the concept of embodiment and what the built environment should offer to maximise this experience. Furthermore, the methodology used is phenomenological, in order to identify and interpret the essence of human experience in architectural spaces.

### **3.1. Phenomenology of Perception**

In philosophy, perception is a wide field of discussion, but this research will explain perception from the phenomenological approach, even if there are several approaches, such as Empiricism and Rationalism, that analyse perception. According to Empiricism, the primacy source of knowledge from the environment is derived only from sensory perception and it does not explain how consciousness determines perception. On the contrary, Rationalism accepts that the primacy source is reason and is not depended from

sensorial information; as a result, it does not deal with the fact how the nature of perception determines consciousness. Meanwhile, through phenomenology is studied the essence of perception and consciousness. Husserl, considered as one of the first founder of phenomenology, did not deny the existence of the real world, but attempted to clarify the meaning of this world, articulated through the metaphor of life-world<sup>5</sup>. The means that by throwing light to the questions would be obtained the understanding of perception, which to Husserl was considered as the absolute knowledge of the soul through the data gathered from space. According to phenomenology, perception may be structured by several forces; while conscious perception can be structured by attention. Perception, from phenomenological perception is not purely sensation and not purely interpretation. Furthermore, phenomenology takes in account spatiality of human body and body image, which are two factors that may influence perception.

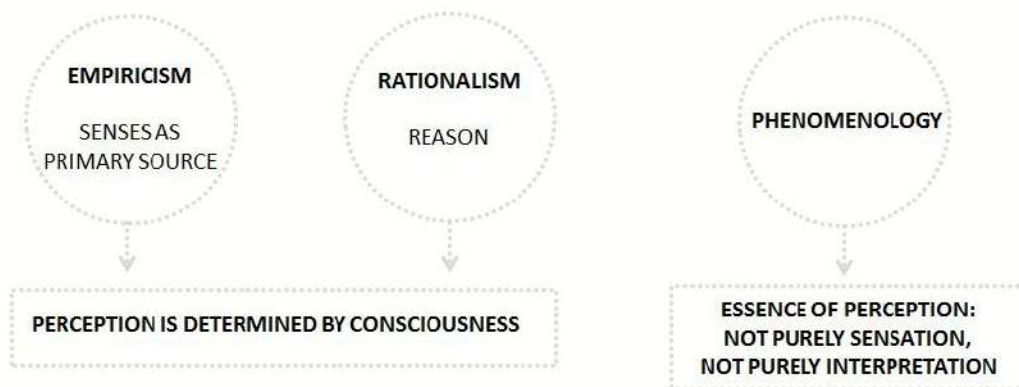


Figure 22 - Philosophical Theories about Perception

According to “Stanford Encyclopaedia of Philosophy”, phenomenology is the study of “phenomena” and the meaning of perceptual experience from one person’s point of view. The aim of phenomenology is to explore and interpret the mutual relationship of human life with the material world, examining human behaviour, experience and meaning. Phenomenologist Herbert Spiegelberg defines phenomenology as a movement and not as a school. He elaborates three main characteristics of phenomenology in “The Context of the Phenomenological Movement”.

*“1. Phenomenology is a dynamic philosophy that advances in relation to intrinsic principles as well as to the “things” it studi es-in other words, in relation to the typical territory it encounters;*

<sup>5 5</sup>. *“The life-world is the locus of interaction between ourselves and our perceptual environments and the world of experienced horizons within which we meaningfully dwell together. It is the world as we find it, prior to any explicit theoretical conceptions.”* (Valle, 1998)

2. *Like a stream, phenomenology incorporates parallel currents, all related but by no means homogeneous or moving at the same speed;*

3. *These phenomenological currents have a common point of departure but need not move toward the same destination; rather, many of these currents branch out in different directions that, collectively, can be considered as a "phenomenological movement".* (Spiegelberg, *The Context of the Phenomenological Movement*, 1981)

Consequently, phenomenology is a practice, which provides different approaches concerning the study of the phenomena and its application in several disciplines. Meanwhile, phenomenology of perception deals with two main issues: Firstly, tends to investigate objects of perception, whether they are ordinary objects or sense data; secondly, how the subject perceives. There are two methodologies in approach to phenomenological research: existential and hermeneutic. The third one is the first-person approach, as a starting point to bring awareness. The first-person approach is the most personal approach and can serve as basis for examining its specific characteristics and qualities, while the researcher approaches the phenomenon from his own experience. On the other hand, the existential approach is the interpretation and study of other individual account of study. The hermeneutic approach is the interpretation of material in attempt to recover a meaning. However, the research is focused on the existential and first-person's approach in order to understand perception as an experience and its significance to the perceiver. According to Merleau-Ponty, "phenomenology is the study of essences and a philosophy which puts essences back into existence, and does not expect to arrive at an understanding of man and the world". (Merleau-Ponty M. , *Phenomenology of perception*, 1996) He focuses on the issue of perception and embodiment in order to understand the relation between body and mind. Furthermore, it is important to analyse perception from phenomenological approach since phenomenology aims to analyse and study of the "phenomena" and the understanding of perceptual experience from one person's point of view, which is actually is necessary because, as it is mentioned above, perception is individual to each subject. "The phenomenologist does not postulate back stories why the experience happens as it does. The phenomenologist describes and structures the manifold of human experiences." (Merleau-Ponty M. , *Phenomenology of perception*, 1996)

According to Merleau-Ponty "phenomena" is the first layer of experience through which things are first given to us, the system of "self-others-things". On the other hand, phenomenon is not the conscious mental state and experience of phenomena, and is not depended on mind's creative power. Study of phenomena is the investigation of the link between the individual human being and other things found in the outside space. Merleau-Ponty specifies three qualities of phenomena:



- “1. It is not the same as one’s subjective experience of something,
2. Technically two different people can have different phenomena of the same phenomenon,
3. Temporal extension of a phenomenon is not well defined, although it is necessarily finite and usually short.” (Merleau-Ponty M. , *Phenomenology of perception*, 1996)

Perception is not only a result of the action of impulses in the sense organs, but it is a far more complicated phenomenon which is not only a sum of sensorial data, but includes as well as reasoning. In “Phenomenology of Perception” Merleau-Ponty argues that learning to see colour is a change in the structure of consciousness, to obtain a new dimension of experience and the formation of an “a priori”. Learning a new habit is existential rather than an intellectual act of knowledge. The term “a priori” describes propositions or facts whose truth can be known “prior to experience”. “A priori” is the notion of necessity of experience and “a posteriori” the notion of possibility. The human existence depends on the transformation of possibility into necessity through the act of attention.

The next important stage of perception is sensation, which is seen as an inseparable notion. “By sensation it is understood the state of experiencing self, by this it means that to see is to have colours, texture or lights, to hear is to have sounds, to sense (sentir) is to have qualities”. (Merleau-Ponty, 2002) Quality is not an element of consciousness, but a property of the objects in the surrounding environment. Through the sensorial information, it is provided the subjective knowledge about the surrounding environment. These notions are broadly discussed in phenomenology, which intends to return “what is directly given”. While the “given” is not the scientific presuppositions, but what is intrinsically given in our intuition. What we perceive as true is true to the sense of self and its activities. The other way of manifestation of ambiguity is found in the body as a mean of existence. Through the body and the sensorial field are presented the natural aspects of the world. An active body which actively perceives signifies the existing world. In this aspect, we use the existential term “être-au-monde” (being-in-world). For Merleau-Ponty perception is not a process to know the real world, but to question what is already known. He does not doubt the existence of the world perceived but reflects how the limits of the knowledge of the world perceived give the possibility to perceive in new ways. As a result, perception is not only a result of impulses in sense organs but it is a change in consciousness. In order to discover the various experiences a space can offer, an architect should undertake a phenomenological approach by imagining him/herself in place of other users in order to analyse situations and experiences and apply this knowledge for creating architecture.

Various architectural theoreticians believe that the application of philosophical theories in architecture can provide the understanding of architecture, and especially

phenomenology, which serves as a mode of interpreting architecture and give opportunities to explore new architectural images and situations. Phenomenology in architecture does not only consist on the implementation of sensorial design in architectural space, but it deals with the manipulation of space, material, memorable encounters and other mental components in order to establish experiential spaces in architecture. Phenomenology is capable to explain essence and bring us close to the phenomena; as a result, it puts us in contact with our experiential being. “Phenomenology concerns the study of essences; architecture has the potential to put essences back into existence.” (Holl, *Intertwining*, 1996)

### 3.1.1. Phenomenology in Architecture

Phenomenology in architecture may be considered as a discourse or practice rather than a movement, since it is considered to be a continuous discussion between architects and theorists to provide a form of comprehending architecture. There are no rules in applying phenomenology in architecture since in various architects are seen various interpretations. “Phenomenologists are much too individualistic in their habits to form an organized “school”.” (Spiegelberg, *Phenomenological Movement Second Edition*, 1965) There are different approaches and applications of phenomenology in architecture leading to a continuous dialogue in architectural theories. Architectural theorists consider that phenomenology can bring them closer to the essence of things and phenomena, and as a result provide a higher level of comprehension in architecture. According to David Seamon, phenomenology in architecture can provide “seeing with new eyes” (Seamon, 1993) of the phenomena.

*“Phenomenology concerns the study of essences; architecture has the potential to put essences back into existence. By weaving form, space, and light, architecture can elevate the experience of daily life through the various phenomena that emerges from specific sites, programs, and architectures. On one level, an idea-force drives architecture; on another, structure, material space, color, light, and shadow intertwine in the fabrication of architecture.”* (Holl, *Intertwining*, 1996)

In the discipline of architecture, three main theorists provide the basic concepts in the application of phenomenology, such as Husserl, Heidegger and Merleau-Ponty. From their concepts, architecture theoreticians developed the theoretical or practical approaches in phenomenology in architecture. The difference between them starts with the definition of phenomenology. According to Husserl phenomenology is a return to the

things themselves, while for Heidegger is a way of “seeing” and for Merleau-Ponty is the essence of perception. Husserl considers perception as a pure intellectual consciousness process, while Heidegger concentrates in the process of dwelling and space, and Merleau-Ponty emphasises the importance of the body and senses in perceptual processes. In this research are considered two groups of theoreticians and architects: Heideggerian and Merleau-Pontians, due to their reinterpretations of the separation of mind and body – being in the world. Respectively, Christian Norberg Schultz and Frampton following the Heideggerian approach, while Juhani Pallasmaa and Steven Holl following Merleau-Ponty’s approach. Also, if we could define another group categorisation, would be the division in two other groups: architects that apply phenomenology in theory and those that apply it in theory and practice. Firstly, it is necessary to see the differences in Heidegger’s and Merleau-Ponty’s theories application in architectural theory and practice. Thereby, it is necessary to understand primarily the basic approach of phenomenology of Heidegger and Merleau-Ponty.

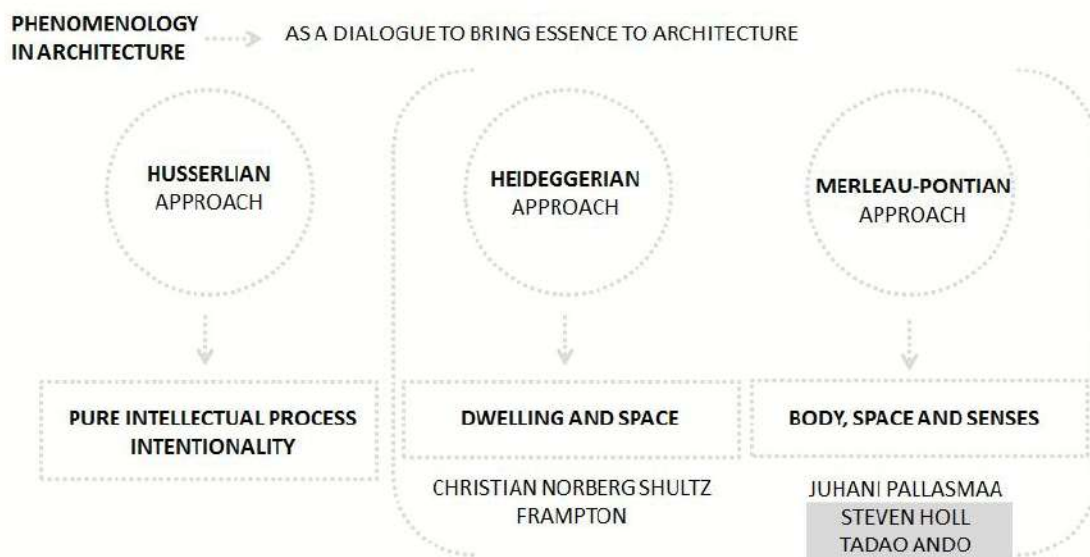


Figure 23 - Key Terms in Phenomenology in Architecture

The two approaches mainly differ from the focus themes of their discussions. Heidegger is mainly concerned with the topic of the belonging, place and dwelling. While Merleau-Ponty’s focus remain space, mobility and individuality.

Heidegger’s approach to phenomenology is about “being”, which means the analysis of existence is the central point of discussion. From this he developed the notion “Dasein”, which means “being there”. This existence is related to the space the person is positioned, and this space is not only physical but it is an experiential and interactive relation field for that person. Person and space are not separate components, but they are a whole.

Following this discussion, he developed the notion “Spaces Spaces” (der Raum Räumt) to give answers to the question what space is.

*“Spacing means clearing out [roden], making free, setting free into a free open area. Insofar as space spaces, freely gives a free area, then it first affords [gewährt] with this free area the possibility of regions, of near and far, of directions and bounds, the possibilities of distances and magnitudes” (Mitchell A. J., 2010)*

Since space is a whole with the subject, it is something unfixd, due to the movement of his “owner”, and it has direction and distances. According to Heidegger, Sculpture, as a visual art form, considers the body and space as a unifying entity, by which the sculptor gives shape to the invisible relationship between the person and the world. He interprets such concept through the work of the sculptor Heiliger.

*“A head is no body equipped with eyes and ears, but instead a bodily phenomenon, stamped by the looking and hearing of a being-in-the-world. When the artist models a head, he only seems to copy the visible surfaces; in truth he shapes the properly invisible, namely the way in which this head looks in the world, how it holds itself up in the open of space, approached by the humans and things therein” (Mitchell A. J., 2010)*

The act of creating a sculpture is an act of appearance, which consists of creating a spiritual and illusive relation with space, body and time. The same is for architecture, which is an act of appearance of the existential being. Buildings are built in order to shelter human’s existence and provide their basic need. This act of appearance is a process of creating a relation, illusively and spiritually. It is a process of creating multiple relations between space, time and body. Buildings locate the human existence and configure the human presence through the articulated activities in the presence of time. The figure of the buildings deals with the presence and absence of a society. First, the building is built for the needs of people and then it shapes their life and vice versa. It configures physically over time how people measure their presence in the world, setting out the particular character of builder and dweller. Through the presence of time, people define its meaning through other additional living activities as an act of measuring their presence in the world. This concept is present in traditional Japanese architecture, which differs from western architecture in many features, especially as an architecture, which applies phenomenology in practice.

The basic principles of Western architecture remain those of Vitruvius: durability, accommodation and delight, while durability is not a concern to Japanese culture. Delight is the key concept to architectural spaces, provided by the concept of “mono – no – aware”. “Mono-no-aware” also signifies that beauty is the best when it is brief. These has two different aspects: architecture does not need additional elements, such as extra paint

or other accessories, the beauty remains in materials and nature; and the appreciation the effect of time on the building. This is connected to the experience of dwelling in Japanese architecture, which is a way of letting things as they are and not making them as something they are not mean to be and the things that fulfil their own predetermined state or end.

Christian Norberg-Schulz applies theories of Heidegger, mostly concerning the concept of dwelling and being-in the world, since he considers phenomenology as a method well suited to penetrate the world of everyday existence. (Norberg-Schulz, 1980) As claimed by Schulz, to dwell means to establish a relationship between building and human being, by the sense of belonging in space the human develops the act of identification through settlements. Buildings are important to human existence because are directly connected to human life and death, with presence and absence. While human builds, he builds to have a shelter. During natural catastrophes, he is faced with the fear of death and the fear of losing control of things. As a result, buildings configure the human's presence and existence; it demonstrates his existence through the activities he develops. Furthermore, it is through the different levels of existential space that Norberg-Schultz explains with the concept of "dwelling". As originated from Heidegger, act of dwelling consisted of a process that overcame functionalism and regained its figurative meaning through giving spiritual revelations in relation to human's existence, and as a result leading to the generation of "meaningful" environments.

According to Isozaki Arato, the principles of Japanese architecture is "ruination". Exactly the other difference from the western culture is the attitude to the destruction. Western architecture is about construction, whereas in Japanese architecture is about construction and destruction. In Tadao Ando's writings in "Beyond Architecture", he emphasizes: "Architecture is intimately involved with time. Standing amid time's continual flow, architecture, simultaneously experiences the receding past and the arriving future." To him it is not important how the building will look in the future. In the Zen Buddhist, "yugen" means spiritual transcendence sense of living intensely in the present moment. This term means darkness and mystery, but in the same time, the character "yu" means serenity and peace. This effect of time and ruination in buildings is found in the aesthetic traditional Japanese approach, which supports the imperfections and incompleteness. The presence of time is not provided only by the use of materials but by the whole configuration of spaces and the narratives the building tells.

The Heideggerian approach to phenomenology has existential meanings and some of his principles concerning dwelling seem to be in coherence with Japanese traditional architecture. By existential phenomenology is emphasized the pre-conscious lived experience by analysing existence through human experience in a situation. Merleau-

Ponty's approach is also existential in nature but differs from Heidegger in the aspect of relation between subject and world. Firstly, that space is created by the subject and emphasizes the role of the body in experiencing the world. Secondly, the body is the interface between the mind and the world, and it is the objective, visible and mobile mediator between these two. So, the main difference between the two is their concept of embodiment. Merleau-Ponty considers experiential and perceptual activities as individual, at the level of an individual body which is not attached to the world, while Heidegger speaks about the relatedness of body with the world, as attached to each other. Heidegger does not argue the idea of because of the body a person can change his location. The body is not a possibility of actions, it is not considered as an "I can", but as an "I am". Since the Merleau-Pontian body is more individual, he elaborates more the aspect of body capacities concerning movement in space.

*"Merleau Ponty's body is not the Cartesian flesh cadaver, with its pliable springs and levers infinitely stilled. Merleau Ponty's theme is the kinaesthetic that moves through a world that is its own, a world that is in the same uncanny way itself flesh." (Krell, 1997)*

These concepts lead towards the concept of embodiment, by which is understood body extended towards the surrounding environment through its consciousness. Perception is not only to "see", or only sensation, but involves other more complex processes. It is not based on the information the body receives about the world, but in how the body inhabits his/her world. Furthermore, application of phenomenology provides different levels of investigation of architectural experience, by which we can distinguish six main themes: perception, place, space, lived body, movement and nature.

## **3.2. Space, Object and Body**

### **3.2.1. Space**

An important aspect in phenomenology, which relates closely to architectural practice, is the notion of space, *Dasein*, used by Heidegger. This notion is related closely with *being-in-the-world*, which deals with the presence of buildings, body awareness and movement. This is elaborated in the further chapters, while analysing the role of the body in architectural space. Firstly, before understanding the relation of body to space, it is important to define what space is and understand its notion in architectural terms.

Space is a notion broadly discussed not only in the field of architecture but also in other disciplines. While speaking about space, we tend to think it in physical terms. This is due to the fact that classical science defines space as a physical world arranged in three

dimensions and it is from the movement that space gets its properties. However, since from the period of the classical Greek, there were many definitions about space, which did not consider space only a matter of materiality. Plato defined the concept of “*chora*” to describe the notion of space. “*Chora*” is the material of things which can be comprehended only by reason. A concept that remained present in the definition of space by Newton. He defined two types of spaces, the absolute and relative space. In absolute space “*chora*” is fixed and does not change, while relative space is part of this absolute space. Relative space is the movable absolute space, in which “*chora*” is depended by the senses and body’s position. In this aspect, space is defined by the architectural features and the sensorial qualities play a crucial role in its definition.

In phenomenological terms, Heidegger unfolds a concept to the question of what is space as “space”, by giving a definition of “Space Spaces” (der Raum räumt).

*“Spacing means clearing out [roden], making free, setting free into a free open area. Insofar as space spaces, freely gives a free area, then it first affords [gewährt] with this free area the possibility of regions, of near and far, of directions and bounds, the possibilities of distances and magnitudes”* (Mitchell A. J., 2010)

According to this concept, space is something unsettled and unfixd. It is a movement that brings the bodies out of themselves. It is a separation that allows these bodies to communicate into regions, distances and directions. Space is constructed in dependency to the human body, which is considered as an occupying object. Spatial condition is structured depended on body movements. As a result, spatiality is a combination of geometry and movement.

*“If we define space from its origin, we get two interpretations: “to make space distinct” and “to state the precise nature of space”. In art and architecture space is defined from the senses and experiences, while science tends to give to space a type of description of: “material thing in which all material things are located”. (Tschumi, 1996).*

However, Bernard Tschumi sees the relation of body and space as twofold, with the concept of bodies violating space and space violating bodies. In the first aspect, the presence of the body is seen as an intrusion in an architectural space’s order. The process of getting inside this space violates the balance of the geometrical order, by setting limits to the purity of the architectural order. In this way, the architectural space starts a silent dialogue with the user.

*“Violence is not always present. Just as riots, brawls, insurrections, and revolutions are of limited duration, so is the violence a body commits against space. Yet it is always implicit. Each door implies the movement of someone crossing its frame. Each corridor implies the*

*progression of movement that blocks it. Each architectural space implies (and desires) the intruding presence that will inhabit it.” (Tschumi, 1996)*

The other aspect of this constant communication between the body and architectural space, is the space violating the body. Before being part of the architectural space, a mental image is created that implies the wanted experiences to the human. In cases when the space is not in equilibrium with these images, space violates the body. The spatial torture leads in psychological destruction, in the stimulation of violent desires. This violence may be categorized as two types: Formal violence, which deals with the conflicts between objects and the new presence of a building in a specific context, because it violates not only what was present on site but occupies the territory itself. The other type of violence is “programmatic violence”, which may be defined as actions, events and programs that by accident or intentionally become destructive.

According to Christian Norberg Schultz, who applies Heideggerian phenomenology in theory, concerning his spatial concept about the perceptual processes. The perceiver’s orientation in space is made through intuition, as a way of “seeing” things. Furthermore, geographical features are elements that help with this process, which indicates also this attachment of subject to things in space. Space is an Euclidian space, which is physical and represented by orthogonal co-ordinate system. Through events it obtains the fourth dimension. According to Heidegger there are two types of space: space in the geographical sense and personal space. Each person is the “owner” of the personal space, which defines the interpersonal communication and the relation to other people and objects. It is an important feature that defines the organization of spaces in houses and buildings, even the layout of the cities. The centre of space is the perceiver, changing direction according to his movements; as a result, distances are relative to him. To explain this, he supports Kevin Lynch theory: The world may be organized around a set of focal points, or be broken into named regions, or be linked by remembered routes. The existential space is a result of perception and schemata, which are immediate perceptual spaces related to past events. So, experience and schemata make the “image” of the space, or existential space. Heidegger defines existence as spatial. “The space is there and only if it is there, can man exist. And once man dwells on the space, or understand it, then he can build, and physically dwell.”

For Norberg Schultz, there are five types of spaces: physical/pragmatic space, perceptual space, existential space, cognitive space and abstract geometrical space. The existential space is what is of interest to the research since we are dealing with perception. This space is a system of perceptual schemata or “image of the environment”. Meanwhile, space is the product of an interaction between the organism and the environment. The



existential space has a centre (proximity), which represents a connection between the different cosmic realms through the transverse of the axis mundi that connects different cosmic realms; it has direction/paths (continuity), areas/domains (enclosure). According to Norberg Schultz, existential space has different levels that are given by the environment and its level of relation to the perceiver, and the interaction of all the levels give the structure of this space. The lowest level is determined by the hand, and by this level the actions as grasping, carrying, are performed. The second level is the furniture levels, which is determined by the size and shape of the body and are preformed activities as sitting, lying, etc. The third level is the house which its size is determined by body movements, other activities and territorial demand. This is considered to be a private space and as Heidegger point out, it is the basic principle of existence where the person finds himself. The fourth level is the urban level which is determined by social interaction, and the last level is the landscape level, which is a result of interaction of subject with landscape.

Christian Norberg-Schultz attempted to build the foundations of phenomenological interpretations in architecture, considering it to be the method most suited to understand the everyday experiences. Phenomenology is a method of abstracting the everyday life-world, in order to make the environment meaningful through the creation of specific places. According to him, phenomenology must be used in architectural practice in order to recover the lost poetic awareness which is the essence of dwelling. The theoretical approach of Schultz supports the concept of Topological Schemata, concept derived from Heidegger's approach. The organizational schemata consists on the establishment of centres or places (proximity), directions or paths (continuity), areas or domain (enclosure). The best example for the understanding of the application of these phenomenological concepts in architecture is the poem "A Winter Evening" written by the Expressionist Georg Trakl. In the poem it can easily be found the basic properties of space. (Norberg-Schulz, 1980)

*"A Winter Evening*

*Window with falling snow is arrayed,  
Long tolls the vesper bell,  
The house is provided well,  
The table is for many laid.*

*Wandering ones, more than a few,  
Come to the door on darksome courses,  
Golden blooms the tree of graces,*

*Drawing up the earth's cool dew.*

*Wanderer quietly steps within,  
Pain has turned the threshold to stones,  
There lie, in limpid brightness shown,  
Upon the table bread and wine.”*  
(Trakl, Brown, Hamper, & Black, 1986)

In this poem we can find all the important aspects of phenomenological approach of Christian Norberg-Schulz. Firstly, it gives the description of concrete images and situation of the everyday life, such as the snow or other elements, and also the title that expresses a background and the presence of a landscape. Through the description of these elements it is given the relationship between the inside and the outside, which is an important aspect in his theory. The outside is given the natural landscape and mostly through man made context. Meanwhile, the inside is described through the environment of the house. Furthermore, he gives a set of places, which are of an outside or of an inside characters, where particular activities take place.

*“Places are points of departure from which we orient ourselves and take position of the environment. That structured environment depends on our ability to recognize it. A place is characterized by a certain size.” (Norberg-Schulz, 1980)*

“Centre” or places, “directions” or paths, areas “domains” are the basic elements of the existential space. According to Norberg-Schulz, the open plan of the modern house does not consider the relationship of the outside with the inside, the private with the public domain. Furthermore, in modern architecture and urban context it is present the phenomenon of “loss of place”, by which it means that spaces have lost the traditional character of streets and squares. The use of international style in modern movement has brought the loss of the local and regional character of a place, leading to monotonous environments.

Secondly, in the poem is present the sense of space, which can also be found through the process of the falling snow, which implies the presence of earth and sky to give the sense of space. In indoor or outdoor spaces, a set of symbols can be found, such as the bell, or indoor furniture, etc. The table is the symbol of the central space, and the necessity of people to gather. Places, paths and domain, are necessary for identification and orientation in space, and sustain the meaning in spatial organizations. Man as a wanderer in the poem emphasises his need for orientation.

Furthermore, the identification and orientation can be found in the openings, such as the elements of window and door which serve as elements of interaction of the inside and outside. They express the need of person for belonging through the attachments and memory he creates with the inside, the existential place, and the need to interact with the environment. The creation of tension between these two provides the perceptual experience of space.

According to Norberg-Schultz, phenomenology serves as a method of recovering the lost language of architecture from the modernist movement. The figure-ground relationship of a urban environment is lost as a result of high density buildings and the enclosure of the settlements, which have produced spaces with a lack of stimuli and surprise, leading to loss of orientation and identification. This loss is found because of the international style used for buildings and through the vanishing of the typology of a building, such as the typology of house. He supported the post-modernism movement with the idea of using form as a sign with the use of the decorated shed and the use of decorated screen facades of Venturi, which brought back the symbol of the traditional house. By such approach, it might be considered that some of Christian Norberg-Schultz's concepts have their roots from the act of seeing. "“Seeing” means, above all, recognizing something as something.” (Norberg-Schulz C. , *Nightlands*, 1996) The décor of the screen façade reflects the complexities of the inside and gives significance to the house. It is a form of transition from the private to the public. This emphasises the importance of visual sense in Norberg-Schultz's phenomenological approach, which actually should be seen more in relation to all the sensorial experiences and body awareness which is not mentioned in his writings.

The absence of the relation of the body with space seems to be an issue not taken in consideration in his theories about Genius Loci, which is also criticised by Führ. According to him, Genius Loci is a production of photographic phenomenon from selective points of view, oriented in sight and the aesthetic of two-dimensional surfaces. It is based on the absence of the people and of the activities in the environment. Body remains “motionless” and movement is not considered, while the experience of the perceiver is less important than the body of the buildings. Body in Genius Loci is motionless and disabled. Furthermore, Schultz seems to have a larger scale approach rather than focused on the details of the interior.

Meanwhile, Pallasmaa has another approach from Christian Norber-Schultz, since he follows Merlaeu-Ponty's theories.

*“Meaning in architecture depends on its ability to symbolize human existence or presence, on the spatial experience of the work. The Phenomenology of architecture is looking at*

*architecture from within the consciousness experiencing it, through the architectural feeling in contrast to analysis of the physical proportions and properties of the building or stylistic frame of reference. The phenomenology of architecture seeks the inner language of a building.” (Pallasmaa, The Geometry of Feelings: A Look at the Phenomenology in Architecture, 1996)*

He emphasises that architectural practice is dominated by ocular-centric paradigm, by arguing that vision is the sense that creates distance between perceiver and target, and other sense provide a more intimate and corporeal level. The architectural experience is obtained not only by vision but also through other sensorial modes.

According to Pallasmaa, the main task of architecture is to provide embodiment and existential metaphors to human beings, which coincides with the first approach to Merleau-Pontian phenomenology. It should fulfil the existential meaning to human beings through emotional feelings. Architecture is rooted in the “primacy of feelings”, which form the “basic vocabulary” in architecture. As a result, all sensorial modes play an important role in perceiving space and architecture should provide a multi-sensorial information in order to provide experiences. There are two types of feelings architecture should transmit to users, such as “loneliness” and “silence”. A concept embraced also by Peter Zumthor, who tends to be more practical in nature. Architecture should be capable to transmit emotions and reactions to the users, in order to be considered as true architecture. What it should provide to the users in order to obtain the architectural silence is through providing mental and spiritual peace. So, by silence in architecture is not only considered the acoustic aspect of space, but it means of involving the subject with space by transmitting tranquillity, peace, sadness and spirituality.

### **3.2.2. Phenomenology of “Objects”**

The presence of objects as components of space obtain a meaning through the presence of the human being. Certainly, without human presence, space and objects remain an abstract reality. Human presence adds value to objects through experience. Starting from childhood space, “spatial encounters produce the poetic “vitality” of the child-subject.” Architecture is an invitation to experiences and emotions. A building and its components should speak a dialogue with the perceiver in order for the abstract world to become concrete and form a necessary part of the human of “being-in-the-world”. It is necessary to understand the meaning of architectural elements, whose position is defined by the architect and have a static presence in space. These “objects” are not movable and their presence defines certain mental states to the perceiver. They serve as threshold spaces,

spaces that are transitory or that have a determinant role on spatial configuration and movement. They become the concretization of human boundaries in physical and psychological terms. Mostly these spaces are related to emotional reactions, such as fear and anxiety, or are spaces where memories are localized and give a meaning to existence. Our everyday life-world consists of concrete “phenomena” found in our surrounding environment. They also provide non-physical phenomena such as feelings, which are the meaning of our existence. Especially in a familiar environment, body extends itself in objects present in space. By obtaining a relation with spatial components, a person obtains knowledge about the phenomena and him/herself. “Who wants to become acquainted with man should listen to the language spoken by the things in his existence.” (Berg, 1955)

### **3.2.2.1. The Window**

A window is an aperture to the outside wall that provides the indoor space of a house with outside view. It is a transitory place, which creates a contact with the outside. This contact is not physical but gives to the observer a telescopic capacity to allow the person to observe distant scenes even without participating, in other words, providing the panoramic perception by creating a connection with a separate object. The window represent the eyes, ears and nostrils of a person from several aspects. Firstly, by hosting a strong relationship between the inside and the outside world, between privacy and public. It is linked to the curiosity to see by having the choice to be visible or hiding from the outside world through voyeuristic gaze, the viewer choses to be a spectator or to be surveyed. Even though the window provides to us this connection with the outside, it is a limitation itself, because when viewing from the closed window, what is seen is a bi-dimensional image projection of the outside, due to the glass that serves as a filter and at the same time creates a reflection of the inside or light glare.

The window has a relieving power to those that are prone to loneliness, by which they become part of the human harmony without being a member of it. The viewer becomes an observer of the forces of time and space, witnessing the changes of seasons, changes of urban structure, dynamism of passengers, etc. The relation of window with human has a dualistic nature. Firstly, window as an escape from loneliness, and on the other hand, window linked to fatality, a reflection of self with the outside world, which becomes a place of anxiety, following with the act of “defenestration”. The artist Brian Goggin, through the mural sculpture of “Defenestration” describes window as a transitory place of escaping from society’s expectation: “The act of “throwing out” becomes an uplifting gesture of

release, inviting reflection on the spirit of the people we live with, the objects we encounter, and the places in which we live.” (Goggin, 1997)



Figure 24 - "Defenestration" Art Work by the Artist Brian Goggin (Goggin, 1997)

Being a transitory zone, through the transparency of glass, it becomes a vulnerable place creating a risk of the privacy of the interior space and its deepest secrets to be in contact with the outside. Window is prone to “panopticon” effect, followed with the fear of being seen. “The inside is always definitely somebody’s territory, whereas the outside is anonymous.” (Pallasmaa, *Geometry of Terror: Alfred Hitchcock's Rear Window* , 2004) For Adolf Loos the privacy of the house must be kept isolated from the outside risks of invading this space, to avoid this he attached a small balcony as a barrier to avoid visual exchanges between inside and outside. “The house should be discrete on the outside; its entire richness should be disclosed on the inside.” (Tournikiotis, 1994)

In Chinese architecture window is considered as a picture frame. The opening on the wall coincides with a garden, and the window serves as a hole to capture the natural elements. This “tableaux” enhances the feeling of the observer as a being-in-time creature through the changes of seasons or climate. These windows contain different motives and patterns achieved by craftsman’s technique, in order to keep the inside space as secretive and at the same time provide curiosity to explore the outside. The positioning and dimensions of the windows usually are irregular, but the patterns used in the windows are similar as a way of providing a common language between order and chaos.

The window not only serves for providing a visual connection with the outside space, but also, most importantly, provides the entrance of light. Adolf Loos considered this as the most important aspect of the window. The primary function of this element is to be a passage of light and air for ventilation. For blind persons the window becomes a crucial landmark for understanding space through thermoception. Being a source of natural light not only provides thermal comfort to the interior space, but becomes an hallucinatory element for the invisible light that is projected on horizontal or vertical spatial determinants. The interaction between shadow and light creates a spiritual effect for those that are inside. The artist Robert Irwin, through some of his works, brought the idea of the

window as a picture frame, which gives the effect of time and space through the performance of light inside the spaces. By the movement of light, one is conscious of time, and as a result, shakes the consciousness of being-in-the-world.



Figure 25 - "Apertures cut into existing windows" by Robert Irwin (Irwin, 1997)

In 1920's one of the biggest discussions between French architects, Le Corbusier and Auguste Perret, was the shape of the aperture of the wall, the window. According to Perret, the window should provide the human body a feeling of presence in the outside context, and as a result, it should be vertical, associating the sky with the ground, while the horizontal window of Le Corbusier created an exclusion of the person from the outside, by which the observer was faced with an unending panorama. While through the traditional window, the person is more enclosed to the inside world leading to an emotional exclusion. The discussion was of a formalistic nature and seems as an effort for standardization in architecture. While the shape of a window is based on the type of context that is present, the level of intimacy a space requires and the necessary amount of light coming inside. Consequently, windows come in different shapes and form of positioning; they can be horizontal or vertical. "Windows are so troublesome...but they give a building character, and so they are worth preserving. That is what this issue is about: appreciating the variety and importance of windows, fixing and weatherizing them." (Poore, 1982)

The Japanese architect Uno Tomaoki designed "Ryusenji House", a single-family residence without vertical windows. For the architect the window is the medium of providing a relationship between nature and human being. In this project, the context did not provide a presence of nature, furthermore it is positioned in a urban context, where privacy is necessary. In this case, the window cannot be considered as a frame of the natural view of the horizontal world, but only to the vertical, which corresponds with the sky. A set of horizontal windows, which provide the only source of light to the house, emphasize the necessity of light in indoor spaces. The lack of contact with the outside

context provides a total isolation except from the sky. The inhabitant of this space coexists with nature, even though landscape is not present. Through the vertical contact with the sky, he/she can have a visual, auditory and physical contact with the sun, stars, feel the presence of changing seasons, and feel the wind of winter, the rain of spring and all other natural phenomena. The lack of vertical windows leads to exclusion from society and the surrounding context, a sort of freedom for someone that seeks to find his/her understanding of being-in-world and his/her relation to time and space.

*“This is the story how I happened to design Ryusenji House.”“Can you design house without window?” This was the first message from a young couple. Although I accepted their will, I insisted them not to be isolated from the nature. At the end of the day, I designed the house focusing on natural light. Few years later after completed, I visited the them and they said to me “ We have never experienced such a sense of freedom in our life”. I still remember it one of most precious moment in my life as an architect.” (Tomaoki, 2014)*

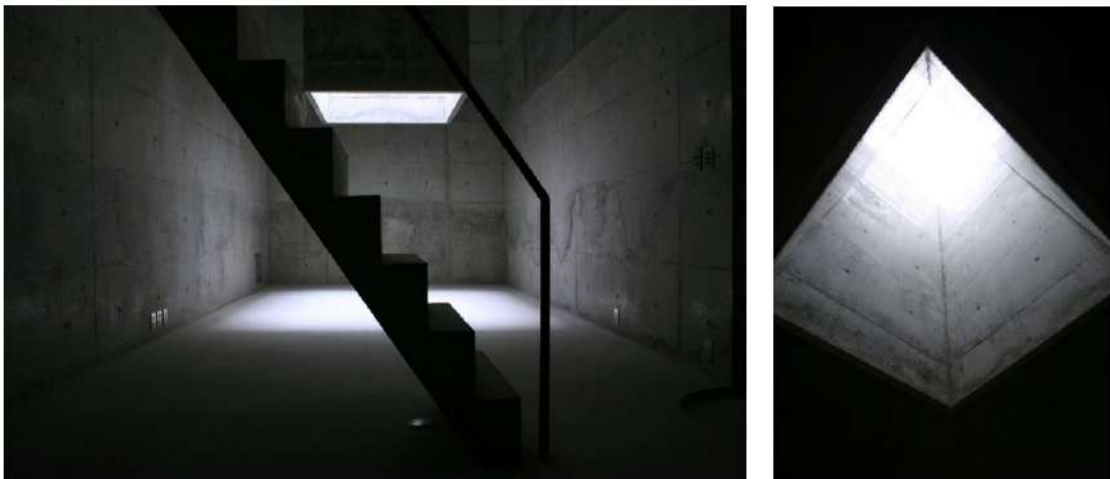


Figure 26 – “Rusenji House” by Tomoaki Uno Architects (Uno)

### 3.2.2.2. The Door

The door is a transitory place between two spaces, outside and inside, or even two spaces in the interior of a building. It is a place that separates and connects at the same time, a space of arrival and departure, of welcoming and rejection. Each door encloses a certain type of space. For this, it is important to distinguish the front door from other doors, which its primary function is to serve as a filter or “purifier” from the outside factors.

The front door is the portal by which a person gets inside a space from the outside, or vice versa. This should not be considered as an obstacle, but as a place by which the habitant



gets in contact with the external world and as a meeting place of trusted or untrusted outsiders, as a welcoming or rejecting transition. As a result, this becomes a place of dialogue, inanimateness and closeness, distant and individual. The front door is a place of acceptance and reflection at the same time. The pausing moment of being accepted inside is a pause related with a reflection of a person, which leads to anxiety of waiting and being accepted while the door is closed, as a psychological threshold.

*“How concrete everything becomes in the world of the spirit when an object, a mere door, can give images of hesitation, temptation, desire, security, welcome and respect. If one were to give an account of all the doors one has closed and opened, of all doors one would like to reopen, one would have to tell the story of one’s entire life.” (Bachelard, 2014)*

Frontal door might be unique or repetitive more than once, depending on the intention of the building. The repetition of the frontal doors comes as a necessity to bring confusion to the outsiders or to access spaces from the outside in order to explore the outside space more, without traversing the interior of the building. According to Heidegger, the threshold is the central structure of the door, which provides the transition of outsideness to insideness.

*“The threshold is the ground-beam that bears the doorway as a whole. It sustains the middle in which the two, the outside and the inside, penetrate each other. The threshold bears the between. What goes out and goes in, in the between is joined in the between’s dependability. The dependability of the middle must never yield either way.” (Heidegger, Poetry, Language and Thought, 1971)*

In Chinese culture, the outside garden doors, sometimes present in the interior, appear as portals positioned in sequences for enhancing the transitory states from one space to another. These portals, “moon gates”, seem as windows that touch the ground and serve for framing the observers’ view and the landscape. Usually these doors serve as a smooth passage from public to more private spaces, as a portal between two worlds. The use of the circle is not coincidental, but is a symbol in that represents cosmic order returned to earth.

For Eastern culture, the door should not be an obstacle, but on the contrary, the transition from one space to another should be very spontaneous, and the door itself should also provide the entrance of light but not expose the privacy from the outside. In Japan, shoji – is the typical room divider that is considered as a door. These are sliding panels that allow the expansion of spaces when needed, by being totally opened the division between two spaces is not evident, and when closed allows total privacy by enclosing space and through the paper provides indirect light inside space.

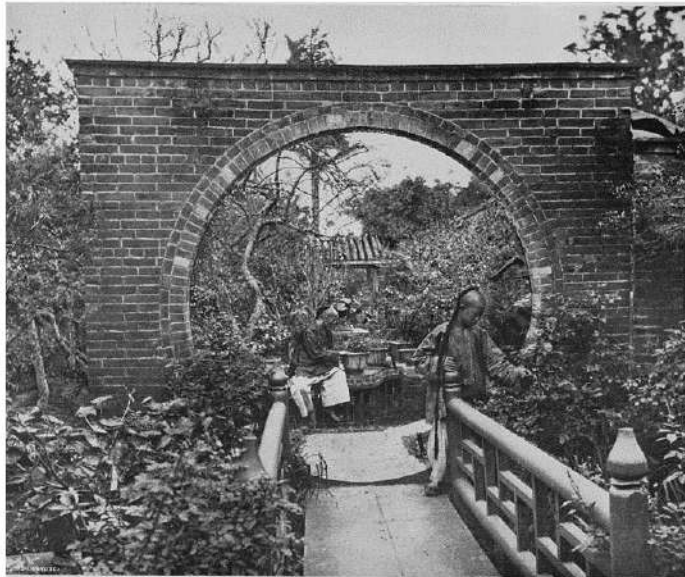


Figure 27 - Chinese "Moon Gate" in Chinese Garden (Thomson, 1898)

In Japanese culture, Motoori Norinaga (1730 – 1801) brought the concept “mono-no-aware” which has many significations. Primary, it is related to transitional elements in a building, which de-emphasize the boundaries of spaces, such as sliding doors, blinds, folding screens, etc. This signifies the importance of flexibility defined by the partitions of space. This transition from one space to another, from interior to exterior, differentiates Japanese architecture from Western architecture. Furthermore this is presented also in the point of entering inside the building, which is a crucial boundary between public and private, self and world. “Genkan” is the transitory area of the entrance, which has the function of the hallway. This space has an important function because it is where the social interactions between the visitor and the owner of the house happen.

The structure that beholds the concept of transition is the bridging structures, the engawa, which is usually positioned at the back of the house and is an intermediary space between the hallway and the garden. This bridge in the Western world has a similarity to the veranda. It represents the secular world and heavenly world, the upper level and the lower level, the plate and the mouth. This structure is the representation of the non-attachment and means both edge and connection. The structure itself presents a narrative of sequences of spaces in continuity from the entrance hall to the garden, where the most important spaces of the house are positioned in the back of the house, where the garden is located. Japanese architecture in difference to the Western architecture is more concerned of the narrative of the building rather than its structure. This is related to the poetic of spaces, which is mostly expressed along the continuous itinerary, and the use of garden as an intermediate zone. The garden in itself provides a scenery, “shakkei”. The

experience of non-attachment is provided through the “engawa”, garden and “shakkei”. According to Heidegger, whose philosophies support the traditional Japanese concepts of dwelling emphasized that poetically man dwells, as a fundamental way of being in the world.

### **3.2.2.3. The Wall**

Man’s relationship with nature is dualistic. On one side there is a fear of natural phenomena related with fear of death, and on the other side, man aims to have an intimate relationship with nature by challenging it. Human creates boundaries in order to provide safety and also to expand the sense of self. Walls are a sort of boundary not only to protect the human being from the environmental factors or other threatening elements to his existence, but also a sort of territoriality. Through this boundary human separates himself from nature and cosmos as a way of marking his own existence. As a result, walls become, a “territorial delineator” that separates but at the same time connects human being with the surrounding. The wall, as the boundary of human environment and environment, shapes the wind and create an experience, which is auditory and tactile in nature, through reflection of sound of the wind and direct contact by passive touch.

The wall itself is a vertical surface, which provides division of space or support when it is part of the structural system. At the same time, it separates the ground from roof. Walls define closeness and density of movement. Through their spatial configuration, they define the amount and direction of circulation in its users. However, most importantly the wall sets a limit between self and others, as a result defines the level of intimacy and sociability through form and configuration.

*“Each individual, in his place, is securely confined to a cell from where he can be seen from the front by the supervisor, but the side walls prevent him from coming into contact with his companions. He is seen, but he does not see; he is the object of information, never a subject in communication.” (Foucault, 1995).*

Even though the wall sets a limit from others, by creating openings it provide a continuous visual contact with other spaces or people, at the same time provides ventilation and indirect light contact. It creates openness by providing spatial interactions, but intimacy at the same time.



Figure 28 - Muller House by the Architect Adolf Loos (Colomina, 2017)

The wall does not define function in space. Its role is to regulate movements and relations of people. Walls can be of different shapes and forms, separate or even penetrate volumes, framing spaces or even defining its limits, define a relationship with light and shadows. These planes can be canvases of memory through the use of nude materials, which are consumed naturally with time and can be in direct contact with human's touch.

#### **3.2.2.4. The Stairs / The Elevator / The Ramp**

The stairs are the vertical spine of a building. They connect the below with the above, earth with sky. The stairs make possible the exploration of the building vertically and connecting the two most vertical extreme points of the building along with the horizontality.

*"Verticality is ensured by the polarity of cellar and attic, the marks of which are so deep that, in a way, they open up two very different perspectives for a phenomenology of the imagination. Indeed it is possible, almost without commentary, to oppose the rationality of the roof to the irrationality of the cellar." (Bachelard, 2014)*

Through this verticality the stairs defy gravity. While ascending the stairs, there is present a psychological fear of climbing a structure on air and while descending a psychological danger of falling. While descending stairs requires a lot more focus than ascending, as a result, this is translated in higher awareness of bodily movements. Moving in the vertical spine of the building, from the existential aspect, is considered as an act of going towards death "An existential mode of being-in-the-world is documented in the phenomenon of falling" (Heidegger, *Martin Heidegger: Basic Writings*, 1977).



Figure 29 - Sequence from Music Video of "Month of Sundays" by Metronomy (Metronomy, 2014)

Stairs can carry secrets, too. They can serve as a wardrobe, provide shelves, or under it another hidden activity might happen through the placement of furniture. Different structure of stairs provide a different pattern of movement, while different materiality provide a different sensorial experience, especially through auditory information.

Stairs are the modulator of time. This is closely related with the concept of rhythm, since physically they are built according to a rhythm. Rhythm on the other hand is an organising power as well as a producer of meaning. The architectural rhythm they imply is very much associated with body movement and its memory. According to Merleau-Ponty, the experiences of our own bodies are a gestalt and our space perception is related to body schema, which is related to a sequence of movement experienced over time. Through rhythm and movement we become more aware of our own body.

The staircase is a vertical disclosure, which leads to potential directions as up and down and horizontally to the floors. According to Bachelard, there is a tendency in architecture of losing its verticality, by this, it does not imply the rise of building in height, but concerning the exploration method, which through the presence of the elevator as a strict schedule the exploration method is limited to the horizontal. The elevator discloses floors as a list of numbers and functions as a moving hall. Our body is not moving and as a result, we are not very aware of moving in verticality. The first elevator was created as a machine to imitate the divine and entertain others, in the form of "deus ex machina". While the ramp is the creator of the scenography. It is an element of elevating our body slowly, by directing us towards the sky and leaving unknown the end of it. It makes us conscious of gravity and friction. The ramp is an instrument of equal access for all, which opposes exclusion and defeats limitations.

The staircase is not just a vertical connection of different floors, but is a space itself that might obtain various characteristics, according to its composition. It can be a space that allows secondary functions to develop along its way, providing continual visual contact in order for the vertical dislocation to be gradual and natural.

### **3.2.2.5. Roof**

The roof provides an important role for obtaining shelter and a sense of security, not only in physical terms but also psychological. Psychologically, man relates the roof with his/her house since its primitive geometry was designed in such shape. The roof is a component for defining and connecting underneath with over. It serves as a closure to provide shelter, defining the vertical limits of body's space, at the same time perceptual possibilities. Shelter is a necessity to overcome the sense of fears and insecurity to the outside world and to extend his sense of being. As a result, the role of the roof is as a content of symbol and geometric shapes. One of the concerns of Postmodernism was the disappearance of the roof during modernism, considering as a symbol related with the concept that a home should represent its function from the façade of the building. Following this concern, the missing presence of the roof did not provide the mental representation of a home. However, the concept of dwelling does not imply only the presence of roof.

*“The mass-forms possessing a pronounced figure-character have been traditionally used to represent particular “worlds. The hemisphere, the cylinder and related bodies on polygonal planes, are very common in sacred architecture. The round towers of mediaeval castles emphasize the impregnable character of the building. While a pyramidal or thatched roof stresses the concentration of the mass, the flat roof preserves the parallelepiped. In our time the flat roof is employed to facilitate the co-ordination of the mass-elements.”*  
(Norberg-Schulz C. , Intentions in Architecture, 1966)

Since its primary function is to provide shelter, the absence of the roof does not provide the sense of the home. Along to this, the sense of belonging and dignity is lost. By providing openings, a connection with sky and natural light can be accomplished. As in Japanese Architecture, an important feature is the relation of daylight to darkness. Providing shadow plays through the roof of a building affects atmosphere of the interior space. “We find beauty not in the thing itself but in the patterns of shadows, the light and the darkness, that one thing against another creates... Were it not for shadows, there would be no beauty.” (Tanizaki, 1977)

In Tadao Ando's architecture, an element that defines his architecture is relation with the sky, which is considered as a spatial-structural element. When the sky produces sounds, by providing a direct contact to it, the internal structure of the building echoes. The shadows created by framing the sky, interacting with the three dimensional volumes in the interior create a dramatic and complex scenery in space.

### **3.2.2.6. Corridor**

The corridor can be considered as a transitory area, since it is an extruded doorway leading the movement to other spaces or connecting it with the outside. Since it functions as a transitory space it is associated with fears of being lost and disoriented. At the same time, it is a space that cuts through a system of spaces creating a sort of harmony in the rhythmic dispersion of spaces. In Feng Shui, "Qi" (• ) or "ch'i", which is energy, is one of the most important elements of designing spaces. It is important for the movement of this energy to be smooth. In narrow and long corridors this energy is fast moving which leads to deteriorated energy. As a result, these sorts of corridors, especially those that have spaces spread on both of the corridor's sides are considered as "bad" spaces. These type of corridors are very rare in Chinese architecture, or in many cases in order for the "Qi" to maintain its movement in space, the walls or ceiling are covered with mirrors for it to move in a zigzag way. "Narrow corridors with no doors or windows will only allow the chi to move rapidly from one end of the corridor to another. This means energy moves faster than we'd like, and we must find a way to slow it down." (Vasile, 2006)

The corridor can be physical when it is formed by the combination of walls and roof, or only by walls, such as in Asia, where walls that lead to buildings to create orientation and define transition. However, corridors can be visual, while leading vision towards important elements and framing them.

The primary important component in Japanese architecture is the relation between buildings, buildings with natural environment and the relation between spaces. It is important that the passage from one space to another should have a continuity and the boundary zones must be blurred. As a result, the transitory zones remain the key aspect in Japanese architecture. The term "En" (• ) is used for this intermediate zones and its meaning is "edge" and "connection". Usually this term is used when two people fall in love in silence. Therefore, to "En" another additional feature can be presented is destiny, which translated to architectural context, is the effect of time to the building. First, let us understand the meaning of these transitory zones in Japanese tradition.



Figure 30 – Visual Corridor in Lu's Salt Merchant House, Yangzhou, China  
Source: <https://www.trip.com/travel-guide/attraction/yangzhou/residence-of-salt-merchants-lu-82395>

The term “mu” in Japanese language gives a clearer description of these zones, which is translated as “emptiness” or “void”. The character if combined to other characters means as something is erasing and put in order to accommodate a new structure. From attachment, it goes to non-attachment, as an extension towards the horizon of earth and sky. Isozaki in 1978 proposed an installation in Paris entitled *Ma: Space-Time in Japan*. Through this work, he presented “hashi” which means bridge and edge, at the same time “ma” is the space between edges.

All of these elements provide the architectural experience of a space, which is depended on the level of relation of the perceiver to them. These elements do not provide experience separately, but in totality as a system, providing the level of psychological and physical comfort to that specific place, to form a definition for the significance of space. The connection of the perceiver with these elements is significant especially in residential environment, as a space where time and space provide a significant meaning to the perceiver.





Figure 31 - Key Phenomenological Aspects of Architectural Elements

### 3.2.3. House and Home

In order to provide an understanding of human's existence, it is important to analyse the definitions of “home” and “house”, as the most meaningful place to human experience. Primary, place is an existential space, where particular activities happen and serve as a point of departure, to orient ourselves and recognize the environment. While, existential space is a system of perceptual schemata and cannot be considered as separate, but as a series of spaces. Domestic space is the starting point of the understanding of “the being-in-the-world” and provides the fundamental concept in Heidegger's philosophy.

Dwelling becomes a setting into work of truth and a means of making the world visible. It is through the sensuous qualities of space that contribute to the poetic quality, which is essential in dwelling. By considering these two as separate entities, it is firstly emphasized the importance of language in providing a relation between being and the essence of being. In continuity to this, Heidegger uses metaphors, “metaphoric of proximity”, which are associated with being and are given values such as shelter, house, neighbouring, etc. In this form, he makes the house thematic.

*“Metaphors may help us to construct a conceptual image of matters, affairs, and situations that are difficult to describe in a more rational way. Metaphors are pervasive, not only in everyday language and thought, but also in action and everyday activities. We find ourselves using metaphors because they already mean something to us and to those around us.” (Dekkers, 2011)*

According to Heidegger, house is considered as a space of estrangement, related to the concept of homelessness, or an alienating space. He relates this concept to modernity, especially from the use of technology.

*“By making the house thematic, Heidegger identifies the figure that organizes the tradition he attempts to dismantle, but in the end he fails to dismantle the house. On the contrary, he repeatedly advocates to return to a it, a withdrawal to the primal shelter, the site of unmediated presence, in order to take refuge from the modern which is to say technological-age of representation that is condemned in as much as it produces a generalized “homelessness”. (Wigley, 1993)*

Heidegger uses two concepts, “*Heimlich*” and “*unheimlich*” to describe the difference between these two entities. “*Heimlich*” in German language means familiarity, domestic, hidden and secret; while “*unheimlich*” is something that became estranged, once hidden and secret became revealed. Both terms go back to the origin of uncanny, which is the connection between the familiar and the unfamiliar. Is the anxiety from “one no longer feels at home in his most familiar environment.” (Wigley, 1993)

From this, we can define that “home” and “house” defer in terms of familiarity and level of existential meaning. Dekkers considers “home” as not a fixed concept, which represents: “one’s own house, one’s own body, psychological environment and a spiritual dimension, in particular, the origin of human existence.” (Dekkers, 2011) On the other hand, house is can be a space of exclusion, which controls one’s freedom.

“Home” is not a physical space but a psychological one, a social phenomenon. While house is a shell and protector, which provides the basic need of human for existence, but not necessarily provides security or an intimate level of connection. Home, on the other

hand, obtains an existential meaning by experience and the multi-dimensional atmosphere. It is not simply the building but a condition that integrates memories, desires, fears, past and present, provide us privacy and intimacy. Being at home is being in the world. It is a projection of human existence and a point of reference in landscape, which provides the sense of fulfilment and understanding of oneself through its familiarity, intimacy, secretness and togetherness. Home itself organizes the outside from the inside, which enables to define a different territory with the entrance as the boundary between interior and exterior.

*“Home is an individualized dwelling, and the means of this subtle personalization seem to be outside our notion of architecture. Dwelling, a house, is the container, the shell for home. The substance of home is secreted, as it were, upon the framework of the dwelling by the dweller. Home is an expression of personality and family and their very unique patterns of life. Consequently, the essence of home is closer to life itself than to artefact”*  
(Pallasmaa, *Space and Image in Andrej Tarkovsky's Hostalghia*, 1992)

Gaston Bachelard, introduces the concept of “topoanalysis”, which is “the systematic psychological study of the sites of our intimate lives”. (Bachelard, 2014) Proceeding with this concept, memories of the past obtained from the indoor spaces of a house are still current in the present, as part of the experience. The concept of “topoanalysis” is related to the concept of *topophilia*, which consists of the examination of the intimate spaces of the house. The body preserves more memories than the mind through body experiences and personal poetic images. In Gaston Bachelard, “Poetics of space”, this concept is seen in the spaces and objects of the house as a psychoanalytical process, for instance, the attic as a container of pleasant memories and the cellar as a storage of unpleasant memories. Alternatively, even the table is seen as a symbolic object, which gathers people and organizes the activities. On the other hand, even the hearth of the house, now is replaced with the TV, functions as a central collective space. Therefore, home is not just a building but also a condition, which deals with memory, consciousness and unconsciousness. Home is the space of privacy and secrets. Bachelard related this to the fact that all persons have a private or secret corner in the house. Even the furniture, such as cupboards and wardrobes are intimate places for storing secrets. According to Pallasmaa, the problem with the contemporary cities is that there are no secret places; through their structure, all is visible through the transparent facades. Meanwhile a mediaeval town, with its labyrinth passages they stimulate our imagination and fill our expectations with the action of surprise.

The concept of home and body as key factors of experience is seen in several architects' approach, such as in Peter Zumthor. He relates architectural experience to memories from childhood, which he considers as “lost architecture”. These memories make the

reservoir of architectural experience. (Zumthor, *Thinking Architecture*, 1998) All of these “memories” can become part of the experience and obtain a meaning through sensoriality and body movement. According to Peter Zumthor, memories of childhood, the lost architecture, contain the deepest architectural experience and are the reservoir of architectural atmosphere. To be moved by architecture is related to the first impression given by a certain space, an intuitive impression in emotional and physical terms, which is provided by atmosphere. It is through atmosphere that it is obtained the whole experience of space.

The domestic space produces a narrative to child’s experience, considered as a prior state of being. In the writings of the poet Rainer Maria Rilke, it is distinguished the importance of childhood’s experience in spatial perception. The subjects in space produce a poetic relation between child and space. This domestic everyday space for a child is not fixed but is under the force of imagination and provides the foundation for his/her imagination. The child’s room, the *kinderstube*<sup>6</sup>, is the origin of being where he/she encounters autonomy in every aspect.

*“Childhood becomes the site of autonomy: stasis and action (sitting/battling), containment and expansion (parlour/forest), and even the prosaic and the epic (children/heroes). The magic of childhood is the simultaneity of each of these, where the most remarkable springs forth from the unremarkable.” (Relph, 2008)*

“Insiderness” and “outsiderness” are two dialectical metaphors related to domain, philosophically related to “being” and “non-being”. They set up an immediate relationship between the person and the world. According to Bachelard these two are understood by imagination and define the level of alienation in a domestic space. Similarly, Edward Relph defines “place” and “placelessness” as defined by the unconsciousness commitment to a place in different levels of intensities. These levels of intensities depend on the physical features of space and the type of activities taking place. Relph defines various levels of intensity to a place that define the level of commitment to a place:

“*Relph, 2008*”

is equal to homelessness. It defines a total detachment to a specific space, which appears meaningless and provides a state of alienation between a

<sup>6</sup> Translation from german language *kinderstube* is nursery. The term used by Rainer Maria Rilke to express child’s space.

person and a space. The person does not consider belonging to that space.

is the state of detachment to a certain space but an intellectual attitude is adopted to the object and the activities happening to that space.

is the unselfconscious attitude in which places are experienced as a little more than the background or setting for activities and are quite incidental to those activities. It is a part of the activity but of no attributable forces.

is a secondhand experience. The level of insideness happens without being in a place but it has an involvement. (For ex. When we read a book we get involved through a felt experience of the writer without a direct experience). In this case, the level of the involvement is made personal.

s is being in a place and absorbing its characteristics. Through observations, the place is seen as a set of objects, views and activities. Through the direct involvement with the place, the objects have a significance and meaning to the person.

is to be opened to a place, feel it, know and respect its symbols and the qualities of a space become emotional and there is empathetic involvement to it. The most fundamental form of insideness is . A form of identity with the place, identified with home. The place is part of the person existence and vice versa. The person is identified with that place.

The levels of "insideness" and "outsideness" define the human behaviour and the emotional degree to a specific space, leading to various spatial experiences. Being on the centre of a perceptual space leads to the creation of personal space. It is through the densities of experiences that the relation between space and person is defined. These experiences include the human's level of interaction with the environment and along, the density of the feeling of belonging.

Home is a distinctive territory which does not serve only for accommodation or self-sufficiency but to expand awareness. Architectural elements change their qualities under the effect of time, memories last longer in human's consciousness. Throughout history, human beings have continuously attempted to create the "perfect" house. As a response to these constants attempts the artist Gordon Matta-Clark creates "anarchitecture" as a failure of society to provide the appropriate housing. In his works he creates cuts in floors, walls and roof by creating a void which is the central space of focus. In this form, he considers these surfaces as limits and through their destruction allows the observers to



Figure 32 - Gordon Matta Sequences of Works. On the left "Circus" (1973), ,on the right "Threshold" (1972) (Walker, 2009)

investigate the composing information not meant to be seen. This void creates a continuity and interruption at the same time. Firstly, the created abyss allows experiencing the building in continuum of the underground with the sky. On the other hand, the void allows sensing the building and its components psychologically and kinaesthetically. By interrupting transitory spaces, enhances the psychological awareness of the connection these spaces provide and bodily awareness through untypical movements. In this form, is emphasized the power of the void and what is absent.

Architectural elements together create a continuum architecture. These elements do not have meanings isolated from one another. It is the in-between space that gives meaning to the whole.

*“The work of the mason, who assembles, is the work that matters. Thus the adjoining bricks, in a book, should not be less visible than the new brick, which is the book. What is offered the reader, in fact, cannot be an element, but must be the ensemble in which it is inserted: it is the whole human assemblage and edifice, which must be, not just a pile of scraps, but rather a self-consciousness.”* (Bataille, 2001)

On the other hand, this meaning cannot be obtained without the body and its movements. Through the term “body-subject”, Merleau-Ponty rejects the Cartesian Dualism, which considers the body in the same category with objects, as defined from the physical sciences. Human body is a subject identified by its consciousness, differing from other beings. The subject and the objects should be considered as a whole, the world is expressed by body and simultaneously the world articulates body. It is through objects that it is given an intermediate connection with space. The capacity of the human mind is to find modes of representing the world through consciousness. Objects become “a centre of action”, which responds to the person rather than react with him/her. “Objects which surround my body reflect its possible action upon them.” (Landes, 2013) It is through body movement that architectural elements obtain a meaning, in “wholeness”.

*“Both the human body and architecture prompt the internal... Both of them otherwise constitute a form of “material flow” that through their machinic capacities, regulate chaos in order to codify knowledge of architecture.”* (Ballantyne & Smith, 2012)

### 3.2.4. Corporality

The human body plays an important role in the process of interaction with the architectural environment. It is understood as an essential aspect of perception. Through the performance of the vital actions and interactions with the built environment the perceiver realizes himself as a living entity, differing from animals.

Human body has different capacities from those of animals, which involve practical and logical actions. It is through the relationship between others and things that these capacities are identified. The role of the body is to represent the self and that the body itself should be recognized in its whole expressionism and functionality. Without the embodiment of “the spirit”, it becomes meaningless. By recognizing the body, personal freedom is obtained and along the freedom of the owned body. This leads to the extension of the human existence in two different extremes: “vitalism” and other side “cupio dissolvi<sup>7</sup>”, translated in the dual structure of the body, celebrating the body and producing its own destruction, living and dying.

One of the main paradoxes of body in phenomenology is the two contradictory modes of body, the mode of presence and of absence. This deals with the fact that body is firstly the representation of our inner self, our subjectivity, but it contradicts ourselves through the objectivity of the physical environment through events independent to our will. However, independently from the materiality of space, it is through the “signals” obtained through our body and our “inner” body that we experience space. Merleau-Ponty developed the notion of “flesh” as the ontology of the visible and the invisible.

*“A curious Fleshism (carnisme) inspires this final avatar of phenomenology and plunges it into the mystery of incarnation. It is both a pious and a sensual notion, a mixture of sensuality and religion, without which, flesh could not stand up by itself.” (Deleuze & Guattari, 1994)*

Body, according to Merleau-Ponty, is the construction of consciousness and not just a physical body as defined in medicine and science, without which consciousness does not

<sup>7</sup> “Cupio dissolvi (κῦπιο ... locuz. lat. (owner "desire to be dissolved"). - An expression that has its origin in Saint Paul, who in the 1st letter to the Philippians writes, according to the text of the Vulgate, Desiderium habens dissolvi et cum Christo esse, translated. literal of the gr. τὴν ἐπιθυμίαν ἔχων εἰς τὸ ἀναλῦσαι καὶ σὺν Χριστῷ εἶναι: where you dissolve and ἀναλῦσαι express the concept of the dissolution of the soul from the body and therefore of death. The phrase returns frequently in Latin patristics, as a direct quotation or as a reminiscence, even with formal variants, among which the one stabilized in use as cupio dissolvi etc. predominates, which in this form probably dates back to biblical versions prior to the Vulgate (cf. in fact Tertullian, De patientia 9, 5: "Cupio dissolvi et esse cum Christo, dicit Apostolus"). Over time, however, the original sense of cupio dissolvi has gradually transformed, to generally indicate a desire for mystical annihilation in Christ, and the motto has been taken as a symbol of aspiration to an ascetic life, of renunciation of one's own personality, and subsequently adapted also to more secular and profane meanings and uses, expressing, as appropriate, the refusal of existence, the desire for extenuation, the masochistic desire for self-destruction, and the like.” (Treccani)

exist. It is through the interaction with other bodies and environment that the person knows the world and experiences it. Its condition and its diverse capacities define embodiment. "The flesh is a mirror phenomenon and the mirror is an extension of my relation with my body." (Merleau-Ponty, 1964) This concept goes against the concept of Descartes, "I think, therefore I am", considering thinking as a process not linked to body. According to Ponty, "a cartesian does not see himself in the mirror. He sees the image of the body caused by reflection that can be identified by a thinking subject, a cogito". (Merleau-Ponty & Smith, *The Merleau-Ponty Aesthetics Reader: Philosophy and Painting*, 1993)

Body and person have a dual relationship: On one side, body is the representation of a person and his experiences and on the other side awareness to these experiences is not made available only through the presence of a body. The exact term used for the body is corporality from the discipline of Philosophical Anthropology. This term expresses the unity of the body and self of an individual. Body refers only to the physical part of the person; meanwhile Corporality refers to the human subjectivity in a physical body, giving a personal identity to the human being. According to Husserl there are two types of body: "Körper" which is the measurable and objectifiable body (the body that I have), and "Leib" is the living body, which is the centre of all experiences and inter-subjective relations (the body that I am). By this it is understood that the bodily sensation is not only an experience of owning a body, but it is the totality of self. There is a unity of body and consciousness. Confronting to space, the human body cannot be only Körper, but it must be conscious and a living body (Leib). From this condition he experiences the qualities of space.

*"When I stand here, then I only stand here as a human insofar as I am simultaneously there by the window and, for example, outside on the street and in town, briefly put: I am in a world. If I go to the door, then I do not transport my body to the door, rather I alter my residency ("bodying" ["Leiben"]), the always already extant proximity and distance of the things; the breadth and narrowness wherein they appear changes."* (Mitchell A. , 2010)

Throughout history, in the discipline of architecture, body has been considered as a point of reference for creating spaces. Historical evidence shows that there are strong associations between the role of architecture and the human body, considering that this role has remained for the most part representational, towards the dualistic approach, where mind and body are considered as separate, in support of a purely visual architecture. Starting with Greek Antiquity, body was seen as an entity of universal harmony due to the idea that it was considered as a system of perfect proportions created by God. As a result, body was considered to be the mediator between the microcosm of human being and the macrocosm of the universe. For the Greek culture, creating an architecture based on the human's body proportions was a sort of worship of God. As a



result, the body was considered as a metaphor or as the perfect model to be taken in consideration in creating architectural elements that were in accordance to body's proportions. This application was especially seen in the Greek temples through the use of Doric Orders, while its proportions suggested the strength and beauty of the male human body. Meanwhile Corinthian and Ionic orders, derived by Ionian and Corinthian culture represented the female body. The ideal building was the one that was seen perfect as a whole with symmetrical parts in the correct proportions.

The same concept was followed by Vitruvius, who highlighted the body-temple analogue: "Without symmetry and proportion there can be no principles in the design of any temple; that is, if there is no precise relation between its members, as in the case of those of a well-shaped human body." (Bass, 2019) During Middle Age and Renaissance the search of geometrical perfection in the human body and transferring it to buildings continued. Until the first modulator was conceived by Leonardo Da Vinci, who created the Vitruvian Man, which was the idealized proportions for both body and architecture and brought into focus the notion of symmetry.

*"Similarly, in the members of a temple there ought to be the greatest harmony in the symmetrical relations of the different parts to the general magnitude of the whole. Then again, in the human body the central point is naturally the navel. For if a man can be placed flat on his back, with his hands and feet extended, and a pair of compasses centered at his navel, the finger and toes of his two hands and feet will touch the circumference of a circle described therefrom. And just as the human body yields a circular outline, so too a square figure may be found from it. For if we measure the distance from the soles of the feet to the top of the head, and then apply that measure to the outstretched arms, the breadth will be found to be the same as the height, as in the case of plane surfaces which are completely square."* (Vitruvius, Delphi Complete Works of Vitruvius, 2019)

The idea of corporality in these periods was to create architecture as the recreation of the human body and appreciating the ideas of the Classical Greek writers. Leon Battista Alberti considered architecture as a metaphor of the human body and vice versa. According to him, geometry was the humanization of space and beauty was found through numbers and proportions. Following this discussion, Filarete supported the idea that building had to correspond with human body parts, for instance columns to bones, infill walls to ligaments, finish to the skin, etc. It is evident that the role of body in architectural approach was representational in support of a purely visual architecture, where mind and body are considered to be separate, and body is used as a metaphor for creating architecture.

The anthropomorphic principles of Vitruvius were followed in later periods not only in architectural design, but also in the outdoor spaces. The layout of the gardens in country houses, usually during Baroque period, were organised in accordance with the position of the limbs in the human body. The house was usually positioned in the part of the head, as an important part which represented thinking, while the orchard coincided with the chest or the heart, considered as a more sensorial and intimate space. An organisation in such system was considered as the order of universe with its representation through geometry.

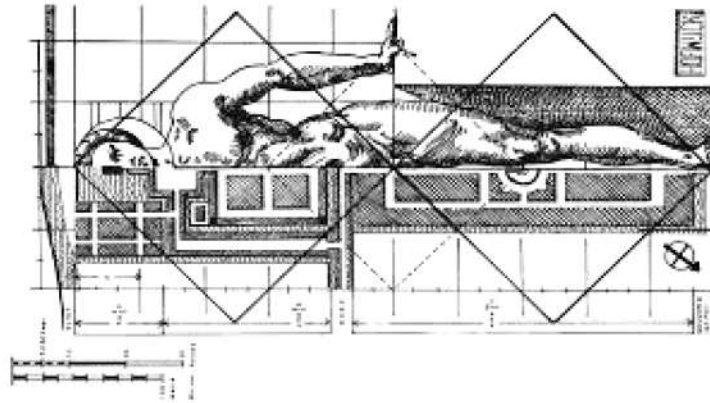


Figure 33 - Hofwijck, projected upon the Vitruvian body (from the 1547 edition of Martin and Gouljon) (Perez-Gomez & Parcell, Chora : Intervals in the Philosophy, 1994)

These approaches prioritized the visual sense over other senses and considered the body as an object. In this case the body is not considered as “Lieb” but as “Körper”. Spaces are experienced when body is “lieb”, or also known as “soma”, which provides the one person’s point of view and experience. Through soma it is obtained the multi-sensorial information, which is directly depended on the movements in space, and does not necessarily mean to be a conscious action. For instance, during sleep, soma finds unconsciously the edge of the bed, in order to maintain its boundary and to monitor itself. To distinguish soma from body, Tadao Ando brings the term “shintai”, by which there is no distance between mind and body. It represents the union of spirit and flesh which are in a dynamic relationship with the world. According to Ando, “it is only the “shintai” that builds and understand architecture.

*“The “shintai” is a sentient being that responds to the world...Architecture must also be understood through the sense of shintai. “Shintai” derives from the East-Asian somatic theory and practice, specifically its notion derives from Chinese word, “shenti” which denotes the living soma and is formed by two characters: “shen” and “ti”. The character itself, “shen” is the symbolizes the whole person in traditional Chinese, and has its origin from a pregnant woman’s body, which represents something dynamic and directionally asymmetrical. The notion “shenti” symbolizes the moral and spirituality that should be cultivated rather than the material.” (Shusterman, 2012)*

Related to the concept of corporality, Ludwig Wittgenstein developed the basic foundation of creating the notion of somaesthetics, according to whom is the one's having an aesthetic feeling for one's body. This suggests the appreciation of sensations and sensory aesthetics. Achieving somatic feeling is depended from mental processes and emotions. Furthermore, the use of senses provides the ability to sense one's body.

Later on, in modernism, corporality in architecture took another direction. In the case of the modulator of Le Corbusier, the body standardized space and its components. A healthy white male with harmonious measurements was defined as the appropriate human scale for applying architecture. Once more, the ideal body would define proportions of space by not considering other bodies which differ in characteristics and disabilities. Due to this, the space would not be shaped by one standardized body but it resulted to correct the body. It should be emphasized that there must not be a standard that defines body, because bodies are different and have specific characteristics. Architects should recognize the diversities of bodies, their needs and capacities, and their plasticity. By using body as metaphor defines the "perfect" image of the body through the exact proportions translated in numbers and geometry. In this case it is architecture that tries to shape the human body, rather than the body shaping architecture. According to Rob Imre modern and postmodern architectural design considers body subordinate to the mind; there is a latent idea of the body, rather than a wish to explore and consider its experience.

*"Le Corbusier, however was a great artistic talent with a molding hand, and a tremendous sense of materiality, plasticity and gravity, all of which prevented his architecture from turning into sensory reductions. However, the reductive bias becomes devastating in his urbanistic projects."* (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2005)

There are several approaches that do the contrary of adopting body to architecture. Ergonomics is the study of human proportions, abilities, limitations to have functional, safe and comfortable spaces. The study takes in consideration individual's body size, skills, sensory abilities and attitudes apart from the body size varieties. In this case, it is not present only one modulator but several body types. The discipline uses environmental physics, such as noise, heat, light, radiation and vibration body systems, mainly hearing, vision and sensations. Furthermore, the data used to provide these types of spaces is applied psychology and social psychology to understand skills of group of individuals, communication between groups, behaviour, etc. Ergonomics aims to emphasize the interaction among humans and other elements of space, in order to optimize well-being and human performance in architectural spaces. This is why it is mainly concentrated in workspaces. Two key points in Ergonomics are Anthropometry and Kinesiology.



According to this concept body does not have an image. It leads to rethinking of the appearance and behaviour of the body. Its capacities are not linked to the set of perfect proportions but to the individual experiences of embodiment. For instance, in this research the body of the blind offers a unique perspective of embodiment and interaction with other bodies and space. Perception is not based on the information obtained by the physical body but how the body inhabits space. Each body has different set of traits of experiencing the world and brings a different knowledge of perceiving space.

*“If bodies violate the purity of architectural spaces, one might rightly wonder about the reverse: the violence inflicted by narrow corridors on large crowds, the symbolic/physical violence of building on users. Violence exercised by and through space is spatial torture.”*  
(Tschumi B. , Architecture and Disjunction, 1996)

#### **3.2.4.1. Body Schema, Proprioception and Kinaesthesia**

In order to understand bodily experience, it is necessary to understand three notions of body: body schema, proprioception and kinaesthesia. These are linked to body image, body representation and awareness of the owned body. All of these notions are interlocked and indicate the level of body experience in architectural spaces and their understanding is important for the comprehension of the interaction of the human mind and body functions to produce self-movement and of being aware of an environment.

Body schema or “schéma corporel” is the awareness of one person of his/her own body’s position, posture and capabilities. Through body schema is provided the knowledge of body to perform body tasks and is provided the consciousness of the three dimensionality of space. It is linked with the body possibilities and defines body habits of being. According to Merleau-Ponty, body schema is not only physical but also psychological. In order to demonstrate this dual character of body representation, he gives the example of the syndrome of the phantom limb, which is the ability to feel sensations and even pain in a limb or limbs that do no longer exist. It has been observed that some patients who went through the process of limb amputation, feel the amputated limb as present and even are able to identify its posture, movement and the specific tasks it performs. The explanation to this phenomena is that the limb is over-represented in the somatosensory cortex, in such way that its sensation may survive longer because of the ability of the brain to capture certain signals.

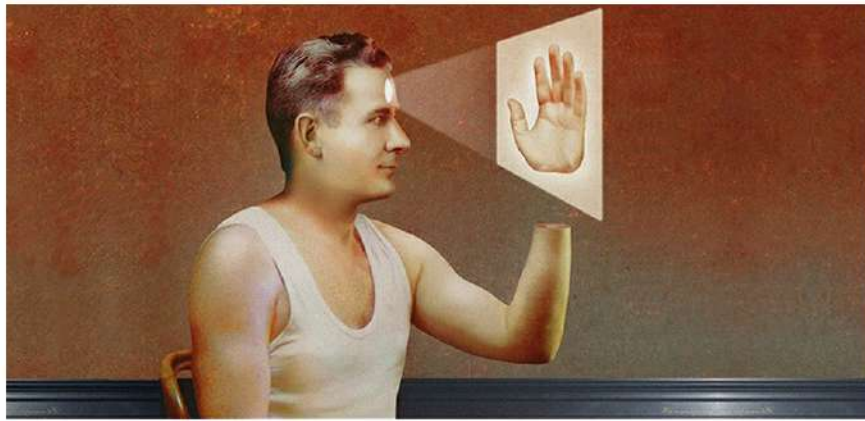


Figure 35 – The Phantom Limb, Source: [www.blommestijn.com](http://www.blommestijn.com)

From this example, we can define the difference of proprioception to body schema. Proprioception is the awareness of body limbs and parts, and ability to relate them to space and time. It is actually through proprioception that body schema is created and is considered as a sense even though it is not considered in the traditional categorization of the senses. This sense works through the communication of muscles and ligaments with the central nervous system and the brain through proprioceptors. It provides the aid for body balance and prevents injuries and for perceiving him/herself vertically, gravitating, ascending and standing. By being aware of the body, we become aware of the environment and as a result, define existence through movement. Movement on the other hand is an important component of human understanding of the perceived world.

	Perception	Proprioception
Obtained	From sense organs when body is active. They adjust to the environment and explore to obtain information	Occurs when the person performs with any motor system of the body
Imposed	Arises from sense organs when are passive, when there is simulation.	Occurs when members of the body move and as a result the joints of body are stimulated.

Table 2 - Differences between Perception and Proprioception

Body posture indicate the perceptual experience, while it adopts to the environment, gives meaning to it and creates its own habits and skills. Furthermore, proprioception is provided through movement and kinaesthesia, which is being aware of the movement of the body and limbs. "Proprioception is the innate and intrinsic position sense that I have with respect to my limbs and overall posture. It is the 'sixth sense that allows me to know whether my legs are crossed or not, without looking at them". (Gallagher & Zahavi, 2012)

Human has the capability of being aware when body is in motion, a kinaesthetic awareness or kinaesthesia, which forms the basis of our ability to be conscious about our bodies and how to move them. The difference between proprioception and kinaesthesia is that through kinaesthesia, we feel the sense of the qualitative dynamics of movements, its directions, tensions, order, etc; and proprioception creates the foundation for the understanding of our bodies and its relation to space and time. Therefore, provides us the experience of movement and the understanding of the capacity of body movements. By being aware of our own body, we become aware of our surrounding space and along we are aware of time. Movement is an important component of human understanding of the perceived world. This is linked with kinaesthesia, which is the sense of being aware of the body's capacities. The difference between proprioception and kinaesthesia is that proprioception is a cognitive process, which is provided even without being conscious, while kinaesthesia is more behavioural since it deals with movement, which means that body detects movement possibilities and through behaviour, tends to produce that movement.

*“Insisting that the essence of the human experience of architecture resided in bodily movement through space rather than stationary observation. Our sense of depth and thus our sense of space emerged through movement with a particular volume. Only by moving from place to place in the third dimension could one develop full spatial awareness.”* (Long, 2001)

The development of movement is a fundamental part of the expansion of human consciousness and of the social self in relation to other bodies and space. According to Merleau-Ponty, gestures are part of this development, including reflex gestures which are not only survival and expressive in function but are part of the adoption to the environment and situations. These gestures can be categorized in three main categories: reflex gestures, gestures of habits and practical skills, communicative gestures. These habits are part of the update of the body schema and are crucial to body's being-in-the-world. According to David Krell, “Merleau Ponty's body is not the Cartesian flesh cadaver, with its pliable springs and levers infinitely skilled. Merleau Ponty's theme is the kinaesthetic body that moves through the world that is its own, a world that is in some uncanny way itself flesh.” (Krell, 1997)

Analysing human movement became one of the focuses in the 1970's, giving a high importance to Kinesics, which approached the body in motion. Kinesics aims to dismantle body movements and interpret it by giving meanings. Body itself speaks its own language and creates a communication system with other bodies and space. One of the aspects of kinaesthesia is that it defines the social relation to other beings, such as religious

communities, wars, etc. through the emotional effects given by the rhythmic movements in group, named as the “rhythmic kinaesthetic simulation”.

Movements and gestures are quite present in the art of dance, as part of exploration of this relation of body and space. Butoh dance is a representative example of the exaggeration and appearance of these movements and gestures. From these exaggerations the body movements are transformed into grotesque aesthetic elements, such as by moving across the stage in low crouches, twisted limbs, or with the feet bent or in air. The twisting of the body, distortion of facial expressions and slow motion movements emphasize a grotesque quality of the body. Butoh dance aims to discover, explore and liberate aspects of the mind-body that have been suppressed by social conditions. The internal experience is transformed in a visible manifestation. Perception in Butoh dance is not relying in the sense of vision but to the whole experiencing of the body. There is no use of mirrors while practicing this dance. Butoh dancer Min Tanak describes: “We live with our bodies, and perceive the world, by keeping the eyes of our bodies open.” Visual stimuli lead to a prolonged attention and division of movement in many image sequences that lead to the suppression of other stimuli from the surrounding. Due to the fact that body movements in Butoh dance are not ordinary, certain parts of it may tremble, stiffen or jerk with distortions or twists. These are defined as “autogenic release” and as a passive experience since the body reaction is unexpected and not predicted. The term passive does not have a negative connotation, since the body is opened to all the stimuli from the outside and within. This process may lead the dancer towards a kind of psychosomatic unity of mind and body. This is an experience of finding oneself through the exploration of impulses and through the use of the senses. Perception in this case is no longer visual but kinaesthetic.

Body is not an isolated activity, but it is engaged to space. Therefore, space does not exist without the structure of the body and is articulated by its position and movement. As a result, space is the location of existence where existential orientation takes place. We no longer speak of body composed of flesh and bones, but as a body experienced during the act of living, the body of embodiment, which is experienced through quality and substance of space. “It is inadequate to say that my body is a form, that is to say a phenomenon in which the totality takes precedence over the parts.” (Merleau-Ponty, 2002) In this aspect, it is important to examine the nature of their lived experience in interaction with the environment. This involves their bodily experience, including experience obtained by the sensorial activity, and how the quality of architectural spaces indicates their existential meaning. “When the materiality of the body coincides with the materiality of space the



subjects “experience their own experience”. (Tschumi B. , Architecture and Disjunction, 1996)

### 3.2.4.2. Kinesphere

As well as Atmosphere<sup>8</sup>, which is the embodied sensitivity in environments and responsible for creating moods in perceiver, there are also personal spheres of human being, such as kinesphere, ecosphere and culturesphere (Stern, 2010). Kinesphere deals with kinesthetic qualities and movement of the body, while ecosphere with the sensorimotor interaction with the world, and culturesphere with the dialogue of self with the cultural world.

Atmosphere	Kinesphere	Ecosphere	Culturesphere
Embodied sensitivity to a felt ambience, moods, and dynamic changes	Affordances of kinesthetic and motor imagining within a body topography	Sensorimotor affordances of imagining interactions with the world	Dialogical affordances of narrative self in relation with the cultural world

Figure 36 – Atmosphere, Kinesphere, Ecosphere and Culturesphere (Grimshaw-Aagaard, Walther-Hansen, & Knakkegaard, 2019)

The notion of kinesphere was created by Rudolf Laban, who was concerned with the analysis of the architecture of movement. “The kinesphere is the sphere around the body whose periphery can be reached by easily extended limbs without stepping away from that place which is the point of support when standing on one foot.” (Laban, 2011) This is an invisible bubble in a form of an icosahedron or elliptical sphere. Its limits are the extension of the limbs and movements are generated with the body as a centre. The position of the sphere depends from the body shift and movements. Kinesphere is the structure of personal space and territory and firstly the perceiver explores this area, and then he investigates the architectural experience through body and vice versa. For dancers, body exploration and spatial behaviour is more natural since they are more aware of this kind of space and to the capacity of movement of limbs. Ignoring awareness of our bodies possibilities limits our extended possible experience of space. Every human being owns a kinesphere, which according to Laban is characterised by *shape* (choreutics) and *effort* (eukinetics). Shape is the quality of movement, while effort is its content.

<sup>8</sup> Atmosphere will be elaborated further in the same chapter.

The shape or choreutics of kinesphere is of three planes. The table plane, which is developed horizontally, conceding with spreading and enclosing as actions; the door plane, vertical plane, represented by movements as rising and descending; the wheel plane, sagittal plane, which separates the right part of the body with the left one. According to Judith Kestenberg (Davies, 2006), development of movements in childhood is made in steps, starting firstly with the horizontal plane, continuing with the vertical plane while developing equilibrium and finishing with the sagittal plane, through the actions of advancing and retrieving.

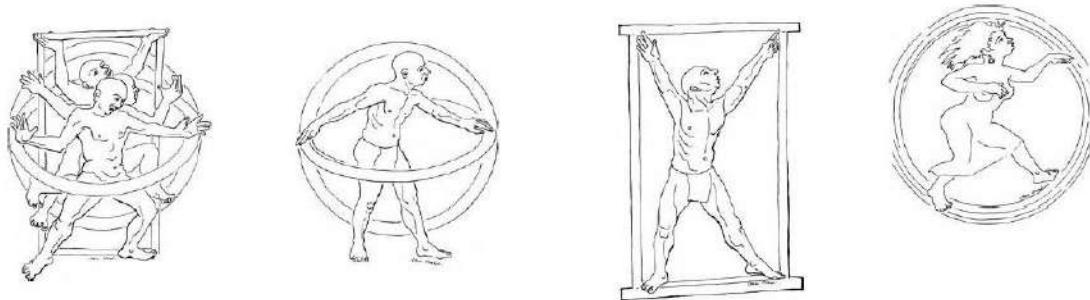


Figure 37 - Kinesphere Planes: Table Plane, Door Plane and Wheel Plane (Laban, 2011)

Architecture and dance both focus on the movements of the body. While dancers examine the possibilities of movements for expression, the architect analyses movements of bodies in space and confrontation to objects, and resolves space for organizing bodies. According to the choreographer William Forsythe “choreography is about organizing bodies in space, or you are organizing bodies with other bodies or a body with other bodies in an environment that is organized.” (Spier, 2005) His work, “Imagining Lines”, gives a system of language through movements, while creating geometric figures, which give several possibilities of spaces, created through the exploration of body movements.

Another fourth quality to Effort was added by Warren Lamb, who suggested Flow of Effort, associated to actions of freeing and binding. These types of movements are very present during childhood and gradually disappear when social interaction begins. In addition to this, he added flow of shape which operates in continuum, between growing and shrinking.

Effort Factor	Effort Element	Effort Element
Space	Direct	Indirect (Flexible)
Weight	Strong	Light

Time	Sudden (Quick)	Sustained
Flow	Bound	Free

Table 3 - Quality of Effort in Movement According to Warren Lamb (Laban, 2011)

Combination of efforts creates drives, which are associated to psychological effects. Possible combination of efforts can be:

Action Drive (Feeling): Weight + Space + Time

Passion Drive (Thinking): Weight + Time + Flow

Spell Drive (Trance-like): Weight + Space + Flow

Vision Drive (Out-of-body): Space + Time + Flow

Flow is an experience which is not obtained only through body movements, but in order to be reached, mind must be equally involved as body parts. This experience is reached through activities and spontaneous events. "Every flow activity provides a sense of discovery, a creative feeling of transporting the person into a new reality, pushing the person in a higher level of performance." (Csikszentmihalyi, 2008) Two important aspects of Flow are that firstly, it "takes place at the unconscious level" and secondly, "our own life condition is deeply entangled in the context of where it takes place". (Ballantyne & Smith, 2012) The nature of activities for providing Flow is of altering consciousness, such as vertigo in children, by which, reality is perceived differently and the sense of losing control dominates. The intensity of experience is defined "how much psychic entropy is caused". (Csikszentmihalyi, 2008)

These activities in time bring variable flows in time, creating several moods in architectural spaces. Such variables are brought through sensorial integration enhanced through movement. "Instead of fixed geometries we should see a sequent of moments made by different movements in which everything flows." (Ballantyne & Smith, 2012) Such moods are directly related to architectural quality which influence the type of movement of people and as a result their psychological conditions and human interaction translated in events.

Following the concept of Flow, Frederick Kiesler's interest was to create spaces, which would satisfy the psychic conditions of people, by creating dream-like atmospheres to "trigger a therapeutic release of unconscious energies." Kiesler creates images in-between imaginary and reality, through shock effect for converging reality with dreams, providing scenic atmospheres. This was translated in creating spaces that would provide free and automatic movement, in continuum to their surrounding environment.

Kiesler presented this idea of flows in architecture in his projects with the term “elastic space” for “freedom of movement”. He proposed “Endless Theatre” as an elastic architecture, which were a series of suspended platforms supported by elastic cables and embraced by a double shell, which would be used for projecting images. Through this approach, mobile and flexible spaces are provided in order to allow the adaption of the continuously changing needs of the crowd, considering a theatre as not a fixed space. “Soft and elastic, yield[ed] to pressure envelop[ed] one’s body continuously.” (Philips, 2017)

The use of the shell is present in most of his projects, and can be considered as a new concept of the organic brought in a collective environment. Furthermore, the use of shelter is an action for emphasizing it as an element that is not only existential but as an element constructed to differentiate human beings from each other and, simultaneously, an element of detachment from nature. Nature itself is shelter, it provides enclosure and protection – “trees, rocks, mountains, rivers, the ocean and the sky [were] all part of man’s shelter. They [were]...the archi-tectonics of the great structure of the seen and felt universe.” (Philips, 2017)

Considering nature as architecture, Kiesler brought the term “Biotechnique” in his theory, which is analysing the methods of nature’s construction to apply them to architecture, and understanding the interrelation of the human body to the environment, which can be physical, spiritual, social and mechanical.

*“It is now clear that the instinctive ability of ... man in general to build and to wear clothing has a dual root: a physiological as well as a psychological one: Physiologically arbitrary reflex motions of the body are in time, mechanized and standardized through our nervous system. Psychologically all animals, and especially man, living collectively, invariably learn by imitating.”*  
(Philips, 2017)

For providing this fusion, spatial continuity is the primary aspect, which includes, according to Kiesler, the reduction of joints in architecture, which he considered as elements of detachment. Another aspect is following the logic of construction of nature itself. Nature suggests the shape and method of creating spaces in fusion with man’s needs, such as cell division, which Kiesler applied in several works, such as The Endless House.

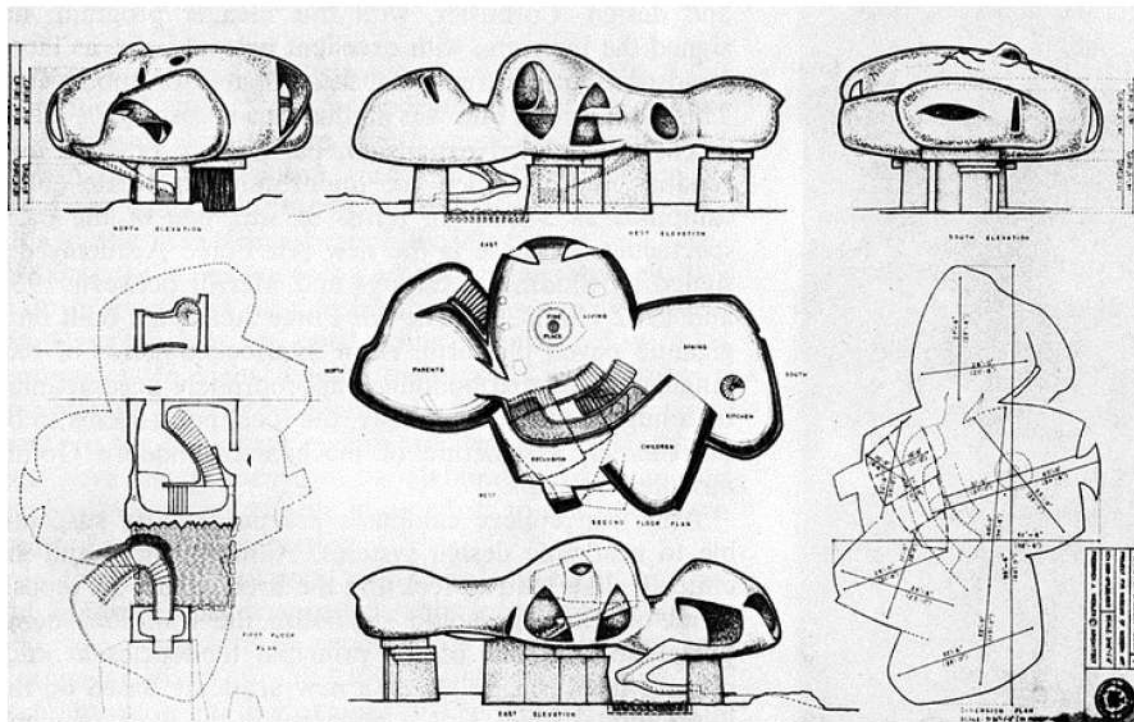


Figure 38 - "Endless House" drawings, F. Kiesler, 1967 (Foundation, 2021)

The Endless House was a new concept of dwelling which provided shelter as an organic system that responded to the social dynamics of the dwellers. The basic shape of the building is the egg, as a natural form that provides shelter and protection, considering the house as a womb. The areas are created by stretching the basic form and creating a series of cavernous spaces similar to shelters that nature provides, such as caves, nests or stones. Each of these spaces are furnished with natural light through abrasion like openings in the solid mass, functioning as windows or skylights, whose surface depended on the type of activity and its necessity for light. For instance, the children's playground and workshop areas were provided with minimal daylight and soundproof mass to create light and acoustic comfort, this one provided also through "Poché" spaces, which divided rooms from each other depending on their function. The dimensions of rooms, horizontally and vertically, depended on the nature of activity. The living room, as a gathering space was of a double height compared to other rooms. Continuum space was provided not only through the use of "Poché" spaces, but also through the use of flexible door screens. The Endless House not only provided an organic-like shelter, bringing its inhabitants closer to the natural structure, but aimed to excite memory through the illusionary effects of artificial lights which provided a scenic atmosphere, similar to The Endless Theatre. The lightning effects were provided through projections on sinuous enclosures which diffused coloured light in space. The effects created "prismatic kaleidoscope" due to the use of mirror convex devices placed on curvilinear walls. The visual images turned to psyche through lighting pulsation timed to body movements. "Durational flow is explored...as spatial flow, where interior and exterior, architectural figure and ground become temporal rather than

spatial conditions, and architecture becomes event rather than object.” (Philips, 2017) In this case, architectural quality is not provided not provided by fixed geometries, but by the sequences of body movements and when the sense of boundary of body is disintegrated in events and spaces which bring him closer to his/her natural environment physically and through memory.

### 3.2.4.3. Natural Environment

*“We belong to the category of mammals that spend part of their existence inside an artificial shelter. In this respect we differ from the monkeys – among whom the most highly developed make only rough adjustments to the place where they will spend a night – but resemble the numerous rodents whose elaborately constructed burrows serve as the centre of their territory and often as their food store. [ . . . ] According to a deep-rooted scientific tradition, prehistoric humans lived in caves. If this were true, it would suggest interesting comparisons with the bear and the badger, omnivorous and plantigrade like ourselves, but it would be more correct to suppose that although humans sometimes took advantage of caves when these were habitable, they lived in the open in the statistically overwhelming majority of cases and, from the time when records become available, in built shelters.” (Leroi-Gourhan, 1993)*

Human beings’ constant yearning for development in cognitive and spiritual means is a biological need, which is strongly related to his/her contact and relation to the natural environment. According to the recent developed hypothesis in biology, “biophilia” is the “innate tendency to focus on life and lifelike processes.” (Wilson, 1984) The natural environment is a space of Flow, which allows the body to explore its capacities and sensuality. Body as a physical entity is refined through memory and dreams, while nature provides both.

In architecture, the courtyard or garden is a space of pleasurability, stimulation and expression. The garden allows the fusion of “insideness” with “outsideness” functioning as a neutral area, which provides human connection to nature, while nature provides the balance between space and time and brings in focus the relatedness of things and reciprocity.

*“The courtyard is an important place where seasonal changes can be directly perceived through the senses. The expression of nature changes constantly. Sunlight, wind and rain affect the senses and give variety of life. Architecture in this way becomes a medium by which man comes into contact with nature.” (Ando, Tadao Ando, 1995)*

During Baroque and Renaissance period, gardens somehow provided an artificial character due to the use of symmetrical geometries, which were mostly inspired by the

“ideal” proportions of the human body and the distinction between inside and outside was more evident, considering nature as an outside and attempts of creating gardens as an action of conquering nature. Kengo Kuma defines gardening and landscape planning as two distinct disciplines. Landscape planning is mostly visual manipulation, while gardening is to involve experience. However, both are interrelated and are combined together. According to Mirei Shigemori, as one of the most distinctive modern landscape architects of Japan, to understand the beauty of gardens is made possible only by experiencing and creating gardens, which should be considered as a “mindscape”.

In Western culture, although the shapes of gardens were considered as symmetric and strictly geometric, the aspect of exploring locomotion was part of their design. An important element was the labyrinth, as elements of distinguishing spaces. In the undefined itinerary in these spaces enhanced the experience through enhancing sensations and fantasies from the unknown. These spaces can be considered as unknown time-space fragments which involves a rhythmic movement and a change of temporal dimension while focused on the consciousness to the arrival destination. A place of solitude and exclusion, where one experiences his/her own experience in the search of “being”.

*“The perception of space is not impassive, it implicates one’s surrounding and one’s state of distraction or concentration. But mostly it involves the postures that the body adopts in movement, mood, bodily humours, and humor. The perceiver is not in space. Space does not pre-exist.”* (Dionne, 2004)

In eastern culture, specifically in Japan, architecture merged with nature, following methods and techniques to harmonize human’s attempts with nature. According to Shigemori, the origin of traditional gardens in Japan was to bring increase the lost contact of man with nature and the gods. A connection which was intimate and pleasurable when primitive people lived in a hut or caves, while was lost when man started to build and spend most of his/her time inside their houses to be protected from natural forces. The start of civilization created a distance between human and nature. Creating gardens was a response to the fear of this alienation from nature and gods. The oldest gardens were *kami-ike* or god-ponds, which were built as an island, where gods lived. On the other hand, civilization brought universalization but endangered culture. These two concerns were the main topics of Shigemori, In his works, he imitated traditional concepts of Japanese gardens and brought new elements to enrich their spatial configuration and the bodily experience.

*“New ikebana<sup>9</sup> rejects nostalgic feelings.*

*We can't find a vivid world in anything nostalgic.*

*There is nothing but calmly sleeping beauty in the nostalgic world.*

*New ikebana rejects formal fixation. Creation always brings forth a fresh form.*

*Fixed form is like a gravestone.*

*New ikebana rejects the concept of moral principles. Ikebana is neither a religious lecture nor a created moral story. If anything, it is art.*

*New ikebana rejects botanical limits. Ikebana is an art and certainly not about plant samples or botanical teaching materials. Plants are the only and most important materials.*

*New ikebana uses the flower vase freely. We accept no limits regarding the flower vase and its use is unrestricted. Either we can make it painstakingly with our own hands, or we can cooperate with a good vase maker. The vase must also follow our new spirit; we must give a new life to old things and make them alive.*

*New ikebana undergoes constant development; it doesn't have a standard form. It adapts to the lifestyle of our time, but it is always tied to an artistic conscience. It is neither a traditional old pastime nor a metaphysical existence departing from life.*

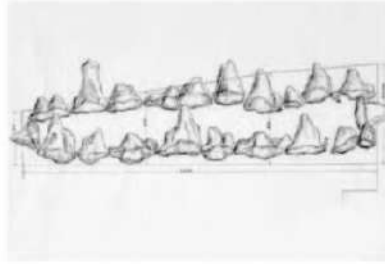
*If we take the biased viewpoint and blind obedience of conventional ikebana, our work would indeed be different. The new spirit will be expressed by a completely new appearance.” (Tschumi C. , 2007)*

The most important elements for creating gardens were selecting the right materials, which were natural, especially the use of stones, which were the most common elements since they symbolized objects that represented location of gods; the layout of arranging stones and trees for providing a kinaesthetic experience; and understanding seasonal changes.

<sup>9</sup> Ikebana is the practice of collecting flowers and branches and arranging them in different compositions. A procedure which was very common in Tea Ceremonies. Mirei Shigemori's influence on ikebana came from Dadaism, which appeared in Japan after World War I.



*Himezagi* stone setting



Mythical animal



*Karikomi*



*Kanji*-shaped pond or *tsukiyama*



Figure 39 - Traditional Chinese Techniques for Chinese Gardens (Tschumi C. , 2007)

Gardens were an inseparable parts of a house in order to bring a second nature to the domain. The design applied to the architecture of the building and garden was in coherence to a common aesthetic concept. Wabi-sabi is the notion in Japanese aesthetic that defines beauty which is found in the imperfect and incomplete. “Rustic” is a dimension of this aesthetic that is associated to Zen Buddhism. “Wabi” has several meanings. It is a manner of living following a spiritual path, the subjective and spatial events. While “Sabi” means the objective, temporal events and the material objects. Wabi-sabi derives from the minimalism of Chinese poetry and monochromic ink painting of the 9-th century, and remains an abstract, nonrepresentational ideal of beauty. It suggests the application of manmade objects and application of earthy imperfect materials. It is strongly sensitive in relation with time, which is concentrated to the present and not the future. It provides metaphysical qualities, which suggest that the universe is in constant motion and change and spiritual ones, which come from the observation of nature. This is associated with the acceptance of the uncontrollability of nature and respect to it through the use of organic forms and soft shapes. Furthermore, the use of natural materials accommodates degradation through time, such as corrosion or contamination. This means that perfect immateriality is the ideal. While beauty can derive from ugliness and it is a state of consciousness rather than the visual qualities. The materials used are a product of a natural process, which are vulnerable to weather and human factor. They are a witness of physical forces and a proof of time. Through their irregularities, they exhibit the effect of accident as a result of events happening by chance. While these imperfections suggest

the sensorial interaction through intimate sense of touch and through the small and secluded spaces, bringing a feeling of womb-like structures, creating a world apart: nowhere, anywhere, everywhere.

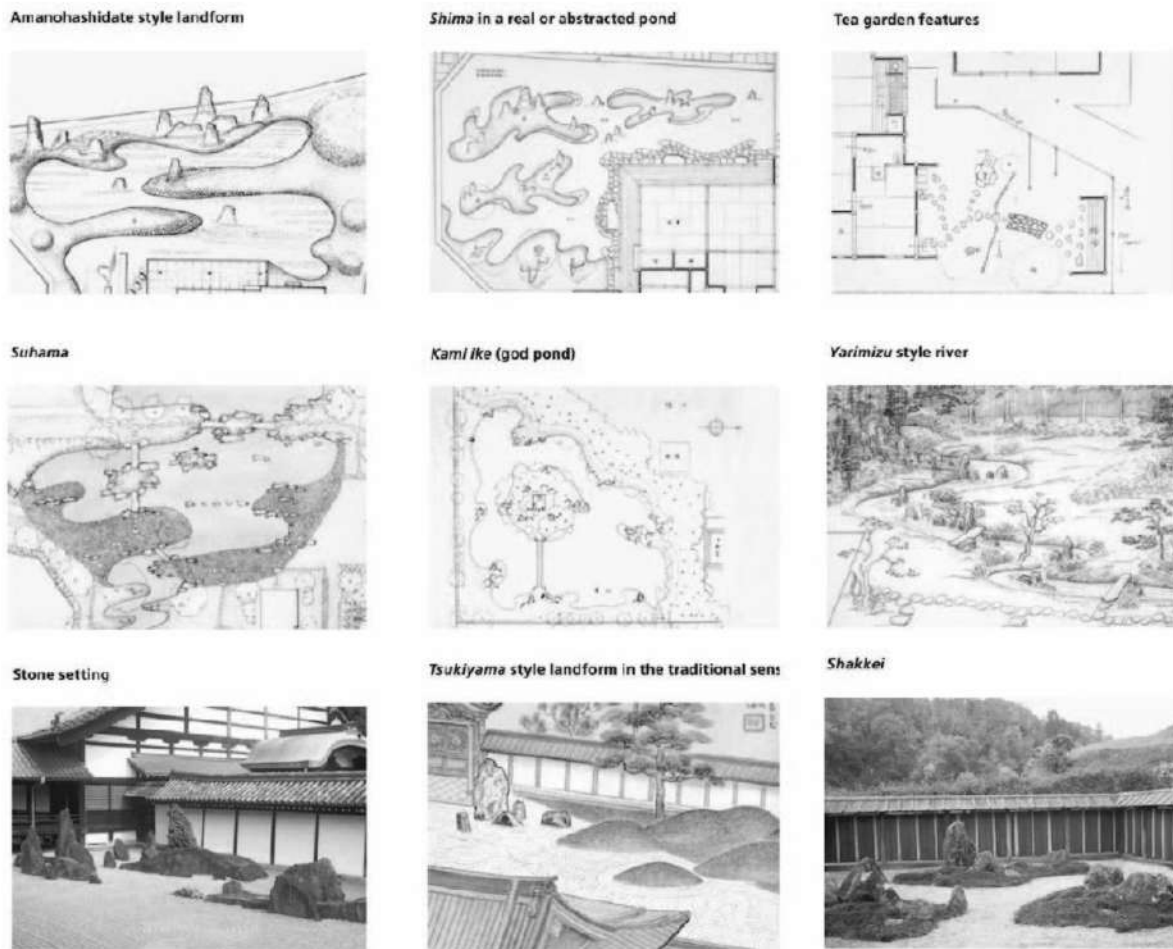


Figure 40 - Traditional Japanese Techniques for Japanese Gardens (Tschumi C. , 2007)

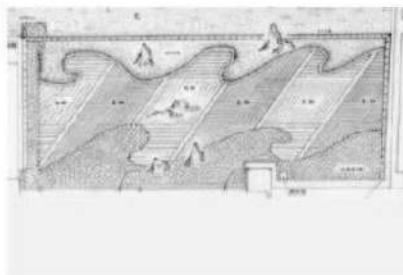
Such notions were also applied in the private domain as a response to the function of the garden, which provided paths for the Tea Ceremonies, a ritual for which the surrounding was crucial. It was applied firstly from Rikyu, who created a tea room based on the prototype of a farmer's hut, with mud walls, thatched roof and exposed wooden structure. Exactly through the tea ceremony is associated to this movement since this event is associated with water, firewood, smoke, and simplicity. Furthermore, the layout of the garden, *chadō*, the way to the Tea Ceremony, offered the possibility of being conscious of everyday life activities.

Shigemori brought back to modern landscape design most of the Japanese traditional elements, by applying them in his designs and provided new concepts concerning the layout of the gardens. Some of these concepts were reconsidering the geometric

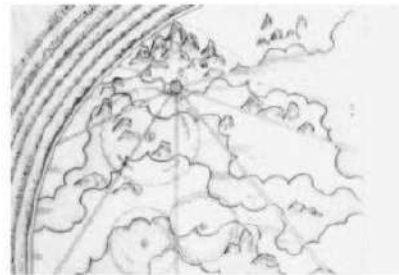
elements in space. Considering points as geometric elements, as independent from others, brought a configuration of kinaesthetic experience. By considering stones as separate, especially as stepping elements, creates the possibility for the perceivers to explore their kinesphere. Furthermore, stones as separate elements symbolize an invitation to explore the landscape. This concept was also applied in Tadao Ando's architecture, who considered mind and body as a unity, using the term *shintai* as the union of spirit and flesh. "Spatiality is the result, not of a single, absolute direction of vision, but a multiplicity of direction of vision from a multiplicity of viewpoints made possible by the movement of the *shintai*." (Ando, *Shintai and Space*, 1988) This was an approach which defined the positioning of the walls and pillars in each of his works. As from the observations of Gibson: "animals and people do in fact see the environment during locomotion, not just in the pauses between movements. They probably see better when moving than stationary." (Gibson J. J., 1979) Experiencing landscape is a process which is made possible in sequences, with the involvement of each of the senses and the whole body.

Lines and colours of nature was another of the aspects that of Shigemori's designs, which was made possible through the use of natural materials and flower arrangement, which provided sensorial interaction changing in dependence of the seasonal changes. Part of these experience is the use of water in different configurations.

**Stripes**



**Buddha emitting rays of light**



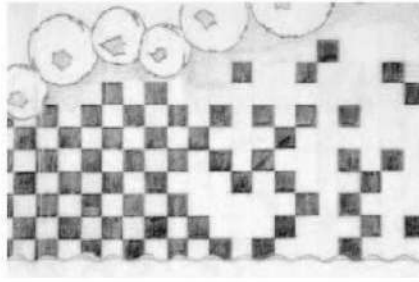
**Fence motif**



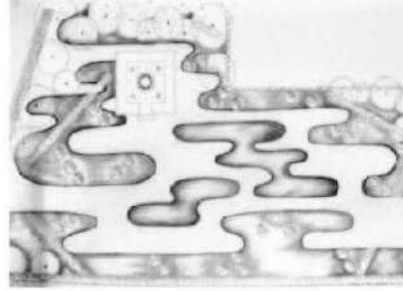
**Tsukiyama style landform in colored concrete**



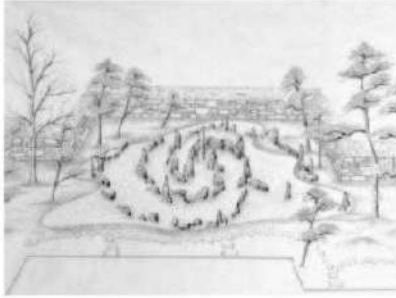
Grid



Cloud shapes



Spiral stone setting



Wall painting

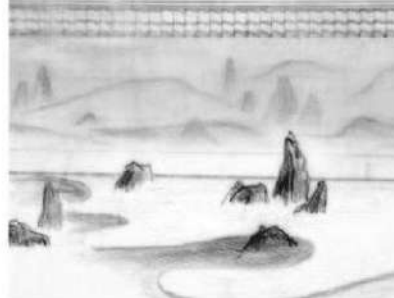


Figure 41 – Shigemori's additional technique for designing Japanese Gardens  
(Tschumi C. , 2007)

The need for access and presence of water is a biological craving for the human being since the saline content of human blood is the same as that to the sea” (Alexander, Ishikawa, Silverstein, Jacobson, Fiksdahl-King, & Angel, 1977). It provides an essential role for giving a social pattern through the act of gathering people, such as rituals, which associate water to birth and death, reminds human beings of the dual structure of the body.

*“We came from water; our bodies are largely water; and water plays a fundamental role in our psychology. We need constant access to water, all around us; and we cannot have it without reverence for water in all its forms. But everywhere in cities water is out of reach.”*  
(Alexander, Ishikawa, Silverstein, Jacobson, Fiksdahl-King, & Angel, 1977)

Water in Jung's theories symbolized identity and personality, while when bodies of water appeared in dreams were a representation of the dreamer's unconsciousness. Approaching water brings a person closer to his/her unconsciousness, since it provides a therapeutic experience, as a result is associated with creativity. “The water of vision projects infinite reflections of the body of my companion, overlapping with my own image.” (Perez-Gomez, POLYPHILO or The Dark Forest Revisited: An Erotic Epiphany of Architecture, 1992) Some sort of sensuality is found in water, since it withholds a mystery in its limits and shapes. Water can be seen, touched, heard and tasted and found in many forms. From the earliest western civilizations, water was a place of creation of myths and

gods, often associated with the female figure, who was in a relationship with male elements of the sky and Earth.

*“This encounter with existence brings me back to life; I am my usual old self. Even though I fear the potential eclosion of inveterate intellectual prejudices, I resolve to be a slave of the senses. Seduced by my first inspection of the fountain after escaping from the dark entrails of initiation, I tried to quench my thirst in its waters, an urge that has been tormenting me all day and has not abated. Perhaps an uncontrollably intense thirst rages throughout the whole universe...Despite the illustrious visions I have just experienced, I feel restless and unfulfilled...I cannot find repose...And so with resigned determination I follow five women of the senses while regretting the absence of my Polya , who would make the sixth and perfect number.”* (Perez-Gomez, POLYPHILO or The Dark Forest Revisited: An Erotic Epiphany of Architecture, 1992)

The use of water provides unification of architecture with nature, and simplifies complicated architectural arrangements and allowing continuity which can be physical and visual at the same time. Through its reflection it eliminates claustrophobic feeling and becomes an element of fantasies. Reflecting the materiality of architecture and lights provides a dreamy atmosphere. Through various methods of applying water shapes, the experience is different through the collaboration of different senses.

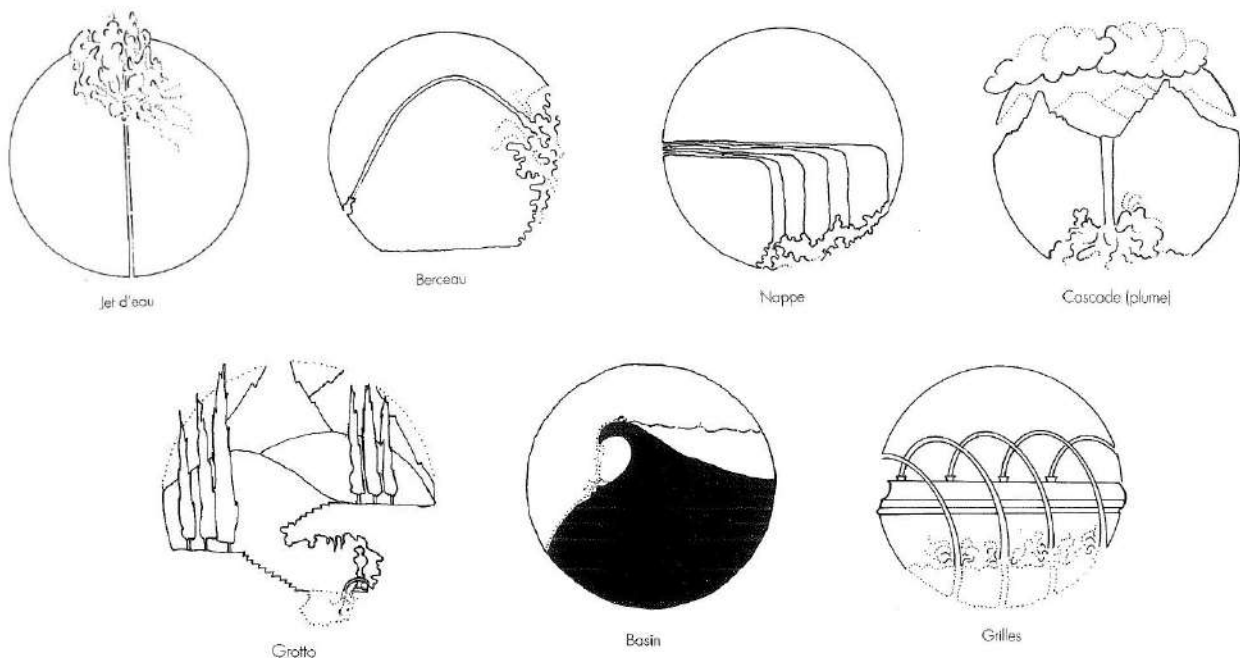


Figure 42 - Variety of Water Shapes in Outdoor Environment (Moore, 1994)

<sup>10</sup> Polya-from poly, meaning "many"-the archetypal modern consumer of information whom Polyphilo must win over to a life of seductiveness. Polya in Polyphilo is also considered as the perfect body in the hero's journey.

Tadao Ando in the “Temple of Water Hompuku-ji” creates a space of tranquillity which is balanced by a large surface of water and passages that connects it with the underneath level, respecting the natural topography of the site, a hill at north-east part of the island of Awaji. The surface of water, with axis approximately 40 and 30 meters, in the form of a pond with floating lotus flowers giving a symbolism of tranquillity and a state of pausing time. An underground space can be accessed from the above level of the pond through a cutting itinerary and has a circular shape divided by rectangular pillars. The itinerary to the temple is paved with white sand and surrounded by vegetation, with a straight wall that creates a framing of the sky and sea. Another curved wall follows the passage to another interior space, where the pond is visible. In the effect of time the cement will change its colour and vegetation will occupy the pond. The surface of water becomes a testimony of the manifestation of time through its image of stillness reflecting temporal changes felt from sensorial stimulation.

*“Gardens are like the earliest experiments in that part of architecture that is so difficult to express with words or drawings, pleasure and eroticism. Whether romantic or classical, gardens merge sensual pleasure of space with the pleasure of reason, in a most useless manner.”* (Tschumi B. , Architecture and Disjunction, 1996)



Figure 43 - “Temple of Water Hompuku-ji”, Tadao Ando; Source: <http://architectuul.com/>

### 3.3. Sensation

For architectural design, it is important to obtain a great understanding of the effects of the environmental stimuli in the experience of the users. This understanding is related with finding the poetic awareness of architecture reconsidering the relationship between body and buildings. Body itself, despite its dualistic nature, preserves more memories than mind. These memories are linked with sensorial experiences obtained from space, time and body schemas. One of these aspects is experiencing qualities in architecture as “beautiful”, which acts upon mind through intuition and providing emotional responses from architectural spaces.

Beauty is not linked with the aesthetic pleasurability of architectural qualities, but it is linked with the attainment of human’s spiritual needs and the understanding of self-existence. Perez-Gomez suggests that the concept of love can provide a link between architectural knowledge and ignorance, rationality and madness, consciousness and body. In order to analyse the relation between love and architecture, Perez-Gomez refers to principles of love according to Plato. “Love (Eros) to Plato is a common desire that seeks transcendental beauty. The physical love of an object, an idea, or a person in itself is not a proper form of love, love being a reflection of that part of the object, idea or person that partakes in Ideal Beauty.” (Scheler, 1954) The ideal beauty is found in particular characteristics of images and love is nothing else but an expulsion of emotions not based on logical investigations.

*“THE TEMPLE OF LOVE is now at arm’s length. It is utterly magnificent! Standing simultaneously at the center and the periphery, this architecture contradicts its appearance from the distance and does not conform to a single geometry, structure, or scale...The place now exists only in experiential time and space, shadow and light, its objectification beyond the scope to present possibilities.” (Perez-Gomez, POLYPHILO or The Dark Forest Revisited: An Erotic Epiphany of Architecture, 1992)*

Meanwhile the ideal beauty represents truth and knowledge and as a result love enables the true wisdom to humanity. The action of love to Perez-Gomez is performed in the works of art and architecture and it is similar to the poetic madness, which firstly is directed to irrationality, producing meanings. “Plato describes erotic delirium as a form of divine madness: possession by a supernatural power, mystic initiation with successive stages and a final epiphany of beauty.” (Pérez-Goméz, 2006)

Erotic space is not only a physical space with geometrical representations, but it is human space. It is a limited space. Perez-Gomez identifies erotic space as “chõra”. It is both a cosmic place and an abstract space, and it underlies the substance of human’s crafts.

“Chōra can be grasped only with great difficulty; it is like the substance of our dreams, and we may conceive it only indirectly through spurious reasoning”. (Pérez-Gómez, 2006) This space is linked to two concepts: katharsis and mimesis. “Katharsis is purification or a reconciliation between darkness of personal destiny and the light of the divine, while mimesis is not imitation but the expression of feelings and manifestation of experiences through movement, musical harmonies and the rhythm of speech.” (Perez-Gomez & Parcell, Chora : Intervals in the Philosophy, 1994)

Following the concept of love as a crucial aspect of architecture, Perez-Gomez describes the experience to architectural spaces in the book “Polyphilo of the Dark Forest Revisited” in a dream of his main character. The dream is a narrative to the complexity of architectural practice and describing architectural space as the territory of love and adventures. The narrative of the journey is explained through sexual images, which aim to remind the sensual nature of body and perception. The dream describes his visit in three gardens of different materiality, glass, silk and labyrinth and his encounter with five nymphs, each representing the five senses, as crucial aspects in architectural experience. Furthermore, the encounter with the different gardens, is related with the concept of “qualia” in architecture. This is a subjective experience which is associated with the physical quality of architecture, including colour, temperature, acoustic quality, etc. Such experience is an act that represent a different qualia, which is caused by sensation, thought, mood or emotion.

Sensation, which is provided through sensorial means, provides changes in the emotional states of the perceiver. The definition of emotion is related to changes of the inner psychological state, which is a state that is further expressed in behaviour. The etymology of the word ‘emotion’ comes from Latin language, and is depended on movement, which from its meaning, “e-movere”, means to move out. In fact emotions aim to move a person towards positive stimuli or to move him/her away from a negative one. Due to the complexity of emotion, several definitions were given to provide a better understanding of the phenomenon and its effects. The first approach for its definition was the consideration of emotion as an act of reasoning and willingness. Such thing defines emotion as something which is controlled by mind. The second approach, as contradicting to the first one, considered emotions as a process which was not rational and separated by processes of the mind, something not able to control and more related to sensorial stimuli. These discussions came as a result of the consideration of mind and body as separated entities.



Nevertheless, Heidegger, considered emotions as linked to consciousness and experience rather than depended by brain. Such approach considers emotions as a reflection of the person's experience and his/her interaction of body and mind, mostly concerned to consciousness and experiences, rather than the brain. Those are the reflection of the individual's experience and the interaction of body and mind, as unified entities.

Emotions are deeply depended by perception and sensation. An emotion involves perception, thought, feelings and body changes. They unfold in a sequence of actions and events, which are indicated by several components in the context of the architectural discipline:

1. Environment
2. Body/Body in Space
3. Phenomena
4. Psychological Space
5. Physical Space

Since architecture interacts with its users, it provides emotions, which involve the perceivers in a corporeal level. It is important to design with the consideration of emotional participation of the users with architectural space. Such consideration defines the empathetic qualities of architectural space, which constitutes not only of the projection of feeling of the perceiver into objects, but also of an interactive submersion into the objects.

*“An emotion is complex in that it will typically involve many different elements: it involves episodes of emotional experience, including perceptions, thoughts, and feelings of various kinds, and bodily changes of various kinds; and it involves dispositions, including dispositions to experience further emotional episodes, to have further thoughts and feelings, and to behave in certain ways. Emotions are episodic and dynamic, in that, over time, the elements come and go, and wax and wane, depending on all sorts of factors, including the way in which the episodes and dispositions interweave and interact with each other and with other aspects of the person's life. And an emotion is structured in that it constitutes part of a narrative roughly, an unfolding sequence of actions and events, thoughts and feelings- in which the emotion itself is embedded.” (Goldie, 2000)*

The emotional effects caused by the dialogue of body, mind and physical space define atmosphere, which as a response, indicate the attitude and the level of interaction of people.

### 3.3.1. Atmosphere

The word atmosphere derives from Greek language and its meaning is air. The word is composed of “atmos”, which means vapour, and “sphere”, which means sphere. In Greek culture, “vapour” or air was related to spirituality and the sublime. In the 18<sup>th</sup> century atmosphere in art was mostly related to subjective and non-subjective experiences of corporeal bodies rather than air as something divine. It was mostly related to magnetic field forces and sensations. In the book "The Work of Art in the Age of Mechanical Reproduction", Walter Benjamin has associated atmosphere with “aura”, which can be defined as something we perceive through air and a web of space and time. “Aura” to him is a timeless experience when the perceiver meets the objects. Atmosphere suggests lightness, formless, lack of gravity and structure. The notion of atmosphere embraces several perceptual qualities, which deal not only with the production of feelings that emerge from architectural forms and materials, but from articulation of space and the level of its relationship, environmental factors, and other complex situational characteristics.

In aesthetics and phenomenology, atmosphere has been a crucial topic of discussion, since it has an existential, survival and emotional importance to the person. Atmosphere is felt and is immaterial, mostly having a character of a “je-ne-sais quoi” feeling, something unexplainable. As a result, it is hard to explain since it emerges from the interaction of objective factors of the surrounding and the subjective feelings of the perceivers. It represents a dualism of mind and body, primarily because emotional sensitivity differs from one person to another and secondly, emotional response is a corporal process with different levels of awareness.

*“Due to their priority and (relative) objectivity, atmospheres must certainly then be registered in the ontological repertory originated by our ordinary, intuitive and pragmatically efficacious segmentation of reality (which is firstly aesthesiological, then socio-cultural and so on). In short, it is a matter of affective and corporeal conditions aroused in the subject by external situations; they are pre-dualistic and, in principle, opaque to the so-called expert knowledge and yet, as invariants obtained from a flux, still classifiable into a familiar and sufficiently systematic repertory (atmospheric topics) of affective-emotional kinds: a phenomenologically ‘true’ repertory, as it is passively perceived,<sup>6</sup> almost as if it were the point of view of things.” (Griffero, 2010)*

Due to its dualistic nature, different definitions are given in order to explain atmosphere. Howard Gardner categorises intelligence in: “linguistic intelligence, logical-mathematical, musical, bodily-kinaesthetic, spatial, interpersonal, intrapersonal, naturalistic, spiritual and existential”. (Gardner, 1993) Juhani Pallasmaa adds three other types of intelligences:

emotional, aesthetic and ethical intelligence. All of the above defer from one person to another. As a result, the level of emotional sensibility is different, but the presence of atmosphere is perceived the same. The moods created by architectural spaces are collectively felt and embodied. Historian Alain Corbin considers atmospheres as “social emanations” (Corbin, 1986) – as contagious in bodies faced with intense situations. Furthermore, this approach was emphasized especially between 19<sup>th</sup> and 20<sup>th</sup> century, when more scientific knowledge from bodies and phenomena was obtained. Atmosphere was thought as something felt and transmitted, which lead to social implications. As an example to this, the anthropologist Tim Flohr Sørensen portrays the relation of atmosphere with the collective through performing death rites in prehistorical caves, where rites as a collective feeling create atmosphere. These rites took place in darkness, where there is no visibility of the dead bodies. The collective practice, relation with the bodies, and the lack of light create an atmosphere, which is experienced as a group. “Death is atmosphere in the penetrating darkness but darkness undetermines the status of human subject as living being.” (Sørensen, 2010)

Atmosphere defines the character of a space, by this, it goes beyond only the implication of the physical quality of a space, but also of the qualities of sensibilities. Before perceiving details of architectural configuration, the atmospheric quality is primarily perceived due to the embodied nature and enveloping effect to the perceiver. We firstly perceive atmosphere before identifying details and physical features. According to Robert Pogue Harrison, atmosphere is related to “genius loci”, the spirit of place. “In the fusion of place and soul, both are susceptible to the same forces of destruction.” (Harrison, 2008) It is through a simultaneous perception that we obtain the experience of place.

During Modernism, the notion atmosphere obtained a negative connotation. It was considered as something without a structure, no function, formless and subjective. It was seen as an artificial ornament effect to intoxicate perception. “Houses and rooms are full of perfumes....The distillation would intoxicate me also, but I shall not let it. The atmosphere is not a perfume, it has no taste of the distillation, it is odourless....I am in love with it....I am mad for it to be in contact with me.” (Whitman, 1996) In the 1960's atmosphere appeared in phenomenology from Herman Schmitz, who considered atmosphere as a meaningful situation and as non-subjective feelings. Atmospheric perception can be considered as a sense, to which the right hemisphere of the brain is responsible. It deals with existential values; as a result, the perceiver creates an emotional bond to the environment. Some spaces enhance attachment which strengthens the sense of being; other spaces lead to alienation which weaken it. The sense of being is associated with several emotional reaction of the perceiver to space, such as stimulation,

the feeling of protection, sensuality, and sense of belonging. These reactions define the character of a space, which determines the sense of belonging to the perceivers.

*“Atmospheric perception is a synaesthetic and sensorymotor unity of experience [that] allows one to holistically sense complex situations: the nuance, the mood, the atmosphere and the significance they possess. In this way the expert develops, in the end, a ‘seventh sense’, a sensibility or a presentiment, an intuitive perception of situations.”* (Griffero, 2010)

From the classical period, architecture’s aim was to provide a correlation between the microcosm of humanity and macrocosm of the universe, which was translated into perfect proportions and numbers. While during modern era, architecture would be more focused on the experience and atmosphere. Atmosphere is an inseparable aspect from Art and Architecture since it is directly connected with human perception. To perceive atmosphere does not require only emotional response but requires also sensorial information and sensations such as: orientation, gravity, balance, stability, motion, duration, continuity, scale, time, memory, imagination and most important, requires movement. Through movement human is capable of feeling atmosphere as a manifestation of corporality, influencing behaviours of humans. When an object occupies a space, no matter the differences in quality with the space or not, atmosphere is created. A change in quality of an object or person can result to changes in atmosphere. Creation of atmosphere is depended on changes of the qualities from one environment to another. As a result, it refers to two terms, defining distinction or integration, which means emphasizing the difference of qualities and at the same time the unity of space in terms of quality. “Atmosphere makes visible both the unity of the difference that constitutes space and the invisibility of space as a medium for the creation of forms. But it is not the same as space, which, as a medium, can never become visible.” (Griffero, 2010)

### **3.3.2. Senses**

#### **3.3.2.1. Categorization of Senses**

The traditional classification of senses recognizes five main sensorial systems: visual, auditory, tactile, haptic and gustatory systems. This classification was elaborated by Plato, who defined the senses which corresponded to visible organs. This emphasizes the predominance of the visual system in Western culture, which remains the same categorization. The traditional sensorial classification is linked with the absence of an analysis of the body and the understanding of emotional aspect, which is deeply

connected to the senses. According to Merleau-Ponty the manifested visibility must be repeated in the body by a secret visibility. (Merleau-Ponty M. , *The Primacy of Perception: And other Essays on Phenomenological Psychology, the Philosophy of Art, History and Politics*, 1964) This means that qualities of space awaken an inner feeling to our body not because they are visible, but because of this invisible manifestation in relation to our corporal being.

In contrast to the predominance of visual of Western culture, in Buddhist philosophy, mind was considered as a sense organ, bringing up the term *Ayatana*, which is a classification of senses or sense base. In their philosophy are recognized six sense bases, which are internal and external, by which through contact and consciousness produce feelings and, as a result, cravings to spatial elements:

1. Eye and visible objects
2. Ear and sound
3. Nose and odour
4. Tongue and taste
5. Body and touch
6. Mind and mental image

In contrast to Platonic sensorial classification, Buddhism considers body awareness as a sensorial entity, which along with mental mapping, an important aspect in the case of visual deprivation. In the sensorial hierarchy, the mind remains the most privileged sense and not vision.

Throughout history, there was a tendency of hierarchizing senses in different cultures according to the importance and the type of information gathered by stimuli, since perception varies from one individual to another and from one society to another. During Classical Greek period vision was considered as the sense of obtaining the absolute knowledge. In the 19th century, French intellectuals started an anti-ocularcentric discourse because of loss of confidence in eye, starting with Bergson and Nietzsche. On “*Genealogy of Morality*”, Nietzsche criticizes the hierarchization of senses, especially ocular-centrism. “Such an eye is no direction at all, an eye where the active and interpretative powers are to be suppressed.” (Nietzsche, 1994) He appraises the body as a whole, by not overestimating any specific sense. However, his dialogue falls from anti-ocular-centric and ocular-centric approach due to the conceptualization of “*perspectivism*”, which is related to Renaissance painting techniques, considered as privileging the sense of sight, upon unique viewpoint of the observer.

The ocular-centric nature of Western culture is reflected even in language, manifested by the use of visual metaphors. This is a result of the strong indication of our mental images in verbal and written descriptions. Different linguistic terms, such as paranoia or narcissism indicate the strong impact that our visual world has in our psychological processes and emotional states, such as curiosity and desire. However, in linguistic terms, during the 20<sup>th</sup> century, there was a tendency of shifting from visual approach to auditory approach, which resulted in the replacement of visual metaphors to auditory and even haptic metaphors. For instance, Derrida, who considered sight as a deceptive sense and not reliable, brought the term “haptocentrism” to emphasize the importance of touch in life experience.

Following this discourse, anthropologists of 19th century understood sensorial hierarchy through analyzing “primitive” societies. They realized that “natural history of the senses starts with the most mysterious, smell, and ends with the most evident, vision.” (Ackerman, 1990) In the case of Hausa culture, it is found a high value on non-visual modes of experiencing the world, especially taste, smell and hearing. This is present in the folk tales and proverbs which use as their central theme taste and food. Alternatively, the case of the descendants of Maya, Tzotzil of Mexico, considered thermal dynamics as quite crucial, where everything is identified by its heat content, including medical treatment with temperature cooling, or even woman-man relationship. Another case of a different sensory priority from Western Culture is the tribe of Onge of Indian Island of Andaman, who consider smell as functional cosmic principle and as crucial to define their social structure. “Lightness to them is associated with the emission of odour, and heaviness by its retention.” (Classen, 1993) From the studies of the anthropologist Edmund Carpenter of the concept of space and time in Aivilik Eskimo, it is presumed that they did not explain space in visual terms, since their living environment is opened and vast and it lacks visual cues for visual orientation. As a result, they confine to non-visual cues in order to navigate.

This difference of priority of senses from one society to another is a cause to the different approaches in societies of human understanding of relation of body and self. According to the anthropologist Anthony Seeger, sensation is cultural rather than biological and differs from one society to another.

*“Just as time and space are not perceived by the vast majority of societies as a regular continuum and grid, so the sensorium is rarely thought of in strictly biological terms. The five senses are given different emphasis and different meaning in different societies. A certain sense may be privileged as a sensory mode.”* (Seeger, 1981)

This might lead to the thought that the way we perceive changes along with time. Through the use of technology and media as an extension to human body, speed of sensorial information changes and leads to the adaptation of sensorial entities and resulting with different level of perception. "As speed changes perception, our ability to know our senses and even our sensory organs adapt, and our understanding of time evolves accordingly." (Kuipers & Aitken, 2000)

According to Ernest G. Schachtel, senses are categorized in two groups, "Autocentric", as people-oriented senses, and "Allocentric", as object-oriented senses. "Autocentric" senses combine quality and pleasures, and deal with feelings. Smell, taste, touch are considered as "autocentric" since they deal with pleasure and intimacy. While, "allocentric" senses are those related to obtaining knowledge and include attention and directionality. Vision, with the exception of colour perception, is to be considered as objectified, "allocentric". However, the sense of hearing is both "allocentric" and "autocentric". Sounds of nature and musical sounds provide this dualistic nature of auditory sense. In Western cultures, children, who tend to be "autocentric", are taught to become dominated by "allocentric" modes. While in other cultures it tends to be the contrary, such as Africa, where kinesthesia and proprioception are dominant, in Japan tactility and in Oceania, smell. (Schachtel, 1959)

In order to understand the importance of senses for the significant emotional response, in the discipline of philosophy in the 18th and 19th century were elaborated related to sensibility and sensualism, which provides a foundation for applying sensoriality in architectural spaces. Merleau-Ponty provided key concepts considering sensation as an inseparable notion to this process, a unit of experience as the next stage of perception. "By sensation it is understood the state of experiencing self, by this it means that to see is to have colours, texture or lights, to hear is to have sounds, to sense (sentir) is to have qualities". (Merleau-Ponty, 2002) On the other hand, quality is not an element of consciousness, but a property of the objects in the surrounding environment. Ideas and qualities are two separable things, where ideas are mental entities; qualities are properties of objects that cause ideas, which are sensations. Concerning the objects' properties, ideas or sensations differ. Locke defined two types of qualities, primary and secondary qualities.

*"From whence, I think it easy to draw this observation, that the ideas of primary qualities of bodies are resemblances of them, and their patterns do really exist in the bodies*

*themselves; but the ideas produced in us by these secondary qualities have no resemblances to them at all.*" (J.A.St.John, 1843)

Primary qualities are those by which sensations resemble to the ultimate properties of objects, while secondary qualities do not resemble to the corresponding qualities of objects, due to other additional properties, such as the size, texture, shape or movement. Sensation refers to the state of awareness of external and internal conditions of the body, while sensorial modes are stimulated by physical or chemical energy; as a result, depending on sensations caused by object's qualities, senses differ from each other and can be divided in two groups, special senses and general senses. Special senses, produced by receptors limited to small areas, such as the tongue, nose, balance, hearing, vision, smell and taste; and general senses, which are produced by receptors spread through the whole body, such as pressure, temperature, pain, position and touch. As a result, this leads to a new classification of senses and recognition of other sensorial systems. In terms of the physiognomy of the human body, the sensory systems can be categorized in four systems:

1. mechanoreceptors, respond to sound, body position, body movement and touch,
2. chemoreceptors, gases, liquids and solids (olfactory and gustatory),
3. photoreceptors, light and color,
4. nociceptors, dangerous stimulations.

Sensorial information is essential for all the vital actions and experience in architecture, by which human realizes himself as a living being. Senses are the medium of perceiving the living environment. Having a clear knowledge of experiences through senses can be used as a method for creating architecture and providing richness of experiences in built environments. Recent findings concerned with the plasticity of human brain have emphasized the presence of other peripheral senses apart from the five classic senses. These senses are related to body awareness, and reactions to other objects and space. As a result, the categorization of senses is as follow:

Vision (Sight), Audition (Hearing), Gustation (Taste), Olfaction (Smell), Somatosensation (Touch), Thermoception (Temperature), Proprioception (Kinesthetic Sense), Nocioception (Pain), Equilibrioception (Balance), Mechanoreception (Vibration).

In terms of architecture, senses can be categorized related to the level of intimacy, in two groups: Senses of distance, which are considered the auditory and the visual system; and intimate senses, which are considered the olfactory, gustatory, haptic system and proprioception. E. Hall, in "Hidden Dimension" mentions the significance of senses in



determining personal, public and social distances between people and objects. As animals, human being experiences the three dimensional space through sensorial systems, leading to social hierarchy and territoriality. In the same line, Pallasmaa relates sight with exteriority, while hearing with interiority. "Hearing creates a sense of connection. It makes us solitary while sight solidary." (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2012) In the article "An Architecture of the Seven Senses", Juhani Pallasmaa elaborates the concept of involvement of multi-sensoriality in architectural experience. All the senses have the equal capability to measure the scale, space and its dimensions and generate new ideas and approaches of a multi-sensorial environment. Architecture is the continuum of culture through the embodied experience and memory.

This debate is related with the psychophysical properties of senses and the relationship between perception and the properties of the physical stimuli. There is a strong linkage of emotions with the senses. This connection is evident in ethnomusicology, which brings out the concept "musical emotions", which gives several emotional responses to the process of listening to music, the same with architectural qualities. According to Damasio, by experience we perceive the different states of our body. "Feelings are critical to sensing the biological variations produced by experiences. These feelings enable us to sense the states of our body that are painful or pleasurable, producing emotions as bliss, longing, mercy and so on." (Damasio, 1994) Architectural qualities provide physiological and emotional responses in human beings, which are ocularmotor, somatosensory and vestibular in nature.

The environment has a crucial role in developing the brain, due to brain plasticity. This is deeply related to the emotional impact architectural spaces have in human's brain, which later on is reflected in human behaviour. The main purpose of architectural design should be to understand the impact of architectural qualities to human emotions and behaviour. "Architecture has the most impact when the ideas used in building design reflect our understanding of how the brain reacts in different environment." (Eberhard, 2009) In the elaboration of emotions, the process of memory plays a crucial part, following three main steps: encode, storage and recall. On the other hand, faster memory improves the cognitive abilities, avoids stress and stimulates brain. The area of the brain responsible for architectural scenery is Parahippocampal area, which becomes more active in more complex scenes, which means that the brain becomes more active. When we perceive, brain retrieves a memory and Hippocampus is responsible for memory and navigation in space and along with experience and stimuli.

Experiencing an interior space constitutes of four steps to conclude with the production of a positive emotion: Firstly, it defines the need for exploration in a specific space, indicated by previous experiences and memory. Secondly, the stimuli, which might be of any sensorial character is provided by physical sources. Third step deals with appraisal, which is related to the feeling of freedom for navigation in space. At the end of this process, the pleasurable emotion is produced from the interior environment.

Sensorial information is not the only factor that leads to the generation of emotions or experiences from a specific space. According to Pallasmaa, experience in architecture is not only a collection of sensorial information, but it constitutes of an intentional analytical process, which synthesizes the collection of sensorial information by different sensorial sources. Furthermore, “mind” is fundamental for this experience, which defines the level of being-in-the-world, through consciousness and imagination. “One who has half-risen to the sound of a distant train at night and through this sleep, experienced the space of the city with its countless inhabitants scattered around its structures, knows the power of sound tot the imagination; the nocturnal whistle of a train makes one conscious of the entire sleeping city.” (Holl, Pallasmaa, & Perez-Gomez, Questions of Perceptions: Phenomenology of Architecture, 2006)

### **3.3.2.2. Vision**

From the beginning of human’s existence, vision motivated the man to get up on his feet and see in distance, by providing knowledge about the distance space and along with it, bipedal balance. Parallel to this, complete body knowledge through proprioception and locomotion is obtained. Vision is the only sense that provides a considerable amount of distance knowledge, which includes the use of horizontal and vertical spatial references. It is because of the presence of light that we are capable to see. However, seeing is not only a function of light but it requires preparation, by which it is understood that it is not a process of a static image but of collected visual fragments. The visual data perceived from each object provides properties related to position in space, size, brightness and distance. All of these attributes are perceived not as unique entities but as a whole.

Visual perception is processed in two steps:

1. Light emitted from object is emulated onto the retina,
2. The retinal image is interpreted by the neural system, specifically by the corresponding area of vision in the brain.

“For vision to occur light must pass through the cornea, aqueous humor, pupil, lens and vitreous humor before the light reaches the rod and cones in the retina, where the image is formed. The rods and cones are photoreceptors that act as synapses and transmit the signal to the ganglion cells. Nerve impulses are sent to the visual areas of the cerebral cortex.” (Arenheim, 1974) For visual input processing, the brain uses specific areas to recognize, faces, body parts, scenes and objects. The area of the brain that makes this categorization of the visual observations is ventral-temporal cortex, the visual brain. The ability of the brain to recognize visual categories is guided by category-selective ventral-temporal cortex (VTC). The demonstration of how the brain encodes the outside world is the category of selectivity and primate visual cortex. When a human is born he is bombarded by visual inputs, which continuously shape the visual cortex. This is divided in other regions responsible for recognizing all of these elements each. The question for scientist is if this map was born or was developed.

Visual perception is performed in several levels:

1. Lighting, colour, character and disposition of objects;
2. Mechanism by which the image is formed upon the retina;
3. Various optical defects of the mechanism;
4. Sensitiveness of the parts of retina to light and colour;
5. Structure of the retina;
6. Parts played by monocular and binocular vision;
7. Various events, which follow the formation of the image upon the retina.

Vision is crucial in terms of developing trajectories by the act of walking. Gibson uses the term perspective structures to refer to the constant patterns in the changing mosaic of the solid visual angles produced by body movement. (Gibson J. J., 1979) These perceptual structures stimulate body movement, referred by (Lishman & Lee, 1973) as visual kinesthesia. This means the importance of the visual sense in maintaining body's balance in certain types of movements. In order to obtain the visual perspective structure two forms of information are necessary. Firstly, the information provided by mechanical-kinesthetic signals in coordination with estimates of time creates the shape of the trajectory. Secondly, the information provided by the relation self-to-object, which provides body location in relation to fixed objects found in the environment. In this type of information it is still involved the motor kinesthetic action.

Furthermore, vision has an important role for experiencing space. This is related to with experiencing the atmosphere of an environment through ambient processing, due to the connection vision has with other senses, such as equilibrium, smell, hearing, position and

gravity. Eye can stimulate muscular and tactile sensations since visual information has an influencing role on the message obtained by other senses, by diffusing attention on different stimuli. According to Hegel “vision is a complex fusion of different levels of awareness which unites and evokes human sensation, consciousness, intuition and understanding blend in one particular action.” (Levin, 1993) For instance, hearing music with eyes shut, provides more focused attention to auditory sense. Even if vision enhances the experience obtained by other sensorial modes, the dominance of visual imagery has a tendency to suppress the performance of other senses and ignore other sensorial inputs obtained by the environment. Visual perception is limited primarily by light conditions (natural or artificial), secondly, by the visual fields’ capacities (focused or peripheral), thirdly, by our movement and level of attention. We tend to understand space by relating to visible objects and signs and give visual attributions to space, transformed in shapes and forms. Furthermore, eyes focus in places of interests. Sighted people perceive firstly the room as a whole and later they focus on specific components. On the other hand, the visually impaired firstly perceive individual components and later on perceive them in totality.

The structure of our visual system provides us with further information about the perceptual context, rather than misdirecting our sense perception. In the school of Gestalt was addressed the problem of the meaning and of the quality of perceptual information. Gestalt Theorists used this example: when a subject with her closed eyes lifts two boxes of different sizes but same weight, the individual can judge correctly that they are of the same weight; but when his eyes are opened, the person experiences a visual misunderstanding, that the smaller box is also lighter than the other one. In this case we are not speaking about a perceptual mistake, but a sensorial synthesis leading to a subjective assessment in which data of the sense organs affect each other.

### **3.3.2.2.1. Central and Peripheral Vision**

Architecture is manifested as a visual discipline since we appreciate, judge it visually through drawings and photography. We tend to admire buildings mainly based on visual appreciation rather than emotional evocation. Nevertheless, architecture goes beyond visual aesthetics. It is the architectural experience that matters, which is obtained through all of our senses and body movements. Despite the fact that all these components are essential to perceive, vision facilitates the process of analysing the environment and remains as the sense by which we gather a considerable amount of information. Through these inputs we are capable to observe and analyse the environment; orient ourselves and move in space; therefore, experience the architectural atmosphere.

Through vision is obtained the first interaction with the environment. In a record of time, we are capable to detect contrast differentiations and movements. Our visual system allows us to locate and identify objects, people or obstacles. While we are presented with an environment, the eyes start looking for visual points of interests to focus on. For this process several actions are performed on each segment of space such as eye movements, head rotation, body movements, which establish the spatial representation of the environment. Vision is not only important for the gathering of the visual hints but is crucial for body posture and movement, which indicate the manner we orient in space. The neural fibres that connect the eye with the brain interact with the inner eye which is responsible for the balance.

The process of visual perception undergoes two steps: Firstly, light emitted from objects is sent to the retina and secondly, the retinal image created is interpreted by the neural system. Visual perception is directly depended to the activity of the visual fields. The presence of two eyes and eye movement (saccades) give us the possibility to see three-dimensionally. The brain combines the data collected from the two eyes to create the perception of depth. Each eye has a visual field of approximately  $90^\circ$ . The dimensions and distribution of photoreceptors are not homogeneous on the retina, while the concentration of cones decreases rapidly with retinal eccentricity. Because of these differentiations in the physiognomy of the eye, the visual fields process differently the information, resulting in visual acuity differences.

The monocular visual field consists of the central visual field and the peripheral field. The central fixation includes the  $30^\circ$  of vision and the peripheral one extends  $100^\circ$  laterally,  $60^\circ$  medially,  $60^\circ$  upward and  $75^\circ$  downward. (Spector, 1990) According to the representation of the visual field by Pöppel and Harvey (Warren & Wertheim, 1990), the visual field is composed of five regions: a. the fovea which shows the highest photopic sensitivity (of the bright light which stimulated the perception of colors); b. the perifovea with a radius of around  $10^\circ$  where photopic thresholds increases; c. a performance plateau extended to around  $20^\circ$  vertically and  $35^\circ$  horizontally; d. peripheral field where thresholds increase up to the border of binocular vision; e. monocular temporal border region.

The main division of the visual fields according to the level of detail of information is: foveal, parafoveal and peripheral, where the highest point of visual resolution is concentrated in the foveal vision, which corresponds to focus vision, part of the central vision, and is responsible for the visual target processing. The resolution slightly decreases while extending to the parafoveal field and reaches its lowest levels in the peripheral field.

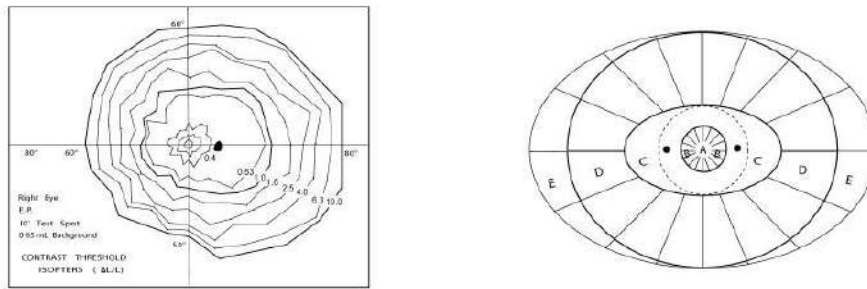


Figure 44 - Regions of visual fields. A) Central vision, with highest light sensitivity; B) Perifovea; C) Performance Plateau, extended till the dashed line; D) Peripheral Field; E) Border Region (Strasburger, Rentschler, & Jüttner, 2011)

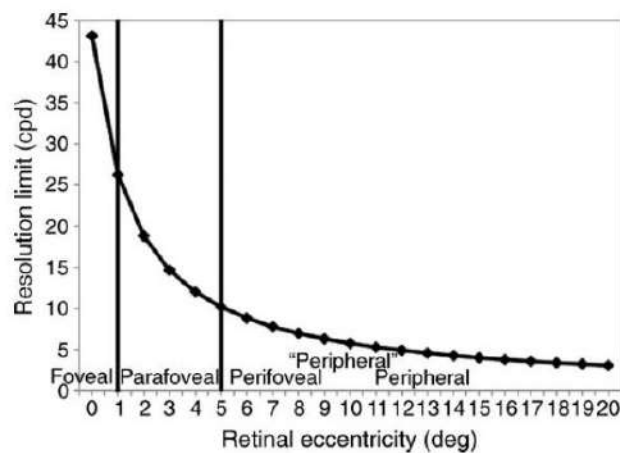


Figure 45 - Decreasing Resolution Towards Peripheral Field (Horton & Hoyt, 1990)

The role of central and peripheral vision is crucial for scene gist recognition, which is the content of the scene and is necessary for the development of spatial representation. Visual fields respond differently to spatial recognition due to the differences found from the physiological aspect. The central and peripheral visual fields differ in terms of the cortical representation in the primary occipital cortex. (Horton & Hoyt, 1990). Changes or loss in these areas lead to sensorial deficits altering the spatial representation's development. The central vision (foveal and parafoveal) provides the recognition of detailed information of objects in the surrounding environment, such as forms, shapes, contrast, and color. Whereas the peripheral vision is responsible for the processing of spatial relations, actions, movements and navigation in the space. Through this visual field, the surrounding is visually perceived as a whole environment and not as separate objects. This is due to the fact that in the peripheral vision there is only one single cell (mango ganglion)

connected to many other receptors, leading to lower visual information. Nevertheless, this cell has a thicker and larger myelin sheath (which allows electrical impulses to transmit quickly and efficiently along with the nerve cells) and as a result, have a higher information processing speed. Furthermore, this means that peripheral vision is much more effective in detecting motion, such as changes in light, quite important for spatial perception. The peripheral visual field supports the processing of spatial relations, actions on objects and navigation of the environment. In this field is found the area PPA (Parahippocampal Place Area) which responds to places more than objects, people or faces. This area in the brain recognizes scenes and analyses the spatial frequencies' configuration.

(Larson & Lochky, 2009) showed that peripheral vision contributes more than central vision in obtaining maximum scene recognition accuracy. However, central vision is more efficient for scene recognition than peripheral, based on the amount of visual area needed for accurate recognition (Wang & Cottrell, 2017). Therefore, the peripheral field is responsible for perceiving the location of the whole composing elements of the environment rather than focused objects. From this aspect, it is necessary to analyze the important role this visual field plays in the architectural experience and also taking it mostly in consideration to create architectural works.

In a building environment the visual scene is a set of geometrical composition and proportion of objects obtained by the visual fields. By all means proportion depends on geometry and distance of the observer's position with objects. In architectural spaces the visual scenes are categorized in three levels, depending on the level of input obtained from the visual fields and defined by upper and lower limits that correspond to the peripheral vision. These frames in the visual scene are found vertically and horizontally, and correspond with the first two categories: Firstly, the surfaces located at the bottom of the visual scene, such as the pavement and secondly, the surfaces at the top of the observer's position and seen from below, such as sky dome. The third category is the visual central stripe which corresponds to central vision, and the visual scene is the vertical surfaces perceived, such as facades. This level is the most important in analysing the environment in level of details, however peripheral vision is crucial for developing scene "gist", which has a significant importance in spatial perception. Scene "gist" is the meaning of a visual scene. The recognition of scene "gist" is the activity by which the observer perceives the context of surrounding environment. It is realized through the activation of several scene schemes which later affect critical cognitive processes, such as directing attention within a scene, or facilitating object recognition and long-term memory for objects within a scene. By all means, this important process is not only obtained through vision but also through body movement, which is essential for the

embodiment of space in a three dimensional way. According to Pallasmaa, architecture is not a series of images, nor visual units and Gestalt; also the interaction between sensory-motor and memory is crucial to perceive architecture: "Our image of the world is held together by constant active scanning by the senses, movement, and a creative fusion and interpretation of our inherently fragmented precepts." (Pallasmaa, Space, Place, and Atmosphere: Peripheral Perception in Existential Experience, 2014)

While walking or driving we mainly use the peripheral vision to avoid obstacles. During this process, we concentrate in specific objects through the activation of focused vision, such as street walls, pavement or other obstructions in order to gather the layout of the scene through peripheral vision. On the other hand, peripheral vision is responsible for creating a coherent mental representation of the spatial relationship between objects in space. Firstly, because structurally peripheral vision covers most of the visual field and secondly, the biggest amount of information from the spatial scene is obtained by this field, sending signals to the brain where to activate the focal vision for the identification and localization of objects.

Peripheral vision has a significant importance in relating ourselves into space even if we are not fully aware of. It is related to the atmospheric awareness since it provides the most of the information. There are two functional distinction maps during the visual process: the focal mode and the ambient mode. The focal mode is activated from the central vision which focuses on the objects and the interaction with them. In here attention is activated and as a result, predominates the conscious vision. In this mode is obtained the "intellectual architecture experience" which is the process of analysing the composing elements of a space as individual objects. This process is characterized by high vision acuity, which means there is a high resolution in vision and a high level of performance of resolving fine details. This means that architectural contrast in material, texture, patterns, light and colour is more sensible in central vision.

The ambient mode is activated through peripheral vision where pre-conscious vision predominates and "atmospheric awareness" is activated. This visual field responds to the processing of the environment as a big picture rather than to objects. Seeing a building from a photography is quite different from experiencing it in the visual point of view. The picture below (Figure 46, Left) shows a photography of an environment from a photography and (Figure 46, Right) shows the information degradation from the central to peripheral vision, where is visible the differentiation in resolution, and presence of chromatic errors, refractive errors etc. The changes between central and peripheral vision are morphological and physiological. In peripheral vision the image is in a low resolution, appearing as blurry. Perception of luminance and colours is much lower in the peripheral vision, leading to reduced ability to resolve high spatial frequency colour. Some colours



can be visible till 60° from central vision (Naïli, Despretz, & Boucart, 2006). Peripheral vision is more sensible to movement and velocity, which means that performs better in detecting motions and spatial frequencies, which are useful to perceive the edges of forms.



Figure 46 - Left: How vision information is obtained through both fields, right: the degradation of visual information from central to peripheral vision

These differentiations in visual acuity from focal to peripheral indicate also that visualizing an environment from a photography or from sequences of spaces is very different from being inside it. We cannot experience a building only by sequences of photography. The architecture photography is not a reliable witness of true architecture quality. When we are inside a building the ambient mode is activated through peripheral vision and the surrounding visual environment will impact our posture, movement, navigation and mood. “Peripheral vision envelops us and makes us feel present in the flash of the world. Peripheral vision and echolocation cause space to open around us.” (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2005) Perceiving atmosphere leads to the embodiment of space due to the fact that this visual field is connected to a unique circuit in the brain, responsible for controlling movement, emotion, attention and decision making. Researchers have proven that peripheral vision has an immediate, direct impact on what we’re feeling, how we’re moving and how our central vision responds to different visual triggers. (Walter, 2011). When we enter in a space we firstly perceive unconsciously the atmosphere and ambience rather than specific details. It integrates us in space through the movements, while the focused one disconnects us from space providing more connection to specific objects perceived. As a result, feeling of participation in space is present through body movement.

This aspect is not only important when we are dealing with architectural experiences but also in other disciplines, such as the Japanese Butoh dance, in which peripheral vision is an important aspect for their performance and it is deeply related to body movement. In Butoh dance there is seen a tendency of underrating the sense of vision, specifically to

the central vision. This is evident in the rolling of the eyes, leading to a diffused vision. Mirror is not part of the training because the reflection of the body obtained by the focused vision might influence the movement of the limbs. The dancers concentrate mostly to the peripheral vision in order to perceive differently from what we perceive normally. By using the peripheral vision the dancers remain opened to their surroundings, diffusing the extends of the external world, in order to better perceive space. Relying to the peripheral vision enlarges the fields available to perceive of the external world.

*"In the West, ruled by Christianity, a bird's eye view is common like the ascension of Jesus Christ, who viewed the world from a vertical standing position, while in the Orient of Buddhism, an insect's eye view is common, like the Reclining Buddha as he died surrounded by his disciples, a lot of animals, insects, and other creatures." (Kasai & Parsons, 2003)*

These different views of the world come from different vectors in each of the cultures. By employing the peripheral vision, another ability can be acquired, the ability of seeing void space, the space that is left behind. This is an alternative form of perception of Butoh dance.



Figure 47 - Gestures and Body Schema in Butoh Dance Performance ("Gigante de sal", 2019)

Peripheral vision encourages us to experience indirectness, implicitness, embodiedness, flow, harmony and depth. It involves engaging with the notion of between-ess, and requires calm attention and contemplation rather than sudden shock of sensation, impression or excitement. Since the information obtained from this field deals with the atmosphere and architectural experience, becomes crucial for defining the quality of a space. The lack of consideration of the ambient mode or atmospheric awareness in architectural spaces leads the users to the feeling of being outsiders rather than being part of it.

In a space or building, the atmosphere is the first we perceive. The creation of atmospheres is much more visible in arts rather than architecture which is mostly concentrated on the functional use and circulations rather than the atmospheric awareness. Specifically, there is a correlation between architecture and cinematography while buildings and city spaces serve as filmic device and visual fields give and take information. An example where this interaction is evident and peripheral vision is more activated is the set design in “Dogville” movie by Lars Von Trier. Firstly, the scenery of the film has the nature of a theatrical performance rather than a film, due to camera filming in a conventional manner in one interior and using medium and general plan, where more than one subject is on focus, as a result the spectator choses the focus. Secondly, the simplification by eliminating distractions of the background facilitates the process of reading the information of the foreground through peripheral field. The walls and other barriers are not present, leading to a wider visual scenery for the peripheral field. A few hints are used to create the atmosphere, such as houses are symbolized by unique elements leading to better identification and orientation.



Figure 48 - Sequence from the Scenery of the Film "Dogville", Lars Von Trier

Aside obtaining the atmospheric atmosphere, the peripheral vision has a high impact on our everyday life. For instance, in web-marketing methods to draw attention to people are used while stimulating peripheral vision. This is seen in the appearing position of the pop-up advertisements, which generally is the contours of the computer screen, where the peripheral vision can read the motion and shift the focus to the advertisements. Other context where attention shift due to the peripheral field is seen in the most common environments, such as working areas. Focus vision is highly active while working on computer screens. If the workstation is positioned on the side of entrances or exits, which is the area with more frequent circulation, concentration will be disturbed and as a result the working performance will not be effective. Therefore, in order to provide efficient working performance it requires avoidance of such peripheral disturbances.

Peripheral vision can define the level of intimacy in spaces we frequently use, through

processing the spatial organization of the space and light contrasts. In a bar or restaurant, apart from its primary function, this sort of space needs to provide comfort through the level of intimacy and privacy. Thus it is necessary to reflect this through making the neighbouring tables for each table less visible for the peripheral fields. This aspect might define the distances of tables from each other and along with it the amount of artificial and natural light. If we consider the light, it is important that the luminance level should be focused on the table and the persons which are seated together and the dimmer light in areas of circulation in order not to have peripheral disturbances and along with it a high intimacy level.



Figure 49 - Interior seen from "window" (central vision); right: contribution from "scotoma" (peripheral vision) (Larson & Lochky, 2009)

In people with Macular Degeneration, peripheral vision is crucial for the spatial navigation. In Macular Degeneration is caused by the damaged macula, which is located in the back of the eye and is responsible for the central/focused vision. This impairment inactivates the cells in this area through affecting the retina, resulting in blind spots and distorted central vision. The symptoms of this visual impairment are the degradation and shadowing of the central vision, distorted vision that causes difficulty doing actions that involve the activity of central vision, such as recognizing faces, driving or reading. The blind spots appearing in the central vision bring out also difficulty to see textures or even differentiating colours, since we mentioned before in this paper that peripheral vision is not very capable to distinguish mixed colours. Troubles for adjusting to light changes, light contrasts and decreased depth perception. People with this visual impairment are affected by the scotoma condition, which means that concentrating in seeing an object they find it hard to understand the object, due to the degradation of the central vision. "The scotoma condition only allows you to see what is in your peripheral visual field." (Larson & Lochky,

2009). In this condition when objects are longer exposed to the peripheral vision, they appear smaller and compressed in shape compared to central vision (vertically and horizontally). If the peripheral vision would be damaged, such as in the case of glaucoma, the objects would be identified but there would be difficulty with interacting with the objects. Furthermore, visual impairments that have peripheral damage or window condition face dramatic problems in recognizing the scene gist, or spatial representation. In this cases (glaucoma or retinitis pigmentosa) mobility issues appear, where in static equilibrium patients with poor peripheral vision have a better quality of somatosensory compensation, but have a tendency to maintain equilibrium leaning forward and increasing the risk to fall down. Furthermore this condition leads to less accurate learning of large-scale spatial layouts than normally sighted individuals. The environmental layout as mentioned before plays a crucial role in visual and spatial learning. The spatial perception deficits often are a result from peripheral visual loss (Turano & Schuchard , 1991).

In these cases the quality of spaces directly depends on the peripheral vision and the level of involvement of space with the person. As a result, spaces should reinforce the importance of this visual field especially in the case of the persons with macular degeneration. The spaces should have characteristics to meet all the users' needs and to provide interaction with the build environment. Poverty of our peripheral vision in buildings alienates us in the city. (Pallasmaa, Space, Place, and Atmosphere: Peripheral Perception in Existential Experience, 2014). Finally, this case demonstrates the necessity of peripheral vision in spatial recognition and orientation.

Vision is the sensory by which we obtain the biggest amount of information. It has a crucial effect in perceiving the atmospheric character of a space and this is provided by the peripheral vision which is responsible for spatial recognitions and scene "gist". This deals with several processes such as: perceiving each object and their spatial relations, maintaining memory traces over time, etc. Without this field the interaction with objects and spaces is quite difficult and as a result affects the architectural experience. It is important to design new spaces taking in consideration this visual field more than focused vision to provide more atmospheric, accessible and inclusive spaces for all.

Peripheral vision should be considered in order to provide a better orientation in spaces, . This can be achieved through the use of rhythmic repetitive and intuitive visual cues to allow the peripheral vision to work effectively in orientation. This can be obtained through the use of large scale way finding strategy points of references, such as the use of structural or architectural elements with a calculated rhythmic distance. Large scale objects are important especially for individuals with only efficient peripheral vision, since the use only of this field leads to viewing the objects smaller than they are and distorted.

The use of colour can work as orientation quite well, by highlighting emergency elements with colour in order to have emergency circulation accessibility for all the users. In the extreme peripheral visual field, the predominant colour system perceived by human is blue-yellow; as a result, the use of this range of colours would be more effective and identifiable. Hence, a way finding system is created with points of references.

We create a spatial grammar as a language through visual cues organized or managed according to certain rules that define perception of space qualities related to shape, colour, light, depth and movement. Auditory information should be integrated with other sensory pathways to provide intelligent spatial organization in buildings and urban environments.

### **3.3.2.3. Hearing**

Our auditory cortex converts the stimulus into perceptual messages, by which the surrounding environment is experienced. There are two types of sound that the human ear can hear, the echo as an additional sound or sonic perception, and a sonic event, such as a handclap. Also, we can perceive the echo as a stable object, such as a wall. In this case we are dealing with a passive acoustic object. "The echo is the aural means by which we become aware of the wall and its properties, such as size, location, and surface materials." (Blessner & Salter, 2007) The wall is not a source of sound energy but an audible manifestation, an acoustic cue. With such elements we can actually understand the physical surrounding world, we can "see" with ears. The space, composed by several geometrical objects, creates an aural architecture which can influence our emotional states. Aural architecture goes parallel to visual architecture. Visual and aural reinforce each other. Through the two types of stimulus perceived, the perceiver gains more knowledge of the external environment. This type of relation between sound and vision is not always a supportive relation; it may become in some cases conflicting.

Sound is complex, as it is directly linked with time. Human audible normal range varies between 20 and 20, 000 Hz and auditory experience is provided in three spatial dimensions: azimuth (horizontal direction), elevation (vertical direction) and range (dimension). However, people do not use hearing in the same way. As in the case of the visually impaired, which define a different sub-culture of hearing as they use it for facilitating navigation in space. Furthermore, hearing is depended on the level of awareness of the auditory cues. We are not fully conscious of the "soundscape" since we always associate it with vision and as a result, concentrating in the effects of sounds in a physical environment is difficult. Thus, hearing to sighted individuals remains an everyday

mechanical process Each space has a physical feature and each of these indicate the nature of “soundscape”, which is always changing.

Auditory spatial perception is the mind’s ability to perceive space through sound. Auditory awareness allows us to perceive space through complex cognitive activities, enabling the “visualization” of space and being conscious about its existence. This type of perception influences our psychological mood, behaviour and our level of social interaction. Auditory spatial awareness does not only mean the capability of detecting the change of sound in a space but also of the emotional and behavioural experience of space. Each sound source in space has a social, cultural and personal meaning. There are four ways of manifestation of spatial awareness:

1. Influencing human’s behaviour. Some spaces give more privacy, some others reinforce the feeling of loneliness, and some provide us with a social bond.
2. Easing navigation and orientation. Some visual cues might be misunderstood depending on the condition of light or speed of visual information. Sounds allows us to better visualize the spatial cues and as a result providing better orientation. Furthermore, in the case of visual impairments, especially in blind individuals, hearing replaces vision and facilitates navigation in space.
3. Affecting the aesthetic sense of space. As vision can make a space aesthetically pleasing to the eye, so aural perception can do so for the ear, by adding aural richness to the space and creating acoustic arenas<sup>11</sup>.
4. Enhancing the spatial awareness of our experience. The physical acoustics of a musical space merge with sound sources to create a unified aural experience. Space then becomes an extension of the musical or vocal art form performed within it. Consequently, sound indicates our emotional moods. Typical spaces that effect our psychological state is a city with empty streets, which gives a sense of insecurity, or a sound polluted city, which give a sense of irritation. These emotional moods indicate in the attitude and interaction of people. “We can only appreciate the importance of aural architecture when we recognize the interwoven relationship between spatial awareness, social behavior, and the design or selection of a physical space.” (Blesser & Salter, 2007)

<sup>11</sup> . . .

The character of a sound defines the nature or function of spaces and contributes on creating an identity of the experience. This sound produces a mental image composed of several data such as volume, materiality, program, location and the character of a space. Spaces exist through the use of echoes and reverberations, through the altering of sound speed and effect of time. A noise made in distance gives an echo, which is reflected to the wall, the ceiling and the floor. This information given to the receptors transforms in a perceptual experience, by which the person becomes aware not only of the presence and distance of the object producing sound, but also of the existence of the surrounding spatial elements.

*“The sound is considered as soft architecture, because of its possibility of changing our perception of the surrounding and of its important role of defining social structures (private and public boundaries) of a society. Considering these attributions of the sense of hearing, it indicates new ways of deigning a new architecture that embraces all the senses, leading to a new experience of perceiving our surrounding and being attuned with it.”* (Schafer, 1993)

In ancient architecture, sound played a fundamental role in creating architecture, especially public spaces as theatres. “Ancient architecture abounds with remarkable examples of acoustic design—whispering galleries where a bare murmur of a voice materializes at a point hundreds of feet away across the hall or the perfect clarity of the Greek amphitheatres where a speaker, standing at a focal point created by the surrounding walls, is heard distinctly by all members of the audience.” (Viola, 1990)

In the book of Vitruvius, “The Ten Books on Architecture”, it is emphasized the importance of sound and acoustics for creating architectural oeuvres and proposing the use of musical theory in architectural design practice. Vitruvius translated these principles by defining two modes: the proportional mode and the actual mode. The proportional mode is related with the musical experience obtained by physical features of space such as height, width and depth. While, the actual mode is more related to the understanding of the behaviour of sound under certain conditions that are defined by the characteristics of the physical environment. The proportional mode was considered even by Alberti, who emphasized the analogy of architecture to music. “Music is geometry translated into sound. In music the very same harmonies are audible which inform the geometry of the building.” (Wittkower, 1998) A similar approach was taken in Gothic architecture, by reflecting the harmonic rationalization of music in architecture.

*“But our cities have lost their echo altogether . The wide, open spaces of contemporary streets do not return sound, and in the interiors of today’s building echoes are absorbed*



*and censored. The programmed recorded music of shopping malls and public spaces eliminates the possibilities of gasping the acoustic volume of space. Our ears have been blinded.”* (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2012)

One of the most exciting auditory experiences in architecture is tranquillity. This can be used as a tool for creating atmospheres and emotional moods. Even silence, absence of sound, can be an important tool for giving an experience in a building. A good example for this is the Jewish museum by Daniel Libeskind. Specific rooms which are called voids are composed of a floor filled with copper plates in a facial shape, intended to be stepped on. This process creates an echo sound followed with the movement of the person, in contrast to the deaf silence of the empty space. In this space several senses are put in work, but sound is the one that gives the real experience, the emotional and psychological mood. Without sound, perception would not be the same. It is an event that results in dynamic actions that set an intimate bond between the perceiver and space.

#### **3.3.2.4. Smell**

In architectural spaces, in accordance with the traditional classification of five senses, it is broadly discussed the importance of sight, touch and hearing. Even though, the importance of olfactory system in experiencing spaces has rarely been used as a tool in architectural discipline, its role has been considered as crucial for providing memorable and emotional clues to the perceiver.

Smelling is a very intimate action for the human being, since it indicates human relations, behaviour and at the same time triggers memories from the secretive past. “To smell another person or to be smelt by another person is always an intimate thing, the perception of an essence in both senses of the term, because a scent emanating from a body is the exteriorization of an inner space that extends beyond the confines of the skin.” (Jaquet, 2010) Body odour gives clues about the personality traits and of the emotional state of others determining the level of personal space with others and objects, as a result of the level of social interaction.

However, the most important aspect of olfactory system is its relation to the emotional and psychological state. Emotional experiences are classified in two types of behavioural response: avoidance, with a negative reaction to the experience; and appetitive response, which has a positive connotation, dealing with motivation or attractiveness of the odour.

Meanwhile, the term “valence” is related to appetitive response and is mostly related to behavioural response of olfactory perception and arousal qualifies the amount of physiological reaction. Stevenson defines the odour valence in three categories: ingestion, related to food; hazard avoidance, which is related to odours that signify danger; and social communication, related to body odours. From these categories it is emphasized the importance of smells on influencing moods, which defines a level of alertness or attention and of social interaction.

In many cultures, the importance of the olfactory system has been ignored, especially in religious cultures, where the sense of smell was considered as something impure, primitive and animalistic. Firstly, because of the idea that human image was considered as a noble creature, while the act of smelling was considered as an act more related to animals, since they use this sense in order to recognize other creatures and their environment. Secondly, body odour was related to impurity, lack of hygiene, shame and disgust, especially during the Victorian Period in Europe. As a result, being part of the civilized class was to suppress the olfactory sense. Furthermore, smelling was considered as a sensual and sexual sense, as an instinctive act, which had to be repressed. In contrast to this, other cultures used scents in order to enhance the experience in specific spaces, such as in Buddhism, Shintoism and Hinduism, where several odours were a sign of respect towards God, considering the spreading of the scent’s smoke as an action being closer to God. Subsequently, the use of scents started to be practiced as an aroma therapy to provide psychological and spiritual healing.

Through visual, tactile and auditory system we obtain most of the information about space, objects and events, while through olfactory system we obtain the quality of this information and emotion. Smell is significant to the atmosphere of space, while it provides emotional attributes to it, related mostly to the relation of space and time. Smells of an environment can change in the effect of time, such as in years or even a season. Specific smells found in the natural environment give clues to the perceiver when a season changes or even specific materials in the presence of heat, moisture, humidity or drought change their appearance and odour. They become a manifest of time and provide existential means to the perceiver. Time shapes space through transformation, which gives the sense of uncertainty of events.

Furthermore, the olfactory system is connected to memory, due to the positioning of the primary area correspondent for the olfactory function (piriform cortex) close to the memory area of the brain (hippocampus). These two are connected by many nerve fibres that provide the exchange of information continuously. Odours are critical for learning and

memorizing events or environments, recalling emotional episodic memories. (Regina M. Sullivan, 2015) When olfactory information is unknown, pleasurable, or even associated to episodic events that have a psychological or emotional significance to the perceiver, they tend to be memorable and easily registered in the brain. This explains the déjà vu effect resulting from several objects or ambience. Specific odours in space, even if they might be pleasurable, may become a bad experience depending on the effects of the event taken place and as a result, it becomes significant to the perceiver and a repetitive phenomenon. This means that a scent can serve as an affirmation of time but also relating it to memory. Our childhood house is a living smell, with the scents of furniture, or the old wooden floor, or even the perfume used by the mother, or tobacco smoked from grandfather trigger nostalgic feelings. Perfume in architecture represents time; as a result create atmospheric sequences meaningful in various ways to the perceiver. Odour moves slower than light and sound but reaches consciousness far faster than image and sound. As smell particles disappear, memory fades away. "Memory is built out of the progressive and continuous passing of one instant into another, and the interlocking of each one, with its whole horizon, into the thickness of its successor." (Merleau-Ponty M. , Phenomenology of perception, 1996)

Proust brought to attention the presence of involuntary memories, which are memories associated with a simple action memorable to the past, especially to childhood. He explains this phenomenon by the action of dipping petite madeleine in the cup of tea, bringing him memories from his childhood. The nature of this phenomenon is olfactory, gustatory, textural and in relation with temperature. Awareness to the present olfactory experience in the time of the action taking place and also from the past events, cause memory recalls which trigger emotions through this olfactory experience. The "proustian moment" starts from the urban context, where are found various combination of smells, sounds, colours. Some of the odours are pleasant and some others not, but they define the character of the city. In 2015 and 2016 Quercia, Schifanella, Aiello, & McLean, developed a research related to the odours found while walking in the city of London. Researchers matched the social media tags with words related to smell and asked the residents to note the most perceivable smells in itineraries, associating them with colour representing negative or positive feelings. All of the odours were classified in 10 categories, which expressed the nature of the "smellscape" in the city and emphasized the fact that odours have a significant role to the collective urban memory. Furthermore, the classification contributed on the understanding of the quality of air and the association of several services location to odour localization points, such as the food smell in market areas, cleaning products around hospitals, etc. Cities have different "smellscape" related

to the cultural, social, economic character. Its intensity varies and along with it emotional connotations.

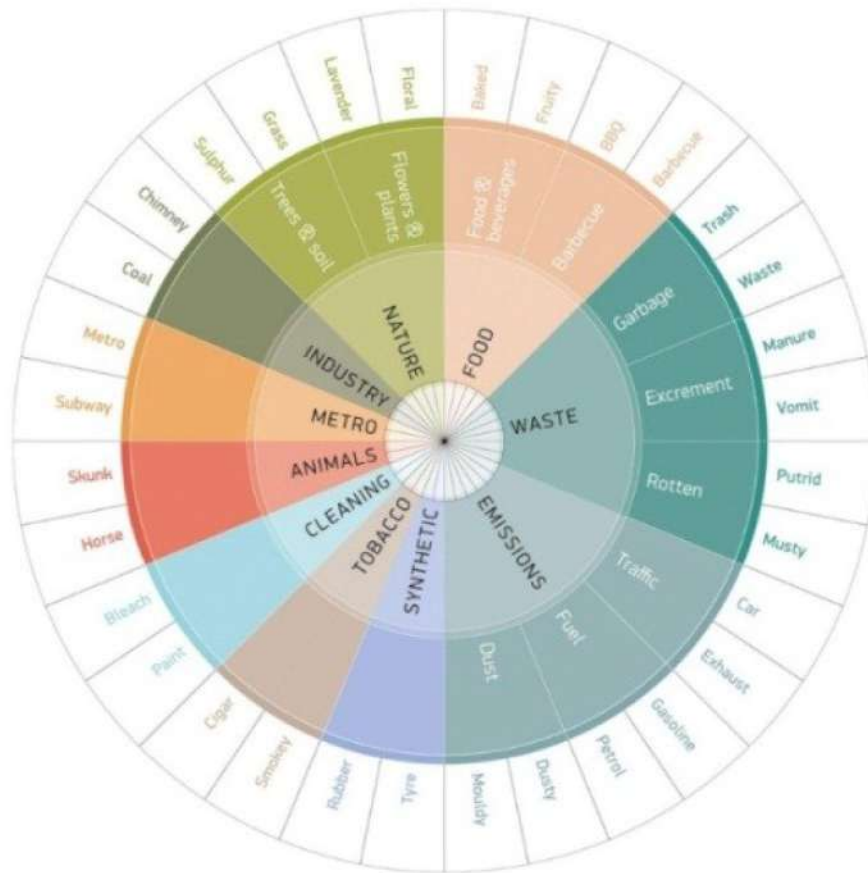


Figure 50 - Urban Smellscape Wheel Example (Quercia, Aiello, & Schifanella, 2016)

While being present in a space, odour cannot be experienced without movement, which brings dynamism to the experience through the collaboration of other senses with the olfactory system. In Art, the relation of body, space and smell has been the focus of several works, such as the artist Martynka Wawrwyński, with the exhibition “Smell me”, which presented space concentrated only to smell, giving a scent documentation of sweat, tears and body odours in order to open a form of social communication. While this work is mainly concentrated to body odours and reaction to them, the olfactory artist Maki Ueda, in collaboration with the architect Makoto Yokomizo, created an installation which distracts the attention from other sensorial modes, especially from sight, offering an environment with disappearing visual clues and promoting movement and orientation through three smell sources. In this case, through odours obtained from body movements become a way finding system for spatial navigation.

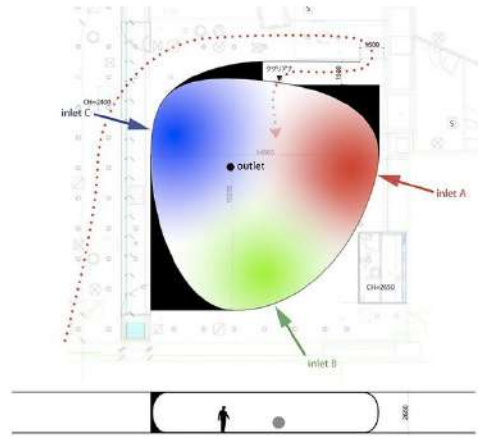


Figure 51 - Installation "Invisible White" by Maki Ueda and architect Makoto Yokomizo

(Ueda, 2019)

It is important to emphasize that smell and touch are crucial for perceiving an architectural space, primarily because they are both considered as the direct extension of body and skin. This is basically manifested in the case of blind individuals which, firstly, through movement they explore the constant transformation of space and its context. Meanwhile, they understand the localization of bodies through the collaboration with the auditory sense, and secondly, they get the most intimate relation to bodies through touch and taste, by which they obtain the information of their physical qualities. Furthermore, the strength of smell in experiencing architectural experiences is due to the fact that smell is the sense which the human being cannot avoid. As Kant describes smell as a sense that cannot be voluntarily turned off even though from his perspective, smell was functional for recognizing alert odours, but we cannot refine it.

### Smellscape Through Materials

How can smells re-define the concepts of space in terms of spatial continuity, enclosures and openings? How can smells affect the spatial relationships within spaces or adjacent. How can movements through the space be dynamic or inactive when explored through the sense of smell? How can the concepts of windows, doors, pillars, ceilings and floors be understood and translated using the sense of smell? When these spatial concepts are juxtaposed with the olfactive perception

of a space, there is an understanding of the boundaries that are invisible within a space and yet significant to either open up the spaces or hinder the continuity of the movement.

Each building has its own smell, even though its intensity varies and is quite related to used materials. For instance, hospitals smell of disinfectant, or library smell of old paper. Some smell can trigger memories from childhood, associated with our personal



Space arrangement can affect the olfactory possibilities in a building. This is mainly determined by the capacity of movements inside the built environment, which can increase or decrease the intensity of odors while leaving traces in air.

#### Mnemo-perceptive Effects

Odor and its source can be dissociated in space and time. If the odor is enough immerse in space and time, its location can be found, in contrary its source can be mistaken.

#### 3. Psycho-motions olfactory effects

Air circulation inside the building is necessary in order to provide odor movement. This pushes people to be active and move, furthermore provides spaces which trigger moods, emotions and memories.

#### 4. Semantic Olfactory Effects

People associate scents with emotions. This depends on the context and their personal interpretation or judgment, leading into a positive or negative judgment.

There are several factors which give the olfactory perceptual experience in a building. Firstly, the space qualities of space, by which it means the physical or chemical properties of the space configuration elements. In this group, it can be mentioned the scents of materials used to define space physically, such as walls, floors, furniture, etc; and the component of time which transforms the materials through natural or other processes. Furthermore, the air quality and volume, which indicate the speed of dispersion of scent molecules, such as body odours of people present in space and their frequency of movement, actions and distances.

Secondly, the factor of experience, which is directly connected with movement and synesthesia with other sensorial modalities.

Thirdly, the neurological process which transforms sensations to perception. This is mostly related to physiological properties, for instance to odor receptors densities, transportation of information from receptors to the Central Nervous System (CNS)

To conclude, with the psychological and cognitive traits which are individual to each perceiver. To this category can be added several attributes, such as memories, mood, expectation, attention or alertness, culture and social context. All of the above are personal and give independent perceptual experience different to each perceiver. All of these factors create the smellspaces unmeasurable and different to each user and associated with their personal personality traits.

Smell is another dimension for designing spaces. There are several notions (Adam, 1998) that are important for the representation of smell in time and that serve as key concepts for designing spaces through olfactory experience: *tempo* – the rate at which a smell appears depends on what speed it is confronted with; *duration* – How long a smell can hold strong at a place before it moves on; and *repetition* – the frequency of repeating.

In a building the main components that contribute to the creation of smellscapes are the materials. For Kengo Kuma, materiality should be defined from the start of conceptual phase in order to provide totality to architecture, by which it means choosing materials that provide specific auditory, tactile and olfactory perception. Through “*The Pavilion of Incense at the Royal Academy of Art's Sensing Spaces exhibition*” he integrated smell to the use of specific materials. The first ideas about choosing bamboo for the structure came from the traditional Japanese Tea House, as a natural and strong material. Along with bamboo, he integrated the tatami mat and hinoki timber, which has a very characteristic scent. The use of these two scents are more personal to the architect as the scents memorable from his childhood that reminded him not only his home but also the oldest traditional smells of his culture. The installation provides dark spaces with light elements for minimizing the visual information and concentrating mostly on other sensorial information.



In Indian rural houses, where air ventilation is necessary to cool the heat inside the living areas, the “vetiver grass” is used in several forms in order to provide the air ventilation and along with it provide a scent inside spaces. The roots or the “vetiver grass” itself, or known as Indian Khus, are woven by converting in mats or curtains and positioned in windows or doors and sprinkled with water every few hours to provide cooling by evaporation and the insect effect on the grass provide the scent of the space. In this case we are dealing with natural living materials, which through biological effects provide at the same time cooling and aromatic atmosphere inside a space.

Materials’ composition and odours are defined by several factors, such as climate, storage condition, interaction with natural components and transportation. Odours of materials can change in presence of time, through natural factors such as moisture, temperature, drought, etc. From these factors, they can release specific odours that tend to be more evident from the effect of time, such as consumption from natural factors, human



interaction and change of seasons. Mainly high temperatures and heat can trigger several reactions in the material, which can change its scent and make materials more perceivable than colder temperatures. This is due to several reactions, such as: Degradation or depolymerization of biopolymers, oxidation reactions, vaporization of compounds of low volatility, release of odorants bound in precursors, etc.

### 3.3.2.5. Touch

*“Our skin is what stands between us and the world. If you think about it, no other part of us makes contact with something not us but the skin. It imprisons us, but it also gives us an individual shape, protects us from invaders, cools us down or heats us up as need be, produces vitamin D, holds in our body fluids. Skin can take a startling variety of shapes: claws, spines, hooves, feathers, scales, hair. It’s waterproof, washable, and elastic. But, most of all, it harbours the sense of touch.” (Ackerman, 1990)*

Hapticity is the concept deriving from the application of the discipline of neuroscience to architecture, which suggests the important role of tactile perception and haptic imagery in architecture. According to Pallasmaa, in the sense of vision there is an unconscious tactile ingredient. (Pallasmaa, *The Eyes of the Skin: Architecture and the Senses*, 2005) There is a sort of curiosity to involve the sense of touch while we obtain visual information, in order to confirm this information and as a result creates a bond between the perceiver and the perceptual source or environment. Actually the basic concept of the notion of hapticity is when visual cues are able to convey tactile information, suggesting a link between emotions and haptic sensations. (Robinson & Pallasmaa, 2015)

Though, this level of emotional connection obtained from tactile sense depends on the level of touch. According to Morton Heller, there are three different touches in human, that suggest different levels of interaction with other objects or bodies: active, passive and dynamic.

**Active touch** is obtained when the tactile stimuli is obtained from the direct use of the body, such as the case of using our hands for touching the handrail while using the stairs. During this action tactile information is obtain without the necessity of vision, furthermore, vision is directed elsewhere and not in the handrail. This suggests a subconscious action as a result of body being in motion.

**Passive touch** is an indirect action of obtaining tactile stimuli which is not directly affected by movement. This happens when we feel the heights or dimensions of architectural elements, such as the height of balcony, width of doors; or even feeling the heat or

humidity of an environment. This tactile mode is mostly depended on memory and past experiences.

**Dynamic Touch** is the case of using another object for obtaining the tactile information, such as in the case of blind, which through the use of the cane obtain information about the surrounding. In this case the cane is the extension of touch and is a conscious action that involves body movement. Even though the cane is a very necessary tool and important in detecting obstacles, it is predisposed to make errors in perceiving some distances, by giving not accurate information.

Although active touch is a subconscious action, it still remains the more accurate and intimate level of touch, in close distances. Architecture can be felt and experienced as a whole through touch.

*“All the senses, including vision, can be regarded as extensions of the sense of touch – as specializations of the skin. They define the interface between the skin and the environment – between opaque interiority of the body and the exteriority of the world.” (Pallasmaa, The Eyes of the Skin: Architecture and the Senses, 2005)*

### **3.3.2.6. Sensorial Perceptual System**

Perception is not provided by senses that work separately, but the sensorial information obtained by each of the senses provide perceptual information. Senses provide the selection and identifications of the components found in our environment, which is actually considered as a source of stimulations. If an environment does not provide stimulation, senses are not triggered, and along with it, it does not allow the possibility for the creation of landmarks, which are quite necessary, especially for people that require such focal points in order to navigate space, such as the case of the blind individuals.

Name	Mode of Attention	Receptive Units	Anatomy of the Organ	Activity of the Organ	Stimuli Available	External Information Obtained
The Basic Oriented System	General orientation	Mechano receptors	Vestibular organs	Body equilibrium	Forces of gravity and acceleration	Direction of gravity, being pushed
The Auditory System	Listening	Mechano receptors	Cochlear organs with middle ear and auricle	Orienting to sounds	Vibration in the air	Nature and location of vibratory events
The Haptic System	Touching	Mechano receptors and possibly Thermo receptor	Skin (including attachment and openings) Joint (including ligaments) Muscles (including tendons)	Exploration of many kinds	Deformation of tissues Configuration joints Stretching of muscle fibers	Contact with the earth Mechanical encounters Object shapes Material states Solidity of viscosity
The Taste-Smell System	Smelling	Chemo receptors	Nasal cavity (nose)	Sniffing	Composition of the medium	Nature of volatile sources
	Tasting	Chemo- and mechano receptors	Oral cavity (mouth)	Savoring	Composition of ingested objects	Nutritive and Biological values
The Visual System	Looking	Photo receptors	Ocular mechanism (eyes, with intrinsic and extrinsic eye muscles, as related to the vestibular organs, the head and the whole body)	Accommodation Pupillary adjustment Fixation, convergence Exploration	The variables of the structure in ambient light	Everything that can be specified by the variables of optical structure (information about objects, animals, motions, event, and place)

Table 4 - The Perceptual Systems (Gibson J. J., 1966)

According to (Gibson J. J., 1966) our living environment consists of several stimulations, which define the nature of the environment. Firstly, the “Terrestrial Environment” provides solid surfaces that condition the behaviour of the persons. This environment is composed of several components, which define perceptual experience in human beings. Such components are: 1) *Consequences of Rigidity* that consists of a layout of arrangement solid surfaces, which provide the possibility to move and to interact with other objects in space; 2) *Consequences of Gravity*, which allows us to move in a vertical position and explore our kinesphere; 3) *Consequences of Electromagnetic Radiation* that are responsible for regulation of cycles related with light and further reflected in our habits; 4) *Consequences of Light*, by which we provide the visual information through reflections, such as perspective projection of an object. Through this process are created two different light environments, Radiant Light, which comes from the direct source and Ambient light which is the light that surrounds the observer; 5) *Consequences of Air as Medium* that provides the possibility of movement, dislocating objects and providing other ambient information about the environment, such as vibration events, diffusion of olfactory information, etc.

On the other hand, (Gibson J. J., 1966) defines the Animate Environment, which consists of the creation of perceptual opportunities through senses for social interaction and

stimulation resulting in the creation of a behavioural loop within a society; and the Cultural Environment, which consists on the complexity of the human communication, which is not only through speech but through other sensorial and bodily activities.

Through the perceptual system of the senses we are capable to perceive our surrounding, even if “errors” are made due to misinterpretation of the sensorial feedback from the environment. Such thing happens from various components, for instance from previous experiences and expectations, reduced information, contradictory information, etc. Most of these “errors” provide a different impression from the environment, which in classical theories of perception is considered as misperception. These “misperceptions” usually are considered as mostly related to failures of visual system, such as visual illusion, reduced information from the absence of light, a blurring structure of the image, etc. However, the term misperception should be replaced with destabilization of “normalized” perception, which is actually a different manner of perceiving the environment from what we are taught to, and furthermore, it is necessary to reconsider the perceptual system of a blind person or a visually impaired, rejecting their traditional consideration, that of an observer of reduced perceptual system due to the lack of visual information.

### **3.4. Case Studies**

#### **3.4.1. So & So Studio - The Mac House, Vincenza, Italy**

The project consists on rehabilitating the present home of a blind woman in her 50's. These modifications are necessary for the client in order to obtain a more accessible home space to perform her daily activities. This consisted on changing the general layout of the house, by reorganizing spaces and eliminating unnecessary elements that define the general labyrinth structure of a typical home. Such case study is selected in order to analyse an approach of residential space for a blind person, which deals with the creation of a navigation system of signs to provide a better orientation and comfort for a user with specific needs.

The first step for the architects was to understand the client's habits and daily movements for performing her activities. As a result, the main focus of the project was movement and transition, which defined the layout of organizing spaces. The main space becomes a straight central hallway, which connects three main points for accessing the indoor space, the access to garage, the main entrance and the exit to the back patio of the house. Along this main path, all of the activities are distributed, and the two main nodes connected by this central space are the kitchen and the client's bedroom.

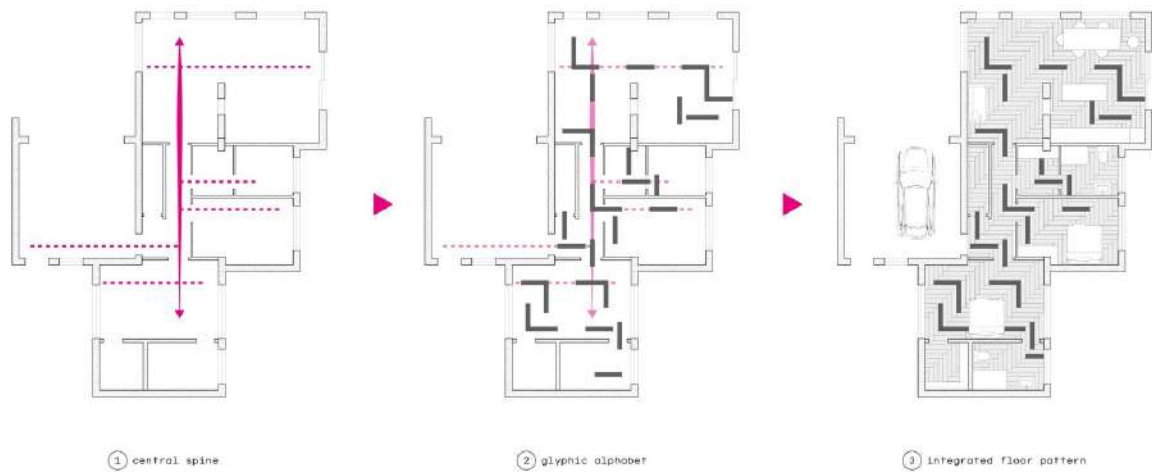
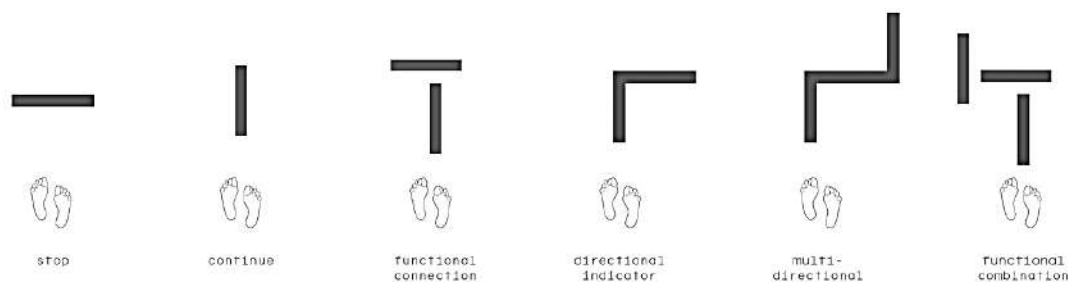


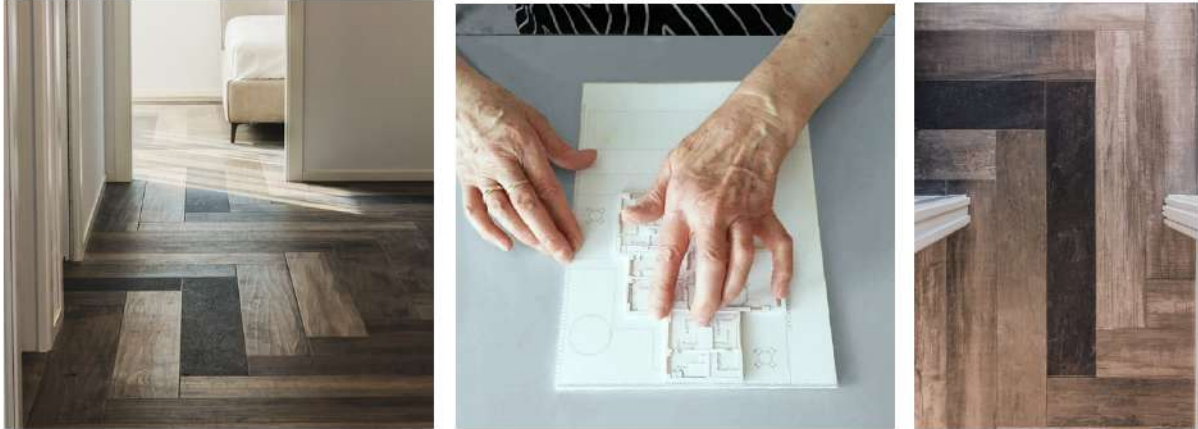
Figure 52 - So & So Stud "The Mac House", Vincenza, Italy

An interesting aspect of this project, is not only found in the space organizations which are a result of the understanding of the typical movements of the clients, but also in the translations made in a glyphic alphabet, which would serve as a structure for providing orientation and knowing spaces' locations. The glyphic alphabet is given in the floor pattern of the house and is found along the main hallway and other connecting spaces of the house. Such system functions as a sign system for deciding further directions in movement. The architects reduced material changes in other surfaces, except from the floor, which is rich of tactile information in order to make it more identifiable. Textured stone tiles are placed in the wooden floor, changing the texture of the surface, which can be felt form movement.

The threshold of the doors is eliminated in order to keep a continuing circulation inside the house from one space to another, while the frames of the doors are still present to allow the user to identify the elements of transitions. The glyph alphabet serves as an indicator of client's circulation, while the positioning of the stone tiles is used as signage in order to inform the user for the further taking steps and the functions directions.



Information about the changes made in the layout of the house is also translated in “drawdel”, which is a miniature model of the transformed space, that explains the evolution of spaces and that the client can feel through touch each of the components and also consider making changes in the future of the layout. In this form, the client is presented with the new system of the home, who creates a mental representation of its configuration and makes the process of habituation with the new layout much easier.



The project is a good example of readapting an existing residential space to a more accessible space for a blind person, in terms of spatial organization, which provides a clear and continuous organization of spaces. Furthermore, the architects consider as very important the understanding of the client, by analysing the client's needs and habits and the communication with the client as a necessary aspect for developing the project, through “Drawdels”. Such models should be part of the presentation of the project, not only in the case of a blind person, but also on each case and should provide the spatial information felt from most of the sensorial modalities. However, the projects does not consider enriching other sensorial experiences apart from tactile sense and does not give further information considering relation to natural light.

### **3.4.2. Taller de Arquitectura – Centre for the Blind and the Visually Impaired, Mexico City**

The centre is located in Mexico City, in the district of Iztapalapa, a highly populated area with the biggest number of people with visual impairment in Mexico. It is a complex of buildings, with a surface of 14 000sqm, providing educational, cultural and recreational public services for the inhabitants, concentrating mostly on the needs of the visually impaired. The whole complex is enveloped from a stone wall which is differentiated from the rest of the volumes and it is identifiable from the outside spaces of the complex. The wall serves as a submersible element, positioning the main level of organizing spaces in a

lower level from the street, as a first action of providing security and eliminating the unnecessary acoustic information coming from the street. Since the wall is composed of stones, the client tactilely understand the limits of the complex. A dense vegetation is positioned partially along this wall, in order to provide the acoustic filter from outside spaces and enriching the sensorial stimuli while navigating the centre's spaces.

The complex, in terms of functional distribution, can be grouped in three areas. The first, encounter with the main entrance from the street is the cafeteria, administration area and services office. The second group, which is organized in the central part of the building complex, along the main central outdoor space, is the typology library, sonothèque, and five workshop areas dedicated to painting, sculpture, the technique of typing, theatre, dancing, carpentry, radiophonic and electricity workshops. The third group offers a variety of courtyards which have a more private character along with other volumes whose functions are library and reading spaces, gymnasium, auditory and the swimming pool. The centre provides a variety of services and typology of spaces, creating a different character according to the function.

The central space for the complex of building is the outdoor gathering space, which provides a full perspective of most of the volumes, where the main classroom and workshop spaces are located. In the central axis a channel of water is positioned serving as directive path for the users from the workshop spaces to the third group of volumes. The limits of this channel is defined by two stripes of pebbles, along each side, in order to warn the users of its limits. The change of texture can be felt through the dynamic touch and acoustically. The sound of water serves as a guide and as an acoustic landmark, which is emphasized from the use of concrete along the edges of the volumes that are rectangular in shape and symmetrically distributed. The differentiation in material allows echoes of sound and enhancing the presence of water in that space.

Since the volumes are symmetric, they provide several ramp corridors, which allow circulation on the both sides of the central space. Trespassing these secondary outdoor corridors is provided by "bridges", of a different texture and material, which provide the tactile and acoustic information to the user of the water presence by also interrupting the strips of pebble paving. Even if the presence of such corridors is felt through air flows and echoes, the process of identifying them may be confusing due to the repetition of the volumes in a symmetric way.

However, these trespassing corridors provide access to the parallel outdoor corridors through soft ramps. These corridors are parallel to the central gathering space and

provide entrance to other classrooms. The entrances on one side are emphasized through the change of the floor level, which can be identified by the use of the white cane from the change of paving, which are tiles different in size. On this side of the volume, there is a continuous shelter, which provides protection and enclosure. The other entrances from the other side of the volumes, which correspond with larger functional spaces, are identified acoustically, through the enclosure of the walls and use of stairs. On this side, in order to emphasize the entrances, floating planes are positioned above the continuous shelter of the other volumes. Furthermore, the planes of different levels reflect the sounds and create the possibility for the user to identify the entrances to the larger spaces. The function of these planes is also to provide an interesting shadow play in different times of the day.

In transition areas, light becomes an element of orientation. Even though in the case of a blind person, he/she can identify the sources of light, which in some cases are created through cuts of the upper horizontal planes and create a system for orientating in the outdoor spaces. These solutions are mostly present in the courtyards, where light directs the user to the vegetation area.

In indoor spaces, directing elements are mainly present in the main hallways which connect entrance with exits, while other functions are distributed along this axis. Most of the volumes are furnished with natural light through linear openings on the upper part of the facades.

The architects consider many aspects appropriate to the necessities of the users, the sensorial inputs through architectural elements and materials; creating a signage system through sensorial inputs and consideration of the relation with natural light. However, the aspect of contrasts and reflections of materials do not seem to be considered, especially in the central square of the complex, where the level of natural light is intense and the reflection from the floor might lead to discomfort for other users.

### **3.4.3. Taller de Arquitectura Mauricio Rocha and Gabriel Carrillo – Library for the Blind and Visually Impaired, Ciudadela, Mexico**

The project consists of the intervention of a part of the Old Library of Mexico City, “José Vasconcelos”, which was built in 1807. The area of intervention consists in its rehabilitation in the use of blind and visually impaired people. This area includes 155sqm portico and two bays located in the southern part of the “Tolsá” square, with a surface of



369sqm. The library includes several public functions, such as a lobby, reception, waiting area, cloakroom, reading booths, library for children and play area. The aim of the project was to ease the navigation in the library and to bring a multi-sensorial experience for the users, offering a courtyard and reading spaces in the garden. The presence of this patio, not only affects the level of natural light in the indoor spaces, but also provides an olfactory experience from the vegetation. The architects use the contrasts of shadow and light, as an element of better determining spaces by the visually impaired. The courtyard plays an important role to this.

One of the main aspects considered is vibration, which is provided through floors, by the use of non-slippery, hard pavements, which vibrate through the movements of the users, as a result informing them acoustically and somaesthetically of the elements present in their path and their location. The changes in material provide knowledge about the limits of areas. In addition to an easier navigation, a signage system is present in the floors, which directs the movements from one space to another and to vertical circulations, stairs and elevator. The signage system is of a yellow colour, which is used also for other elements, such as door knobs, cane guides, railings and bookcases in the living room. Yellow is the colour that can be easier to identify from the visually impaired. This is why it is also used in the paving of play area of the children, in order to better identify the limits of spaces.

The existing cabins, which are in a floating position from the ground floor, and accessed from the first floor, are rehabilitated in function and serve as acoustic elements, which regulate the voice of the readers at the appropriate volume and tone, since they are positioned over the reading booths. These cabins were not used, due to the small size and the lack of ventilation. Their present function is audio equipment area.



## **4. EMPIRICAL TRACK**

Visual Deprivation in Architecture

## 4. VISUAL DEPRIVATION IN ARCHITECTURE

### 4.1. Defining “Blindness”

The visual system can fail in various ways and structures, which can lead in visual impairments or blindness. It is not clear the definition of the visual acuity that corresponds to blindness, since there are globally different definitions of this condition. The World Health Organization characterizes blindness as visual acuity of less than 20/500 or a visual field of less than 10 degrees. Meanwhile, In the United Kingdom, the Certificate of Visual Impairment characterizes blindness as visual acuity of less than 20/400. In the United States, the American Medical Association characterizes blindness as visual acuity of less than 20/200 or a visual field of less than 20 degrees. There have also been recent calls by the International Council of Ophthalmology to define blindness and visual impairment according to their own standards. While in Albania there is no clear definition of blindness as condition. According to National Health Interview Service (NHIS), individuals who suffer from vision loss are those who report to have trouble seeing. Meanwhile the American Community Survey (ACS) provides another definition for those with difficulty seeing as individuals who self-report either blindness or serious difficulty seeing even when wearing eyeglasses. However, this definition is not precise, while even a person with exceptional vision could have serious difficulty seeing when wearing glasses. From a diagnostic perspective, the National Eye Institute (NEI) defines ‘blindness’ as “the best-corrected visual acuity of 6/60 or worse (=20/200) in the better seeing eye.” The American Optometric Association follows the protocol of the World Health Organization in defining ‘total blindness’ as “no light perception” and ‘near total blindness’ as “a best-corrected visual acuity of less than 20/1000.” The standard legal definition of ‘blindness’ in United States follows the criterion endorsed by the NEI, as a best-corrected visual acuity of 20/200 or worse. This unclear definition determines various ways a person can be blind. In order to obtain “visual perception”, visual stimuli must be detected to be translated in molecular signals. Blindness is the inability of this process to happen, which means the failure of visual function.

Before analysing the perceptual experience in visual impairments, it is necessary to determine what visual acuity, visual impairment and blindness mean and how they differ from one another. Blindness is a specific type of visual impairment and that blindness results from a failure in the visual process. Visual acuity is the specific ability an individual has with respect to vision, how well or poorly he is capable to process the stimuli. (Patrick L. Ray, 2016) Visual acuity (VA) means also the ability to distinguish shapes and details

and it is associated with central vision. This area is extended approximately to 95 – 110 degrees in 20/20 visual acuity (normal vision).

According to World Health Organization (WHO), “The International Classification of Diseases 11” (2018) classifies vision impairment into two groups: distance and near presenting vision impairment, which provide the categorization of visual impairment:

Category of Visual Impairment		Visual Acuity		Type of Visual Impairment
		Minimum	Maximum	
Category I	Partial loss of vision or a visual field of less than 20 ° field	1/10	3/10	Visual Impairment
Category II	Socially disabled blindness (legally blind)	1/20	1/10	
Category III	Ability to count fingers at one meter, or reduced visual field at 10 °, but equal to or greater than 5 ° field	1/50	1/20	Blindness
Category IV	Near blindness, and / or visual field less than 5 ° opening	Perception of light	1/50	
Category V	Absolute Blindness	No Light Perception		

Table 5 – Categorization of Visual Impairments According to World Health Organization

Visual impairments might lead to significant changes in the individual’s lifestyle, especially changes associated with the personality of the person, such as the absence of confidence in the remaining senses, loss of personal independence because of the difficulty of accessing built environment, or even loss of social integration.

In terms of architectural design, the intermediate states between blindness and sighted will be categorized as follow:

1. Total or almost total blind – total absence of vision and lack of light perception. This category is divided in two main groups: congenitally blind or people born blind and those who became blind. It is important to divide them in these different categories because of different brain mapping related with visual information;
2. Partial blind – orientation from light and can recognize perceptual visual cues;
3. Amblyopia – incapable of perceiving depth, errors in size perception and from perspective;
4. Colour blindness – decreased ability to perceive colours.

### **Blindness, a disability?**

Blindness by WHO is considered a disability. In different societies, blind people are yet considered as helpless individuals and not capable to deal with everyday environment and other tasks. Following this concept, blindness is mostly a social problem rather than physical, and this social approach not only affects the sighted individuals, but also the blind. Blindness is not a limitation. Deficiency in the sense of sight does not mean that the person is not capable of orienting himself and interacting with the surrounding environment. He instead finds new methods from sighted individuals, which actually leads to a higher perceptual level of experiencing the surrounding environment. “If all people were attentive, if they would undertake to be attentive every moment of their lives, they would discover the world anew. They would suddenly see that the world is entirely different from what they believe to be.” (Lusseyran, 2006)

In the ancient Greek culture blindness had both a negative and positive connotation, while was considered as either a punishment or a gift by God. In addition, in Christianity it was considered as a sexual impurity since loss of vision was related to sexual diseases, but at the same time the Bible considered disabilities as martyrdom. Later on, during Enlightenment it became a notion of philosophical discourse. John Locke in “An Essay Concerning Human Understanding” (1689) doubted the blind’s ability to understand the environment and supported the idea of the lack of ability of learning and understanding. Meanwhile, George Berkley in “An Essay Towards a New Theory of Vision” (1709) denied this approach and considered the blind equal to the sight in terms of the learning ability, but denied the transfer of tactile information into visual information. Following Berkley’s approach, Denis Diderot brought in attention the importance of tactile sense for the blind, preparing the first foundations for the development of education of the blind, such as the invention of the Braille system, in the 19<sup>th</sup> century, in function of reading.

As the sense of vision remains for our architectural experience the mean by which we obtain the biggest amount of information, there have been many discussions about the architecture experience in blind persons. J.F. Fletcher (Fletcher, 1980) identified three theories concerning the spatial ability of the blind individuals. The first approach is the Deficiency Theory, which supports the idea that blind people are not capable of understanding the built environment because sight is missing and remains crucial to spatial understanding. According to this theory, the spatial schemas and spatial relations can only be understood by the sense of vision. This theory derived from the work of Marius von Senden, which argued: "the congenitally blind patient lacks everything that would enable one to speak of a tactile awareness of space." (Senden, 1960) In addition, he emphasized that blind individuals cannot understand the environment only through touch and as a result, are not capable to comprehend spatial relations and spatial transformation processes.

The second approach is Inefficiency Theory, which supports the idea that blind people develop spatial concepts but functionally inferior to sighted individuals. According to Fletcher, blind people are not capable to find their location in space through mental mapping. Blind individuals are not as effective as sighted individuals to perform cognitive processes due to the lack of visual strategies.

The third approach, Difference Theory, argues that blind individuals develop spatial affinities and manage spatial processes that are functionally equal to sighted individuals but remains slower through other means. Even though blind individuals are capable to conduct spatial process, lack of visual cues brings limitations in time compared to sighted people.

An important aspect from the prespective of learning abilities of the environment is the philosophical thought "Molyneux Problem" developed by William Molyneux who asked the question:

"Suppose a man born blind, and now adult, and taught by his touch to distinguish between a cube and a sphere [be] made to see: [could he now] by his sight, before he touched them . . . distinguish and tell which was the globe and which the cube?" (Sacks, 2006) There were two approaches to this question the rationalists and the empiricists. The rationalists accepted the idea that knowledge of the external world was obtained through consciousness and reasoning, while empiricists, such as Locke, disagreed and considered the senses as the source of knowledge, and as a result, gave a negative answer to Molyneux question. Following Locke's suggestion Berkley argued that

perception is provided through awareness of body in movement which provides the structure for visual and tactile sensations. While Diderot implied that blind people can enlarge and shrink shapes mentally, and this is realised through recalling and recombining tactile sensations. As a result, tactile representation could be effective for the blind just as much as visual information for the sighted people. Later on, in 1728, was performed the first cataract operation of providing sight to a congenitally blind person. The person was introduced again with the shape and could not be able to distinguish the shapes that could define through tactile information. This resulted in that time to the agreement of the empiricist's approach. Nevertheless, through the developments in medicine, it was proved that the congenitally blind who became sighted were able to make this distinction but for a considerable amount of time through experience. This proves that we do not have any innate ability to transfer tactile information to visual information; it can be realized only through obtaining knowledge by experience.

Developments in Neuroscience and Technology have suggested that none of these theories is completely valid for the understanding of the spatial abilities of blind people, since it has been accepted the idea that blind persons perform same cognitive processes as sighted people but rely on other sensorial means to obtain the full information from the environment. This is provided through the effective attention of non-visual cues in space and through body awareness. What is unknown is how much information concerning spatial layout is necessary to navigate independently, which is related with the composition of cognitive maps.

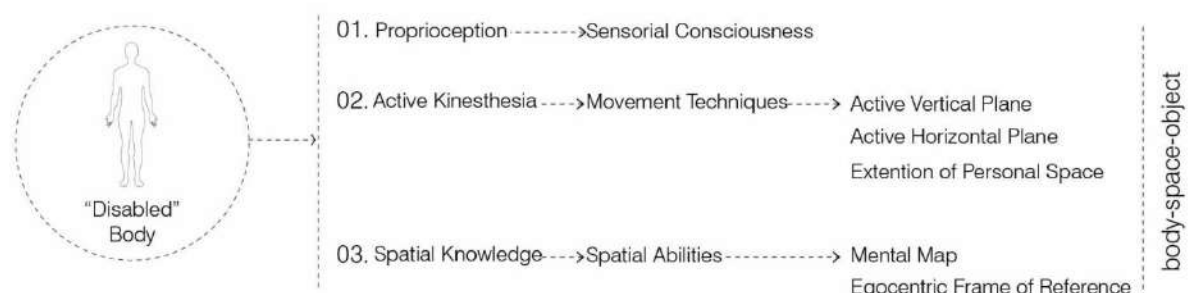


Figure 53 - Key Characteristics of the "Disabled" body of a Visually Impaired

According to Gunnar Karlsson comprehension of space by the blind can be divided in three categories: 1. Comprehension in terms of image experience; 2. Comprehension in terms of notion and 3. Comprehension in terms of knowledge. (Karlsson, 1996) These aspects are quite important for understanding the mental image of a blind person about the environment.

## 1. Comprehension in terms of image experience

By image experience is not necessarily understood "image" as an output to the visual process, but mostly it is a comprehension of the structure of elements, which later can be objectified in mental images. To understand this concept, it is important to define the differences between the three types of image experiences depended on the level of visual information. The first type is the visual experience as a direct information from the visual sense, in the case of a sighted person; the second type are the image experiences based of former or very weak visual impressions. In this category we can mention the late blind which previous visual images memory, which tend to be weak in nature; the third type are image experiences of no visual memory or experience in life, as the case of the congenitally blind.

When there is no visual information due to lack of data input from visual sensory system, tactile information is the most important in order to provide the experience of the whole image. Assuredly, that other sensorial data is necessary, but through touch, the blind is capable of experiencing the structure of elements or objects in space. Through understanding the structure and by putting different parts perceived from the sensorial information, the blind is capable to understand the shape of the elements/objects he/she is in contact with. In order for this image experience to become a mental image, it requires a certain level of familiarity with the object, which is depended on the emotional investment level (through direct or indirect motivation to analyse the entire structure of the object).

## 2. Comprehension in terms of notion

This type of comprehension is directly depended on sensorial input, mostly touch since it includes movement and direct contact with objects, space. It is necessary for the person to be in interaction with specific object or space in order to provide the understanding of its notion. To give a better explanation of this level of comprehension below it is illustrated through a case of a blind individual:

*[S9 has realized that she cannot have an experience of the whole of the entire house]... I can have an image of the wall with windows, this I'm familiar with, but I can't imagine how the roof is in relationship to • . . . then I must climb up on the roof and touch [feel] how it is, then maybe I would get an image of it [Have you touched the wall with the windows?] Yes, both inside and those which I can reach from the outside [but not those that cannot be reached, the comprehension of these parts is of another character, another kind of analogical thinking is applicable] [...] then I can imagine what it looks like and then I can place the others in an approximate way, what I believe, but it can be a misjudgement, it*





Low vision types can be divided in groups depending on the specification of visual condition:

1. General vision reduction
2. Distorted vision
3. Reduced field vision (tunnel vision)
4. Light sensitive
- 5.

### **Distorted Vision / Metamorphopsia**

This condition is caused generally from the displacement of fovea cone photoreceptors from hemorrhage, edema, or scarring. (Trobe, 2014 ) As a result, the visual images appear deformed, bent or misshapen as visual illusion. The straight lines appear bent, while objects appear warped with curved border. This condition causes difficulty to the perceiver of comprehending the real shape or scale of objects or space, which might appear smaller or larger or even out of shape as an effect of distortion. Oftenly this condition is described as a Picasso painting.

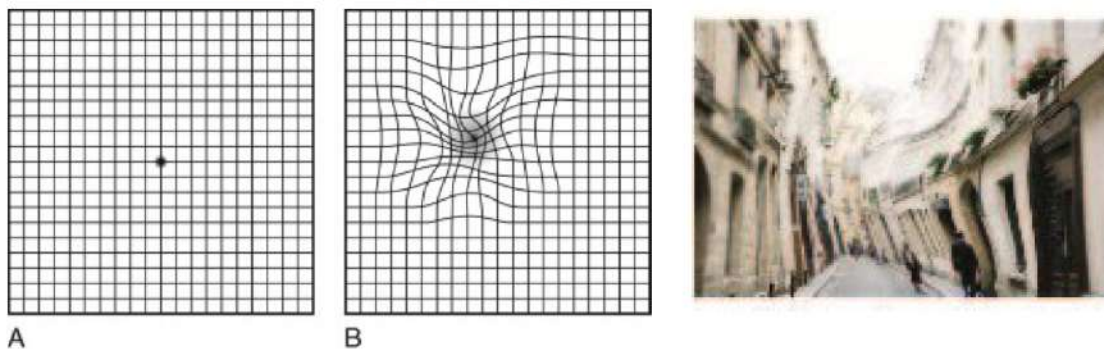


Figure 55 - Distorted Vision (Trobe, 2014 )

### **Reduced field of vision**

This condition consists on the reduction of the visual field, which is the narrowing of the visual field by resulting in the damage of the peripheral vision. This condition might appear in different forms but results in difficulty of comprehending spatial elements and movement difficulties due to not obtaining all the information from the surrounding environment. The only information is the tunnel vision. "In cases of the retinal damage, whether central or peripheral, will lead to a postural imbalance that will in some cases to falls." (Serin-Brackman, Poux, & J.C.Quintyn, 2019)



periferal degradation



retinal dettachment



glaucoma

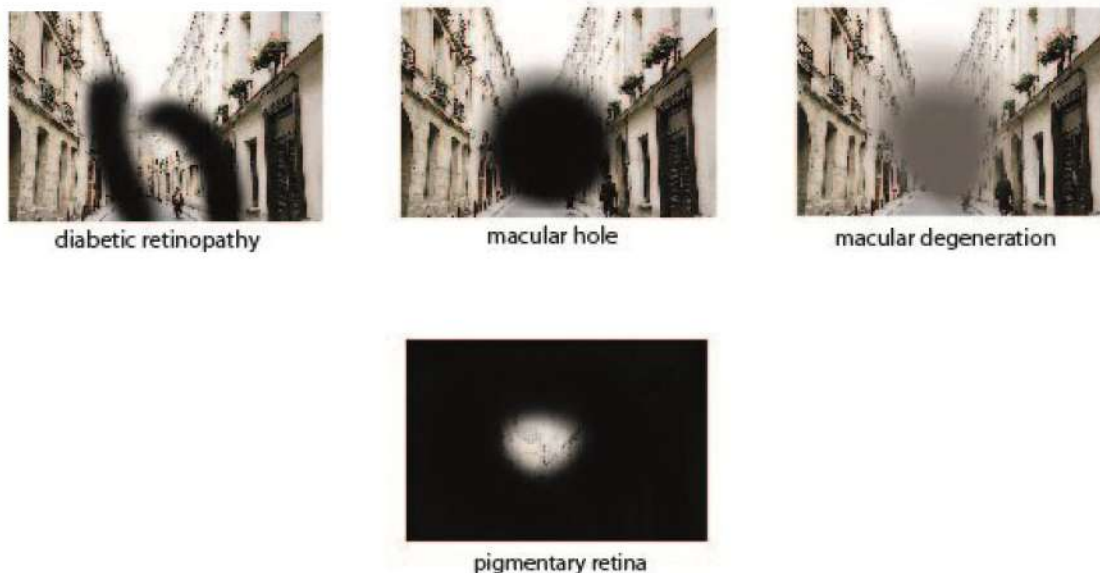


Figure 57 – Visual Perception in Visual Impairments

In this category, can be also positioned the condition where central vision is damaged partially or totally and the only information obtained is from the peripheral field, such as, the case of “central scotoma”.

### **Light sensitivity / Photophobia**

Light sensitivity is the condition of being very sensitive to artificial or natural light, generally from bright light. An important aspect in this condition to be taken in consideration is glare effect, which is the sum of bright light that brings visual discomfort. Glare can be caused in the presence of a high intensity of light or high level of luminance.

Concerning this categorization of the visual impairments, there are four main factors to be taken in consideration related to spatial perception of architectural environments.

1. Illumination, which is the intensity or colour of light;
2. Glare, which is the reflection of light from surfaces;
3. Contrast, which is the difference in luminance or colour that makes an object distinguishable;
4. Size and shape.
- 5.

#### **4.2.1. Problems in Navigation in the Visually Impaired**

The main problem the visually impaired, especially the blind, face is the lack of independency that indicates the ability of completing everyday tasks. This is interrelated with the lack of appropriate outdoor and indoor spaces to provide an independent navigation. Dependency from others may result in the reduction of his/her everyday

activities and the reflection of self-esteem problems, translated then in feelings of helplessness and other psychological problems.

Since the visually impaired do not obtain visual information of environment, they rely on other sensorial channels and develop their personal methodology for space exploration. The most problematic spaces are those that are unfamiliar and those that diminish other sensorial cues, such auditory information. Concerning this, the most problematic spaces are crowded places and those that lack auditory clues, such as train stations, shopping malls, open spaces where are present many background noises. According to (Fruin, 1971) there are two space zones required for locomotion: pacing zone and sensory zone. Pacing zone is the area required for foot placement, while sensory zone is the area required for providing perceptual processes in the traveller, which is concerned with safety requirement because responds to stimuli in the environment. Both of these zones may be influenced by other external factors, such as traffic noise. In the case of blind individuals sensory zones are determining for pacing zones, where in this case traffic noise may influence the level of perceiving other wayfinding clues, but can also serve as signal for recognizing unsafe zones.

Furthermore, in unfamiliar spaces, there are many difficulties experienced by blind persons, such as remembering and recalling information from the environment, especially in cases where are present repetitive identical components, like identical building blocks. Other problems that slow the process of familiarization is the presence of unusual objects, or even inappropriate position of entrances. Independent navigation requires good skills of sequential learning of path segments and spatial updating strategies.

### **4.3. Spatial Exploration**

**Spatial Cognition** is the spatial ability of a person to locate accurately the spatial components, the ability to understand directions, distances and to orientate himself or herself. It refers to a set of everyday abilities that provide consciousness of our body position and where the body moves, through navigation, memory of objects or even topographic knowledge. Spatial cognition happens through **cognitive mapping**, which is "the process composed of a series of psychological transformations by which an individual acquires, stores, recalls, and decodes information about the relative locations and attributes of the phenomena in his everyday spatial environment." (Downs & Stea, 1973) The product of cognitive mapping is **cognitive map**. (Tolman, 1948) Through these aspects, spatial exploration is made possible in unknown spaces. In addition, all of these

components are depended on the amount and level of spatial information. Spatial information may be perceptual and conceptual and as a result, spatial mapping is done both perceptually and conceptually. By perceptual level, in the case of people without vision, means the compensation of missing visual information with other sensorial information. "Since they cannot gather visual information they use compensatory sensorial channels and alternative exploration methods." (Jacobson, 1993)

Through spatial cognition and cognitive mapping spatial exploration and orientation, which is the ability of the person to relate his/her personal location to environmental frames of reference. However, there are even other components necessary to provide spatial orientation, which include:

1. Knowledge of spatial layout of destinations and destinations along the way. When this component is missing spatial orientation can be provided only using spatial strategies, which means that this is not very crucial, especially in novel spaces.
2. The ability to keep track of personal location and which direction he/she is heading. Without this component, the traveller quickly gets lost.
3. Comprehension of the organizing structural principles embedded in given environment, through memorizing each of the spatial components and creating a pattern, such as the case of a grid-like street system. (Rieser & Heiman, 1982)

The biggest challenge for blind individuals is to navigate through built environments. In consequence, technology has tried to bring in use to blind individuals certain devices in order to provide a better navigation. Although researches have lead into a conclusion that there is a lack of knowledge according to the cognitive map of blind individuals in navigating space. Blind individuals have spatial learning capabilities to support navigation in space. Environment exploration is non-visual, and spatial cognition can be performed even in congenitally blind individuals because it does not require previous visual experience. Still, in the case when vision is missing it requires active decision making and planning. This is made possible through "Mobility" and the "Wayfinding Systems", which are important concepts in spatial cognition. These two are different concepts, even though they provide orientation and navigation. Mobility is the physical aspect of spatial exploration, while Wayfinding is cognitive.

#### **4.3.1. Mobility and Orientation**

Mobility refers to the free physical movement without obstacles and hazards, providing safety and minimizing the level of stress or anxiety during navigation. In order for an

environment to be mobile, it should offer as much information from the sensorial zone and provide availability for several pacing areas to be created. 'Mobility is not only dependent on knowledge about objects in the environment. In order for a person to be orientated, it is necessary for him or her to know his or her own position relative to a goal.' (Tezchner, 1991)

There are several techniques used by the visually impaired that involve several manners for exploring an environment. These techniques are also part of O&M (Orientation and Mobility) training for congenitally blind children and later blind individuals, in order to navigate independently in spaces. In this section, we will discuss the physical aspect of physical movement techniques used by visually impaired for exploring a familiar or unfamiliar environment, even though these techniques can improve the cognitive mapping of the visually impaired and providing a better orientation.

Orientation on the other hand means the ability of a person to locate himself/herself in space, to be aware of his/her body position and capacities in relation to other objects in the environment. Also, implies the efficient use of information gather from the environment to move freely and independently in space through detection of landmarks and facing obstacles present in space. This information is sensorial and is auditory, tactile, olfactory and kinaesthetic in nature. There are found two aspects in O&M techniques. Firstly the sensorial zones which provide also the atmosphere of the environment and not only the physical accessibility in space, and secondly the personal space related with kinesphere.

O&M training started to be practiced after the World War II, for the veterans who lost sight during War accidents and later on, developed to help people who lost vision in order to provide independency for performing their daily life activities and moving in indoor and outdoor spaces without the help of others. This is very important for the physical condition but mostly psychological, emotional and social aspect of the visually impaired. These techniques help us understand the approach to space and relation with the spatial components that differs from sighted individuals.

Spatial orientation and wayfinding are the foundations of mobility, but the difference of these two with mobility is that by wayfinding and spatial orientation it is understood the cognitive skill of the person to move in space, avoiding obstacles and using strategies to achieve the final goal. While mobility is the physical ability for navigating space and body movement capacity ability to face obstacles or relate with physical landmarks. It is through cognitive mapping and developing of mental representation that mobility is possible, even without vision.

## **Advantages of Independent Mobility**

O&M techniques are techniques that instruct the visually impaired with techniques that provide several possibilities while navigating space:

- autonomy and unaided walking and navigation
- perform their activities of daily living and personal life support;
- increases spatial perception;
- allows them to be independent from others,
- provide the ability to protect themselves by hazard obstacles.

Independent spatial navigation has also positive effects in the life of the visually impaired, such as:

### **a. Personal Development and Independence**

These techniques can provide new experiences obtained from the environment and a different level of understanding. Furthermore, the person does not feel depended to other people for achieving their goals and activities, while moving from one space to another autonomously. As a result, the person gains more confidence and different perceptual level for relating and interacting with the environment.

### **b. Self-confidence and Social Integration**

O&M training includes improvement of the cognitive mapping, which also results in improvements in body postures, becoming also more acceptable from the society. Most of the blind persons remain in their homes, since it feels as the more secure place for them. This is translated in a solitary life, which causes negative effects to their psychological state. Lack of interaction with others effects their self-confidence and prevents the person's possibility to express his contribution to society. Furthermore, the person through mobility is able to perform social activities in collaboration with a certain group of a community, and as a result, the person feels more involved, active and accepted by the society. While being able to perform these activities he can develop inter-personal relations and extend the social interaction. It is important to provide mobility and accessible spaces in order to promote also the social involvement of the visually impaired in society. "Recent research has not only documented a wide range of early appearing social-cognitive achievements but also provided evidence of the effects of such

developments, in that it demonstrates consistent relations between social-cognitive understanding and the quality of children's social interactions." (Hughes & Leekam, 2004)

O&M techniques are not applied in many developing countries, such as the case of Albania. This is because of the lack of training facilities for the blind, due to inappropriate urban and indoor environments for the visually impaired, lack of regulations, and lack of inclusion culture. It is our duty as architects to provide more adequate spaces, indoors or outdoors, to facilitate the accessibility for the visually impaired. In order to understand some of the techniques for spatial exploration and navigation of the visually impaired, it is important to understand these techniques for providing a better knowledge of their relation to the environment.

### **Kinesphere: Exploring Strategies and Mobility**

Exploring strategies consist on taking directions and using landmarks for accessible navigation in indoor and outdoor spaces, and can be performed with or without a cane. Firstly, it is important to define what can be considered a landmark. A landmark can be of any form, it can be audible, tactile, visible and in order to orientate a person it must be permanent and fixed. If it is easily movable it is not considered as a landmark, especially returning from destination point to start point. Furthermore, landmarks must be easily identifiable or landmarks are individual for each traveller and he/she chooses which elements to be considered as orientating points. It is also necessary to explore other elements around landmarks in order to confirm its presence in returning route.

Using landmarks indoor and outdoor provides:

- Safety while walking indoors and outdoors,
- Understanding of the environment,
- Understand body location,
- Independency navigating spaces,
- Performing daily activities.

There are three types of techniques for exploring the environment by the visually impaired:

1. Hands and arms techniques, which can move in different patterns to explore the environment;
2. Tools extending bodies;
3. Exploration strategies through walking.



While making spatial exploration the visually impaired can use one or a combination of these techniques. This depends on the type of spaces where they are navigating, whether if it is an indoor or outdoor space, or familiar and unfamiliar spaces.

These strategies provide the knowledge of the kinesphere of the visually impaired and how much developed is the awareness of this dimension through the movement of different parts of the body and limbs. Furthermore, analysing human body's elastic capacities help us determine how they express themselves in an independent way. The kinesphere of the blind individuals is a good example to understand the capacities of body and mind to adopt to spaces and changes.

### **Hands and Arms Technique**

Movement of hands and arms is the technique used mostly in indoor spaces but by being combined with other techniques can be used even in outdoor spaces. By this technique, it is provided the detection of landmarks through tactile information. This includes the basic technique, which is differently known as trailing technique; the protective techniques or even square off technique.

#### **A. Basic technique (Trailing)**

For this technique it is important to find a flat surface, which might be a wall, or a door or edge of a table, etc. While walking it is important to follow this surface in order to orientate, to avoid obstacles and find doorknobs. The person stands close to the surface; the arm is extended in front of the body in the waist level and is slightly bent in order not to pressure the muscles. The back of the hand is positioned facing the surface, because the palm is more delicate. The person follows the surface with a slight touch of the two last fingers and gets information of the dimension of the surface and the material. The other hand can be used for the protective technique. The trailing technique is more used in familiar spaces since can be performed without a cane. This allows the person to feel more independent and explore the environment through direct touch.

#### **B. Protective technique**

This technique is combined with trailing but also through tools extending body. It consists in Upper Arm and Forearm technique and Lower Hand and Forearm technique.

##### **- Upper arm and forearm protective technique**

This provides protection for the upper part of the body, such as head and chest, from vertical obstacles such as tree branches, low ceilings, sharp wall curves, wall corners, or furniture positioned in height. The arm is positioned 15 – 30 cm away from body and folded with 120 degrees raised in shoulder height. The back of the hand is positioned in

front of the face and the fingers are bent back towards body. This not only provides protection from obstacles but also allows the person to find door or window frames.

- Lower Arm and Forearm protective technique

While walking the person can combine the two protective techniques, in cases of indoor environments where are present several types of objects. This technique provides protection for the lower part of the body from waist level, generally to protect the person from furniture and other low obstruction. The arm is extended from the middle part of the body with bent fingers and in this case, palm is facing the body. The distance has to be 10 – 20 cm away from the body.

- Picking up dropped objects

In order to find a dropped object and at the same time protecting oneself, the person should bend with the body straight down in order to protect the upper part of the body from obstructions. To find the object the person moves the hand in spiral until he/she finds the object or in perpendicular ways following a square pattern by performing horizontal movements. This technique is not used only in the case of dropped objects but also for a systematic search of objects.

### C. Squaring Off Technique

In cases where the person needs to take directions while walking, a flat surface can be found for alignment, such as a wall, and place his/her back against the wall. Then perform a slight rotation left and right, forming a square as a pattern and later projecting a straight line to walk. This technique can be performed with or without a cane.

### D. Cardinal Directions

In order to know the body location and the directions that will be taken, but also to localize landmarks blind persons use the cardinal system independent from their body location, fixed through compasses or phone compass application. If the definition of true north is not possible, the person establishes a contrived cardinal direction, created on his/her own but always fixed, without using directions as left-right.

## **Tools Extending Body**

This technique provides exploration and navigation of space through other means and not from a direct contact with the environment. While in the trailing technique the person explores the environment through direct touch, through this technique he/she explores

space through dynamic touch. This indirect way of being in contact with the physical environment is predisposed to make errors, especially concerning distances, but remains a safe technique to be used especially in the outdoor spaces where the sensory zone is disturbed from other factors. There are two ways of performing this technique: through cane and through guide dog.

- Cane technique

The cane is the extension of the body in the case of the visually impaired and does the exploration of the environment in terms of obstacles, materials through vibrations and noises. Canes can be of different materials, bamboo, wood, PVC pipe or aluminium rod, etc. There are two types of cane, symbol cane and mobility cane, which can be long cane, folding, electronic and lazer. It is a handy tool since it can be folded and adjusted according to the person's height. In order to provide as much information possible the cane must be in direct contact with the ground through the wheel while walking. The cane is extended generally 90 cm away from the body and moved in several ways, through wrist movements according to the type of space and present obstacles. This is a very useful tool especially for providing more confidence while using urban spaces, detecting elements and provide at the same time sensorial information to the user through vibration, auditory cues and dynamic touch. The type of touch used in this technique is the dynamic touch, the person is not in direct contact with the environment but through an intermediary object, as a result, it is more predisposed of making errors especially detecting distances or understanding some materials. Through the combination of hand technique, errors in material detection can be minimized, and also the person obtains more information about the physical space.

- Guide dog

While through cane, technique it is provided dynamic touch, in this case there is no direct contact with the physical environment. In this case, the person does not fully interact with the physical space since the dog is the one that participates in the navigation process. In this case there are found difficulties to process the spatial experience and a loss of ability to orientate in space. Although, it is a very effective technique for providing safety in outdoor crowded environments. This technique is not applied in developing countries since it lack of training facilities for the dogs, high cost of maintenance and risk from stray dogs.

- The diagonal cane technique

While using the cane, there are several ways of navigating, depending on the level of familiarity of the environment and its nature. The diagonal technique is used in familiar indoor spaces. The cane is held diagonally in front of the body and extended with crossed

arm. The tip of the cane is not fully based on the pavement, such as in cases of carpets or floor cracks.

- The touch technique (two point touch technique)

This technique is appropriate for unfamiliar places and usually in the outdoor. The cane is swung from side to side touching the ground, while the hand is positioned in the level of the waist and in center. The movement of the cane is in form of an arc synchronized with movement of the feet. Specifically, the cane technique is used in outdoor and unfamiliar indoor areas.

- The constant – contact technique

A standard cane touch technique in which the cane tip remains in contact with the ground at all times. The cane is gripped with the index finger pointed down (along the flat side of the grip) with the rest of the fingers and the thumb wrapped loosely around the cane grip. The arm and the cane should form a straight line. The arm is held so the wrist is at waist height away from the body. The elbow should be flexed slightly. The hand is held at the midline of the body. The cane is moved from side to side by flexing the wrist. The tip maintains contact with the ground at all times and is moved to approximately one inch outside each shoulder.

- Ascending and Descending Stairs

The stairs are one of the architectural elements of which blind people are faced with a considerable amount of difficulty to be accessed. The process of ascending and descending stairs is provided by the use of cane and requires specific techniques in order to be performed as safely as possible.

#### Ascending Stairs

Firstly, the person must locate the stairs and to do so it is used the two points technique till the moment the cane touches the bottom of the stairs. After finding the stairs, body is brought close to the stairs until the feet touch the first stair, meanwhile the cane is positioned vertically between two feet. The cane is moved from right to left while touching the stairs in order to understand the width of the stairs, and to understand the positioning of the wall for applying also the trailing technique. After providing the width of the stair, it is necessary to understand the height of the step. To do so the cane is moved vertically on the surface of the stair until reaching the top. Then it is necessary to identify the second step, while moving the cane vertically until it touches the second step. Later on, the same process is done for identifying the third step. While ascending the stairs the arm that hold the cane is extended until it touches the next step in the edge of the top of the step. While

reaching the top of the stairs, it is important to check if there are any barriers presented on the reached floor or other stairs to ascend in order to continue with walking.

#### Descending Stairs

The cane is positioned in the middle of the stairs and swept right to left in order to understand the width and the availability of space for descending stairs. The next step is to understand the height of the step, for which the cane is positioned vertically and moves the cane vertically till it reaches the top of the next step. For finding, the next step it is used the diagonal technique while the cane is positioned diagonally and extended to reach other steps, until it reaches the next floor where the stairs end.

### **Exploration Strategies through Walking and Moving**

There are two main spatial strategies: **route** strategy and **map** strategies. Route strategy is based on linear recognition of spatial features. This implies movement in sequences of events and elements. Blind people use mainly route strategy for recognizing the environment and for navigation in unfamiliar spaces. (Fletcher, 1980) Map strategies encompass multiple perspective of the target space. (Fletcher, 1980) It is the understanding of the spatial configuration through a tactile map represented in a floor map in cases of indoor spaces or from scale models.

“Route” represents intentionality of movement in space, which are planned and analysed by the perceiver before and during navigation in space. Route strategy is a spatial strategy via linear routes that follows focal points in sequences. It is characterized by dimension, direction and time duration. It consists of starting and ending point represented by a line that provides several other points, which are considered as focal points for orientation and for changing directions until reaching the final destination. Such focal points are considered as landmarks which play an important role for recognizing the environment and relating themselves with other bodies or objects. Locating landmarks provides the ability to create strategic movements in space. Landmarks are individual and depend from level of attention and person’s interest, furthermore they depend on the qualities or characteristics they have, how identifiable they are from other elements present in space. Those that attract more attention to the perceiver are considered as potential and dominant landmarks. As a result, their size, attributions and location, as considered by (Gibson J. J., 1966) “components of our terrestrial environment”, signify the role and selections of landmarks in an environment.

Through route strategy a person explores an environment by movement, especially in novel environments. Five important phases are established through route strategies:

1. Establishing the goals,
2. Establishing a clear starting point,
3. Select the most appropriate systematic search patterns,
4. Utilize appropriate mobility technique to adopt the search pattern,
5. Select and implement search strategies facilitating the development of an object-to-object relationship to future travel. (Everett, Rieser, Hill, Halpin, & Halpin, 1993)

In order for route strategy to be performed, it is necessary to create a mental map. Route shapes or patterns give a mental map for deciding directions to be taken while navigating space. Route shapes can be divided in five main categories according to their configuration: "I", "L", "U", "Z".

1) "I" route

In the case of walking in a straight line, from the starting point to the end point, with no turns.



2) "L" route

Walking in straight line with one turning point, left or right.



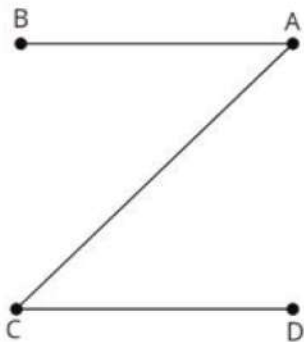
3) "U" route

Two turns in the same directions (two turns left or two turns right).



#### 4) "Z" route

Two turns in the opposite direction



### Veering

According to (Schaeffer, 1928) humans veer in a spiral pathway blindfolded to reach the destination point while attempting to surpass a straight path. This is due to the spiral mechanism in the central nervous system and it is not affected by sensorial mechanisms. Spiralling is a conscious phenomenon, which means that the person thinks is walking straight but actually walking in spiral paths, which their sizes depend individually from person to person. In blind individuals it was seen a tendency to linearize curved path and to appear segmented rather than integrated. "It is indeed probable that every sense organ that has to do with localizing a point in space is subject to the influence of the spiral mechanism so that when the rest of the space field does not contain definite reference points or landmarks which tie the field together, the point fixated will begin to rotate." (Schaeffer, 1928)

In order to avoid this phenomenon the person should find fixed landmarks that lead him/her to walk along the desired path. This suggests creating a frame of reference, which is the definition of the positioning of several points in space that serve as landmarks. For a

blind person it is necessary to create a frame of reference in order to not limit their behaviour path and provide an efficient activity reaching the final destination. For instance, blind persons follow linear paths such as corridors or edge of pedestrian paths. This process is called “shorelining”. In absence of these elements the route is segmented from points that serve as landmarks and remember all these in-between elements to reach the destination and perform the return path. There is strong evidence that wayfinding and spatial cognition can be performed with the absence of vision and especially without previous visual experience. (R. Passini, 1986)

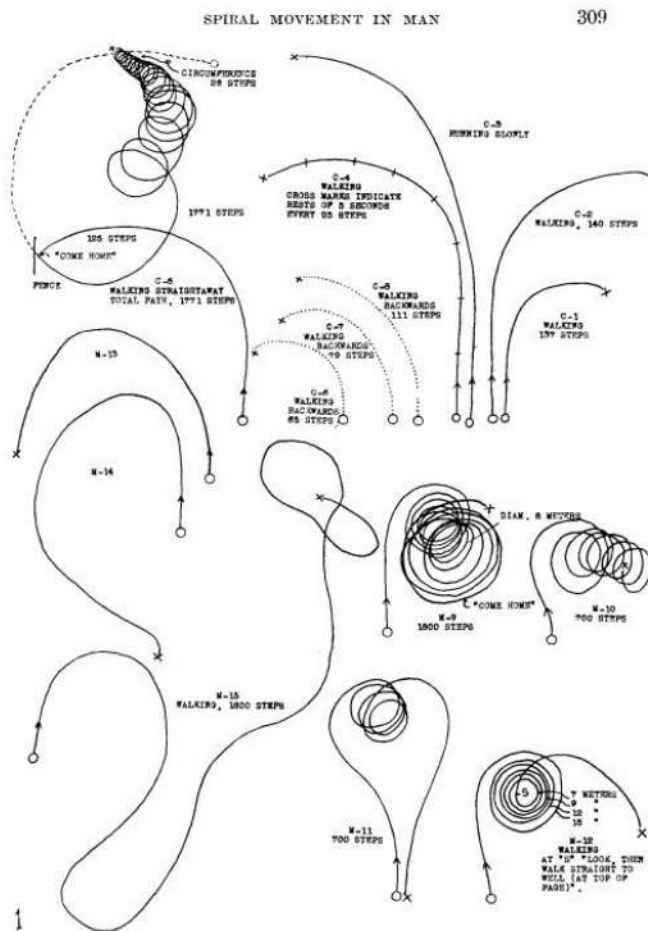


Figure 58 - Veering in Blindfolded Individuals (Schaeffer, 1928)

### Patterns of Exploration

According to (J. M. Loomis, 1993) navigation requires five steps: (1) sensing, that is acquiring information about self-motion and landmarks; (2) creating a trace of the route (i.e., a sequence of contiguous segments and turns); (3) creating a survey representation; (4) computing the trajectories needed to reach the target; and (5) executing those trajectories.



In unknown spaces, especially in indoor spaces, where are present many objects, spatial exploration by blind persons is provided through several patterns of route strategies and establishing object-to-object relations using points, vectors, grid lines and updating space using environmental features as frame of reference. (Tellevik, 1992) The five first techniques are part of the research of E. Hill et al.<sup>12</sup>, Tellevik<sup>13</sup> and the two others Gaunet and Thinus-Blanc<sup>14</sup>.

### 1. Perimeter

The exploration of space is done in perimeter of the space, following the boundary. The person explores space by following the wall through trailing technique with or without a cane, where he/she locates doors, windows or other objects positioned in the perimeter. In this way, the person avoids obstacles, but on the other hand does not experience in total the other part of space.

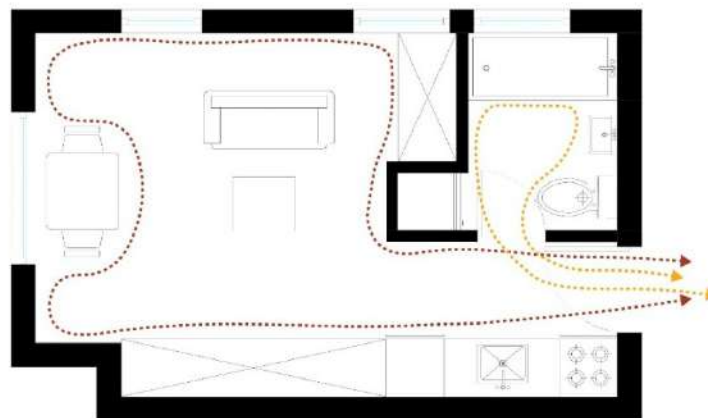


Figure 59 – Pattern of Exploration: Perimeter

<sup>12</sup> Hill, Everett W., Rieser John J., Hill, M.M., Halpin, J., Halpin, R. "How Persons with Visual Impairments explore Novel Spaces." *Journal of Visual Impairment and Blindness* 87.8 (1993): 295-392.

<sup>13</sup> Tellevik, J. M. 1992. "Influence of Spatial Exploration Patterns of Cognitive Mapping by Blindfolded Sighted Persons." *Journal of Visual Impairment & Blindness* 86 (5): 221–224.

<sup>14</sup> Thinus-Blanc Catherine, Gaunet Florence. "Representation of Space in Blind Persons: Vision as a Spatial Sense?" *Psychological Bulletin* .1 (1997): 20-42.

## 2. Grid

Investigating objects by connecting different points of the perimeter to the objects in straight lines. This provides an efficient localization and exploration of all objects.

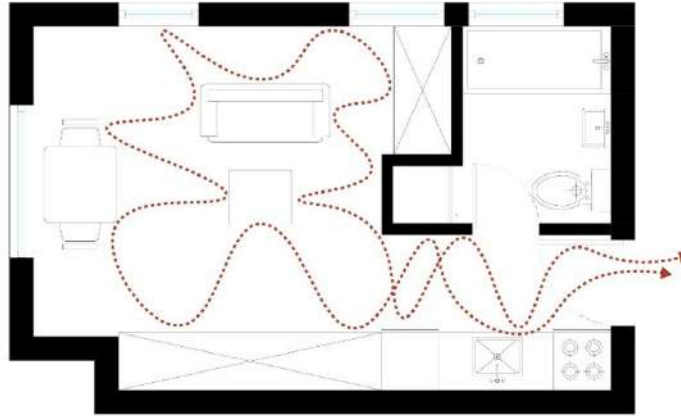


Figure 60 - Pattern of Exploration: Grid

## 3. Object-to-object

Moving from one object to another, without having a contact with the boundary. This provides a full representation of space.

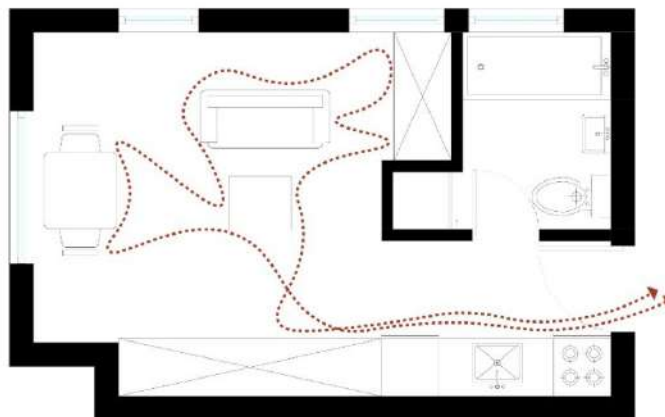


Figure 61 - Pattern of Exploration: Object-to-object

#### 4. Perimeter to object

Following the wall and following the edges of the objects, by not losing contact with the perimeter.

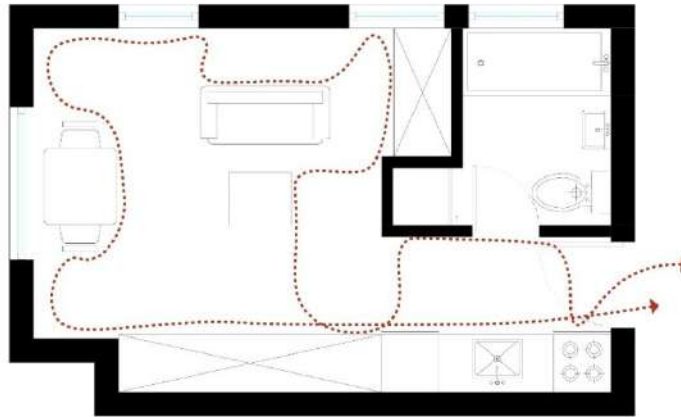


Figure 62 - Pattern of Exploration: Perimeter to Wall

#### 5. Home base to object

Choosing an identifiable object or element as a landmark, which can be the entrance or other distinguishable and fixed elements. The person explores other objects or the space through returning several times to the landmark.

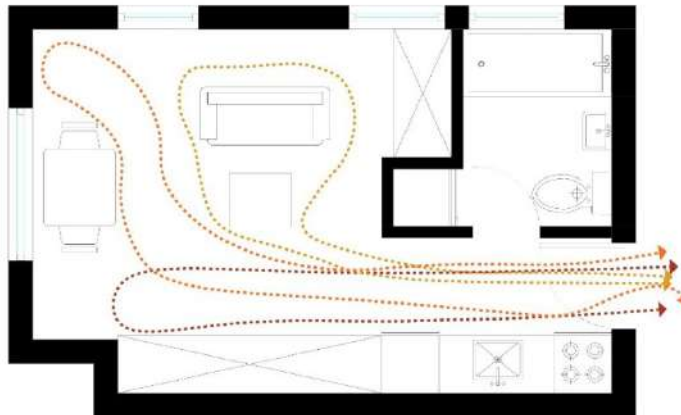


Figure 63 - Pattern of Exploration: Home base to object

#### 6. Cyclic

Investigation of objects in sequences, going in spiral movement and having constant contact with the first explored object.

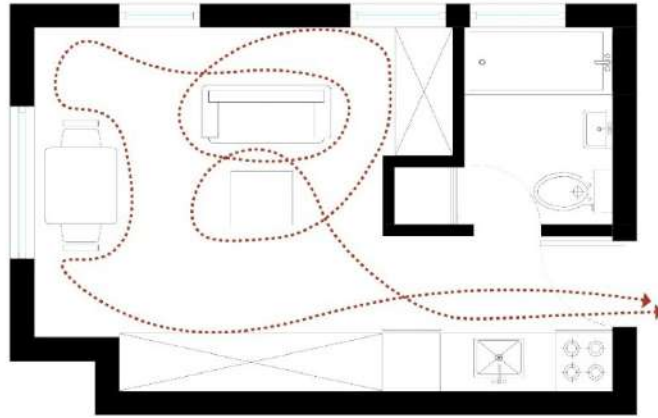


Figure 64 - Pattern of Exploration: Cyclic

## 7. Back and Forth

Moving several times between objects.

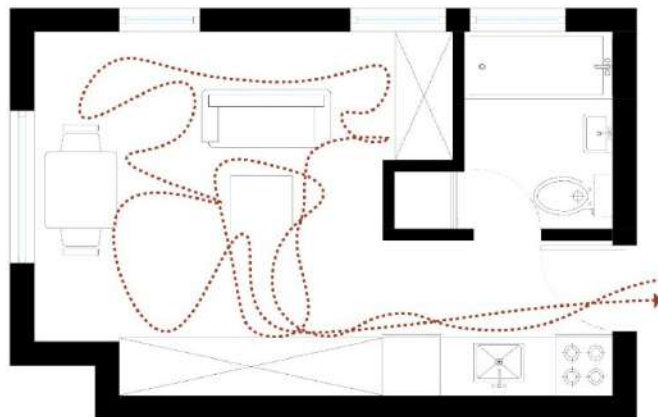


Figure 65 - Pattern of Exploration: Back and Forth

### 4.3.2. Spatial reference frames

There are two types of reference frames for spatial processing: Egocentric (Geocentric) and Allocentric. (J. D. Feigenbaum, 2004) These two differ from each other in terms of relation to other objects and location, even if these spatial abilities are correlated.

Egocentric frame involves a self-to-object representational system. Body is the primary source of information and deals with one person's perception point of view. Location of other objects is processed in relation to body's position and corresponds with the directions, left-back, up-down and back-front, or with the cardinal directions generated

from the person in relation to his/her body. The location of the objects in space is recognized through the relation of stimuli and body from the viewer's perspective. Jean Piaget called egocentrism-perceiving from our own point of view and our initial cognitive attitude as children is primarily egocentric due to perspective. (Jean Piaget, 1948) Furthermore, he defines body-centric spatial reference frame and the kinaesthetic memory as egocentric.

In contrast, allocentrism, is the position in which we perceive through another person's or object's location. In this case, the centre axis is not one person's body but other humans, objects, or other external cues of the environment. In this reference frame the surrounding environment is assumed as stable and the location of one object is relative with the location of other objects. In this case location is based on the true cardinal compass directions but not directed to the one person's perspective.

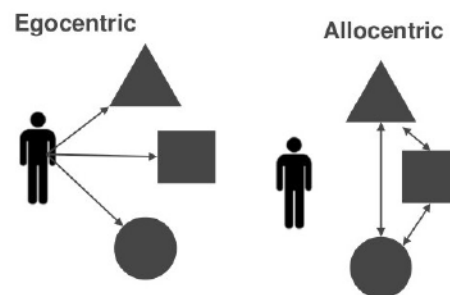


Figure 66 - Left: Egocentric Frame of Reference; Right: Allocentric Frame of Reference

Blind individuals spontaneously rely on egocentric spatial representations. (Luca Latini Corazzini, 2010) Even though allocentric reference frame is depended on vision, allocentric spatial knowledge is not completely absent in blind people. (Hill, Rieser, Hill, Hill, Halpin, & Halpin, 1993) The allocentric spatial reference is aided especially from auditory cues, but for this reference, blind persons find limitations mostly in large-scale spaces, especially the later blind. These limitations are found mainly in distance perception. "As a consequence, the lack of vision should affect allocentric but not egocentric frames of reference." (Ruggiero, Ruotolo, & Iachini, 2009) This suggests that in blind persons it is difficult to switch from egocentric to allocentric reference frame.

### 4.3.3. Sensory Zone

One of the most frequent questions raised, related with perception in blind individuals, is if the loss of vision provides a development of a higher degree of sensitivity form other sense organs or not. Scientists from the "UCLA", Department of Neurology, have

confirmed that blindness causes structural changes in the brain and has the ability to reorganize itself functionally and to adapt to the sensory loss. (Leporé, 2010) From the research, it was found that in blind persons the region of the brain responsible for vision, for instance the frontal lobe, was smaller than those of sighted individuals, and other non-visual areas larger in the blind, or even the reduction of the visual area is linked with the improvement of auditory spatial abilities. This change of the plasticity of the brain suggests the act of brain compensation of the visual areas to other sensorial inputs areas. Certainly, plasticity when blindness occurred depends on the moment. "In congenital blindness, changes occur in the visual responsible cortex, which gets non visual inputs, including olfactory stimuli. The reorganization of the occipital cortex leads to perceptual and cognitive mechanisms that help the blind to achieve perceptual tasks, leading to superior olfactory abilities. This has been proved through psychophysical testing, volumetric measurements and functional brain imaging studies in humans." (Araneda, Renier, Rombaux, Cuevas, & Volder, 2016) Early visual deprivation affects the development of other senses, also due to the attention level they provide for other sensorial means. The lack of vision results in the reliance of touch, audition and olfactory system, in order to obtain the information from landmarks to navigate and obtain spatial cognition.

The level of sensory zone is directly depended on the personal space of a person, which is an invisible perceptual space with the body as centre. Such space indicates the relation of the individuals with other people and objects. Such relations set an immediate connection of person and the world, which are of different degrees and define human behaviour. These relationships take different qualities depending on the qualities of the person and place and provide different experiences, which are dualistic in nature, such as safety/danger, cosmos/chaos, insideness/outsideness, enclosure/exposure, etc. Personal space is considered as the territoriality of a person; as such boundary exists even in other living organisms. Such invisible territory is elaborated through culture and differs depended to it.

The anthropologist Edward Hall compares the sense of territoriality in animals with humans. While, animals define their territory with urine to claim for their own privacy, humans use walls, fences and furniture to accomplish their privacy. There are two types of reaction in animals when their territory is threatened: flight position or fight position. This threat is defined by distance of other creatures from the invisible line of their defined territory. Every person feels space from his presence and allocation. According to Christian Norber-Schultz, "territoriality is defined as the behaviour by which an organism characteristically lays claim to an area and defends it against members of his own

species. Basic territoriality is the sharp sense of the limits that marks the distance to be maintained between individuals.” The navel of all spaces is self and body. According to Heidegger there are two types of space: space in the geographical sense and personal space. Each individual is surrounded by an imaginary bubble, with his body as a centre that defines his personal space. Every movement he makes, the space moves with him. This bubble defines the interpersonal communication and the relation to other people and objects. It is an important feature that defines the organization of spaces in houses and buildings, even the layout of the cities. The interpersonal distances between people is composed from four zones: the intimate distance, the personal distance, the social distance and the public distance that define the position the individual keeps within a larger public. If these zones are intersected from others, the person might have various reactions depending on his emotional and psychological state, or even culture. For instance, when this distance is trespassed, especially in crowded places the individual starts to feel threatened and as a result anxious. According to psychologist Robert Sommer, when this space is violated, the method used by people to deal with it is dehumanization, which means that people often imagine those intruding on their personal space are inanimate. Other method is behaviour, such as attempting to talk which can be perceived differently by others.

The Intimate Distance (from 0 to 45.72 cm) In this distance vision is distorted and any vocalization is in a lower tone. The reaction to the intervening of this space is through body heat, smell, touch and change in emotional moods. This zone is reserved for people with a close relationship.

The Personal Distance (from 46 cm to 122 cm) In this distance the sense of body heat is lost, along with it the most evident body odours. Eyesight begins to focus, and vocalization comes into play. This distance defines the relationship and closeness of the individual from others. This space is created during a conversation in close distance.

The Social Distance (from 122 cm to 305 cm) This is the area of impersonal transaction. Here the vision field is wider. It is reserved for strangers and new acquaintances.

The Public Distance (from 305 cm to infinity) Eyes have the larger field of vision, since this space is used for speeches, lectures and theatres, reserved for a larger audience.

Neuropsychological space has another approach from Anthropology and Psychology. It describes personal space in terms of “near-ness” to the body and is divided in three other spaces: 1. Extrapersonal Space, which is the space that occurs outside the reach of an individual; 2. Peripersonal Space, which is the space within reach of any limb of an individual. This means that the arm’s length defines this type of space; 3. Pericutaneous Space, which is the space outside the body. Visual-tactile perceptive fields overlap in processing the space.

The integration of sensorial information with the signals given from the position of the body in space, results in two types of relation of body and other objects in space: Peripersonal space and extrapersonal space. Peripersonal space is defined as the space immediately surrounding our body; extrapersonal space is the space beyond the arm reaching distance (Previc, 1998; Vallar & Maravita, 2009). The peripersonal space's stimuli are preprocessed differently from those from extrapersonal space.

While peripersonal space is mainly concerned with visuomotor operations in near-body space, the extrapersonal space include a focal component, mainly concerned with visual search and object recognition, an action component for navigating space and a distant ambient component concerned with orienting in earth-fixed space. In allocentric coordinate frames, objects are allocated according to their spatial and configurational properties.

Peri-personal space, depending on the level of sensorial input, selection of such sensorial selected as the main mode of orientation and navigation, is divided in three main categories: Visual peri-personal space, which is located only around head and hand; auditory peri-personal space, located only around head and peri-hand space, which is depended on visio-tactile interaction.

#### **4.3.3.1. Echolocation**

Visual deprivation allows the person to give more attention to non-visual information, especially being more assertive to auditory cues. Auditory sense provides distance information but also information in active and passive condition and it does not necessarily involve direct contact with the source object. The integration of multiple auditory cues results in sound localisation, which creates the possibility to move in space through sounds as landmarks. While for sighted individuals the visual sense represent the most important feedback for mobility, the visually impaired rely mostly on auditory information. Recent research showed that the part of the brain responsible for processing visual input became responsible for auditory processing in blind individuals. (Vass & Epstein, 2013) Furthermore, blind individuals perform better than sighted persons in sound localization, temporal auditory resolution and discriminating speech material in noise. (Muchnik, Efrati, Nemeth, Malin, & Hildesheimer, 2009)

(Schwitzgebel & Gordon, 2000) defined echolocation as the ability to detect the reflective and reverberant characteristic of an object or environment using locally generated sound. These sounds are generated by the visually impaired in two ways: by clicking tongue and by tapping with a cane, in order to provide as much information about the close objects. This is a technique actually used by many mammals, such as dolphins, bats, whales, etc.



For instance, bats echolocate beyond the upper frequency limit of human capacity of hearing, while humans echolocate within their capacity limit but level of echolocation is determined also by the strength of frequency. Echolocation provides guidance to the visual information and can be performed even by sighted individuals, but it requires awareness to auditory inputs, specifically sound reflection (echo). "Some studies have demonstrated that blind people have higher sensitivity to non-self-generated echoic information than sighted controls." (Dufour, Despres, & Candas, 2005) However, sighted individuals actually rely mostly to the visual input rather than sound localisation since they tend to be more assertive to visual cues. "Sighted individuals are fairly accurate at judging the distance of sound sources that are approximately one meter away, but tend to underestimate distances to farther sound sources." (Zahorik, 2001) However, the abilities to echolocate differ in each person, remaining an individual variable.

For blind people echolocation remains an important aspect of spatial navigation. Through echolocation they are able to distinguish different heights, volume, proportion, materials of a space, location of objects. It serves to make a judgment of the physical features of space in terms of acoustic properties and to detect objects present in space. Certainly, the ability to detect objects is reduced with the increasing distance of location of an object and its reduction in size. Concerning the ability to distinguish the shape of the objects through echolocation, from recent findings it was found that blinded individuals were able to distinguish even the shape of objects.

In the writings of Vitruvius, materiality and form were considered as an instrument for formulating spatial acoustics. Materiality plays a dominant role in the way sound is reflected, refracted and absorbed. In buildings where playing of sound is the primary function, design is a result of the calculated acoustic spaces, such as the Boston Symphony Hall designed by acoustician Wallace Sabine in 1890. The position of the materials is calculated in such way to emerge spatial acoustics and to attain the control of it. The effects of this calculation are quite evident in the design of an anechoic chamber where the sound absorbent material creates a complete silence. An anechoic chamber is a room isolated from sound waves, designed to absorb all sound reflections. In this building materiality was used to acoustically distinguish between intimate quiet spaces and loud spaces with the use of acoustic walls and barriers. As a result, sound becomes the element that defines the use of space.

The physical surrounding is an historical evidence of humanity using echolocation in history for orientation and protection. The origin of echolocation are the caves, which did not only provide shelter and protection from natural factors, but they were actually

appropriate spaces for echolocation, especially for being able to orientate in lack of natural light. The parabolic shape of the caves allows the sounds to return due to the strong reflections provided by their shape and the hard material of rock.

*“The parabolic (cave-like) wall returned much stronger reflections than all other walls due to acoustic focusing. The sound emitted in different directions was reflected back by the wall to the point of emission. On the other hand, the staircase returned a reflection with a “chirp” sound. This kind of sound was also the focus of study at the Kukulcan temple in Mexico.” (Pelegrin-Garcia, Rychtarikova, Zelem, Chmelik, Kritly, & Glorieux, 2017)*

Later on, echolocation found its application before World War II, with the invention of “Acoustic Mirrors”, which were built structures in a parabolic shape that served as a radar for reflecting the sound of the parabolic microphones. Their shape and their positioning provided the spreading of the sound wave in a larger area through reflection.



Figure 67 - Acoustic Mirrors, Source: National Archives File Reference: AIR16/317. English Heritage Aerial Photo Library.

Acoustic as a wayfinding system was used especially in the periods when electricity was not invented. Some of these methods can be found even in literature, such as found from the writings of Jean-Jacques Rousseau: "You will perceive by the resonance of the place whether the area is large or small, whether you are in the middle or in a corner." (Rousseau, 1979) Such methods included making marks in the wooden railings of the staircase in order to calculate the steps, or even moving the furniture in the perimeter of the rooms in order to clear out the space for easier movement in darkness without obstacles. These examples show that echolocation is a method that is applied not only in blind individuals but also sighted, though the sensitivity to echolocation is dependent on the characteristics and acoustic properties of the materials, volume, spatial configuration, shape and relation of body with space. Sound is to be considered as material for creating

architecture, through the interplay of architectural elements with body and other forces, such as nature and rural or urban noises.

### Parameters for Echolocation

According to (Teng & Whitney, 2011) there are five levels of cues comprised by echolocation. The first level deals with the physical properties of sound stimuli such as frequency, intensity and spectral ripples; the second level with the basic low-level spatial cues, such as interaural time, level differences and spectral transformation cues. These two are depended on the capacity of the auditory system to detect echo or aural information. According to the findings of (Dufour, Despres, & Candas, 2005) performance of echolocation is depended also on the level of sensitivity to detect echoes. The third level consists on spatial resolution, size, distance and position. The fourth level deals with surface representation texture, shape discrimination, and the fifth with object perception and navigation. These three levels, which are related with the physical and acoustic properties of space, are of our interests in order to provide a better performance of echolocation.

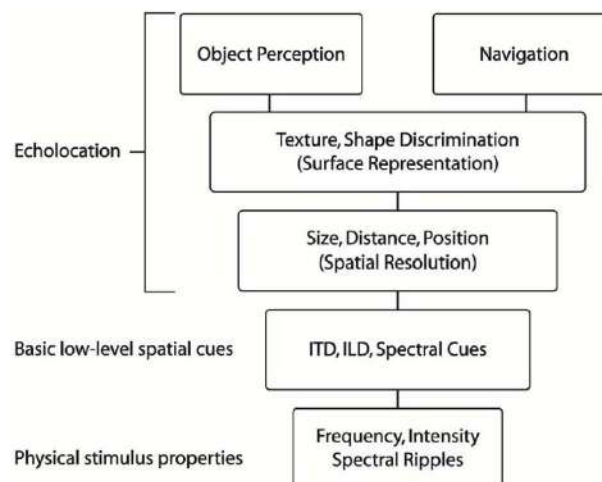


Figure 68 - Parameters for Echolocation (Dufour, Despres, & Candas, 2005)

From this scheme, it is understood that for a successful echolocation, the character of sound and physical properties of an environment play a decisive role.

### The characteristics of sound

Three important attributes to auditory sensation indicate the level of performance of detecting objects in a physical environment through human echolocation: pitch, loudness and sharpness (timbre). Pitch is the frequency of sound wave coming from direct sound or reflected sound on walls or other planes at different distances. Perception of pitch is depended on the time characteristics of sound source and level of loudness. With

Loudness it is understood the intensity of sound or “that attribute of auditory sensation in terms of which sounds can be ordered on a scale extending from quiet to loud.” (ASA, 1973) While, timbre is the attribute by which the sound is recognized. It deals with character of sound, which makes the sound distinguishable when are similarly presented. From scientific research, it was found that repetition pitch and loudness play a crucial role for echolocation at a short distance, while sharpness or timbre provide information for long distances. (Schenkman & Gidla, 2020)

Considering the characteristics of the sound, it is important to understand the behaviour of sound in an enclosed built environment and the indication of this behaviour from shapes and materials. When sound meets an obstacle, the sound undergoes several behaviours, which can be: Reflection and transmission, diffusion and refraction.

#### 1. Reflection and transmission

When the sound hits the wall three behaviours of sounds are noticed: reflection, absorption and diffusion.

Reflection occurs when the sound bounces off the wall, by not being fully absorbed. This happens in hard surface, such as concrete or brick wall. The harder the surface the more reflection will occur. As a result, reflection of sounds creates echoes. The level of echoes created through reflection depend on the material composition and density, which indicates the amount of absorption. Some materials will absorb a part of the hitting sound and partially reflecting it. In order to minimize distracting sounds and better speech in a room along reducing reverberation absorbent materials are used, which are fibrous and open-cell foam materials.

#### **Echolocation vs. echo suppression**

In case of blind individuals, the lack of echo in an environment causes a sense of fear and lack of information from auditory field. This causes distractions disorientation. However, when there is high background noise present in a space causes inability to be oriented and to detect objects through auditory cues. Acoustic regulation of spaces is necessary in order to provide better acoustic performance of the space according to its typology. Therefore, on the other hand, it is necessary not to suppress echo, since it provides important auditory information for the performance of echolocation. (Schenkman & Nilsson, 2010) performed an experiment of comparing echoes in an anechoic room and a conference room, which resulted that echolocation could be performed at a largest distance in a reverberant conference room rather than in an anechoic room where echo is

suppressed. On the other hand, the better use of auditory cues can be performed in rooms with short reverberation times.

### **Parameters for improving echolocation**

In order to define the acoustic characteristics of an environment for a better echolocation performance two aspects should be taken in consideration: level of background noise and reverberation.

1. Background noise causes difficulties on the recognition of objects and defining the location of the reflected sound source.
2. Reverberation interferes on the source information reflection from target to objects creating spectral distortions. (Dufour, Despres, & Candas, 2005) defined an accurate localization of objects through echolocation in blind individuals but also distinguished a disturbance by reflected sounds during their performance, as in the phenomena of “Precedence effect” or “Spectral Distortions”. “Precedence effect” happens when two binaural sounds coming from two different locations with a short time difference are perceived as a single auditory event, while the auditory system is able to detect the first arriving signal’s location. The later coming sound’s information does not provide the localization of the sound source but is useful for the interpretation of the environment. While in the case of “spectral distortions” which happen due to reverberation, which distorts the monaural spectral cues. (Shinn-Cunniff & Ham, 2005) These two phenomena are crucial for the navigation of blind individuals who rely on acoustic cues for orientation in space.

## **4.4. “On Site” Analysis and Data Collection**

### **4.4.1. Experiment**

The experiment aims to understand the spatial experience of visually impaired individuals and to make a comparison with the experience of sighted individuals. This experiment aims to analyse the spatial experience of people with visual impairment and their physical confrontation with specific spaces, in terms of spatial navigation and approach to architectural elements. It is a form of investigation of the interaction of architecture with the case of visual deficiency. This study does not aim to understand the pathologies, but it is an onsite analysis which aims to bring a universal experience in the case of visual impairments. Furthermore it does not aim to compare the experience of different cases of impairments, but a cataloguing of characteristics of experiences. Five subjects were involved with the experiment, which were chosen as representatives of specific visual impairments of different characteristics concerning architectural experiences. These

specifications correspond with different aspects of perceiving space, in order to obtain several perspectives of spatial experience.

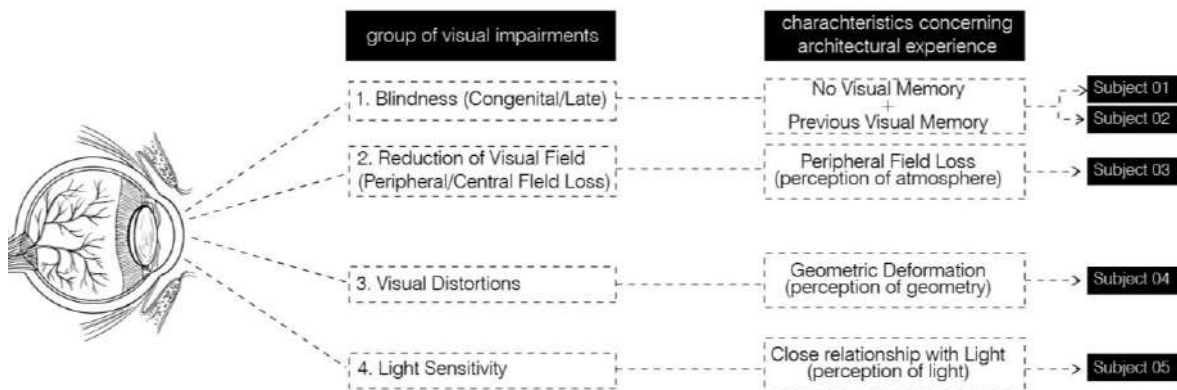


Table 6 - Group Categories of Selected Subjects for the Experiment and Interviews

List of participants:

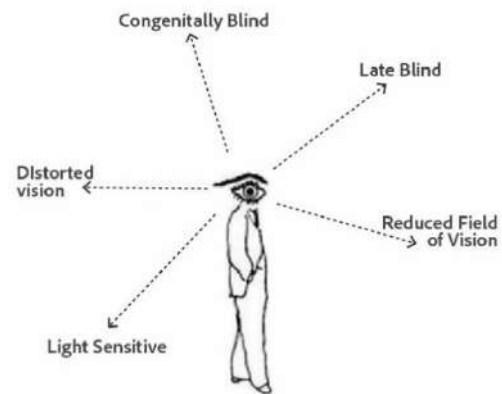
Subject 01: Congenitally blind (with no visual memory)

Subject 02: Late blind (low level of visual memory)

Subject 03: Reduced field of vision

Subject 04: Visual distortion

Subject 05: Light sensitive



Characteristics:

ID.	GENDER	AGE	CONGENITALLY BLIND	LATE BLIND	REDUCED FIELD OF VISION	VISUAL DISTORTION	LIGHT SENSITIVE	RESIDENCE
S-01	M	60	YES	NO	NO	NO	NO	APARTMENT
S-02	F	30	NO	YES	NO	NO	NO	APARTMENT
S-03	M	36	NO	NO	YES	NO	YES	APARTMENT
S-04	F	21	NO	NO	NO	YES	NO	APARTMENT
S-05	M	52	NO	NO	NO	NO	YES	APARTMENT

Each of the participants explored two types of spaces: one familiar space and one unknown/unfamiliar space. The first type of space was their residential environment, which is considered as the most familiar space. It is considered as their private space, with a high level of comfort and security for performing several activities, as a space of a high intimacy level. All of the residential spaces are individual apartments in residential buildings. The second type of space is a space which was not known to the subject, and

experienced for the first time. These are public spaces, which are not considered as intimate spaces and where other outside factors are present, which indicate the nature of sensations and the level of security for navigation. Furthermore, these spaces are of a much larger scale than the residential area, which makes the navigation and exploration more challenging for the subjects. The choice of these public spaces was made considering the different nature of space and specific physical characteristics. All of the spaces are indoor public buildings, except from the cafeteria which is a semi-opened space.

The aim of this observation is to understand the patterns of exploration used and the selection of landmarks. Furthermore, an important aspect of the experiment is the observation of body schemas of the participants while navigating space. All of these observations are translated in route schemas through plans.

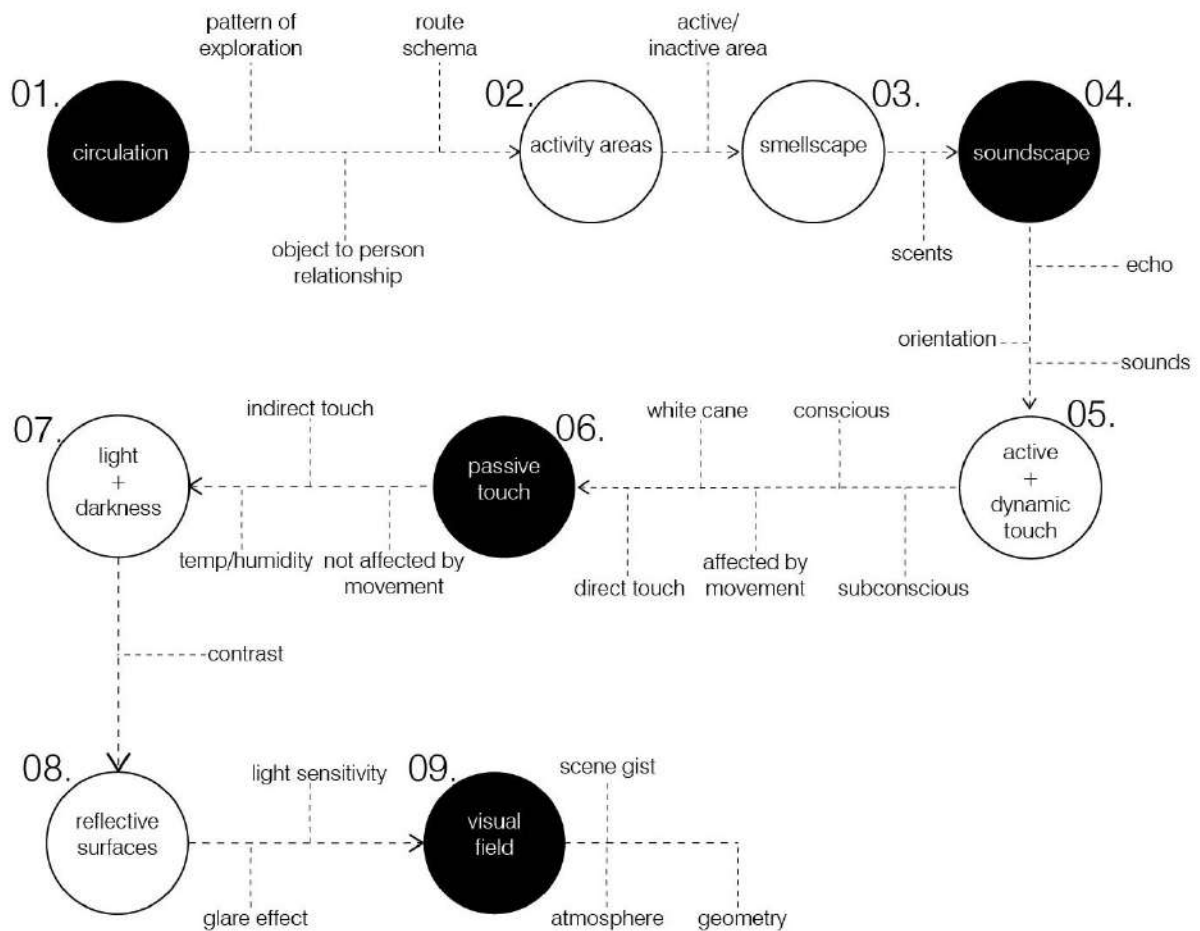


Table 7 - Elements analyzed from “on site” analysis and interviews

The “on site” explorations of each subject was photographed, but in terms of respecting their privacy are not made public. The observations were translated in maps and the information obtained from these observations was dismantled in different maps of specific analysing elements, which some of them resulted from the personal interviews with the participants:

, which provide information translated in drawings concerning the pattern of exploration, route schemas and object to person relationship. This information is given by the itineraries made from the subjects, which define the most common circulation scheme in residential space and the frequency of use of several areas. This information is given on which provide knowledge of active and inactive areas.

, provide information about the sources of scents and smells in spaces and are defined after the interviews with the participants.

specify sources of sound or echoes in space, which may be disturbing or pleasing to the subjects, or even as landmarks for their orientation in space.

include direct somesthetic contact with architectural elements or objects or contact with cane in case of totally blind, which might be conscious and unconscious, and are affected by movements in space. which include sensing

humidity and thermoception, considered as indirect touch.

indicate the level of light and darkness contrasts. These maps were generated from the personal observations on site and are not a result of any given information from the participants.

are a result of given input from the subjects of the surfaces considered as reflective and problematic for their navigation.

provide information according the level of information obtained from each participants indicated from the degree of their visual field, which define scene gist and body posture indications.

### **Buildings for the Experiments**

Each of the participants visited spaces that were part of public buildings of different categories. For all the subjects, the space was never visited, which means there was no previous mental memory of the site, for the confrontation to this space to be more unconscious and natural. As a result, more data would be obtained from observations.

Subject 01 - Religious building, in this case the “Catholic Church” of Tirana. The building is a representative of spaces which are considered as spiritual.

Subject 02 – Historical building, “The Roman Amphitheatre of Durrës”, Durrës city, as a series of subterranean spaces, which has interrupted contact with light.

Subject 03 – Educational building, “University Polis”, Tirana, as a space that has a high traffic of people.



Subject 04 – Cafeteria at the “Opera & Ballet Theatre” of Tirana, which is a crowded space and considered as a socializing space.

Subject 05 – Cultural building, the “Archaeological Museum” of Durrës city, which is a space of exhibition, with fixed objects present.

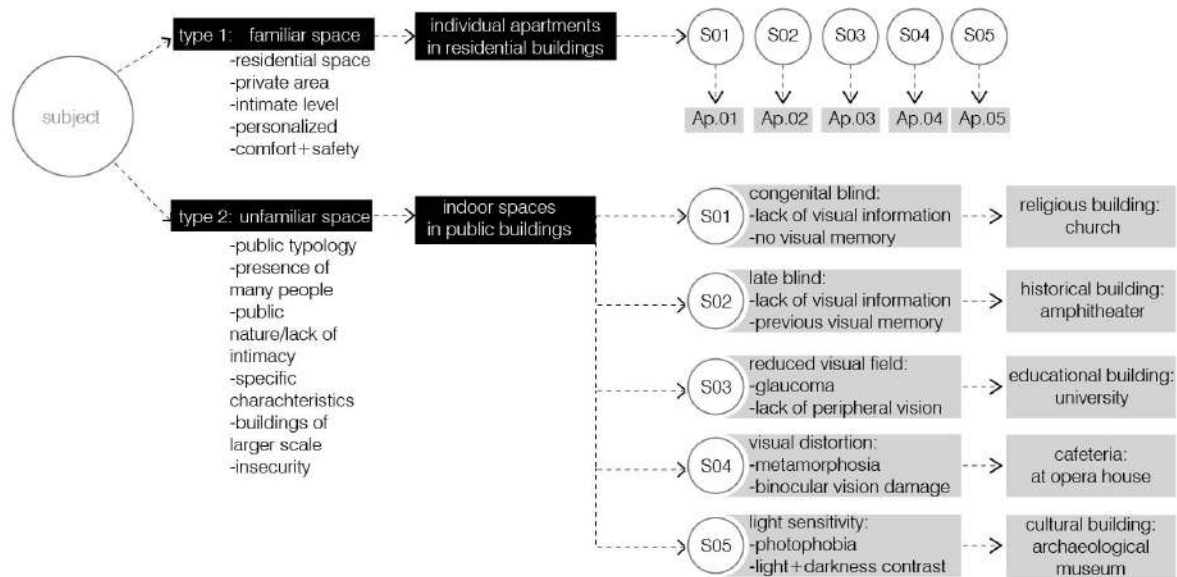
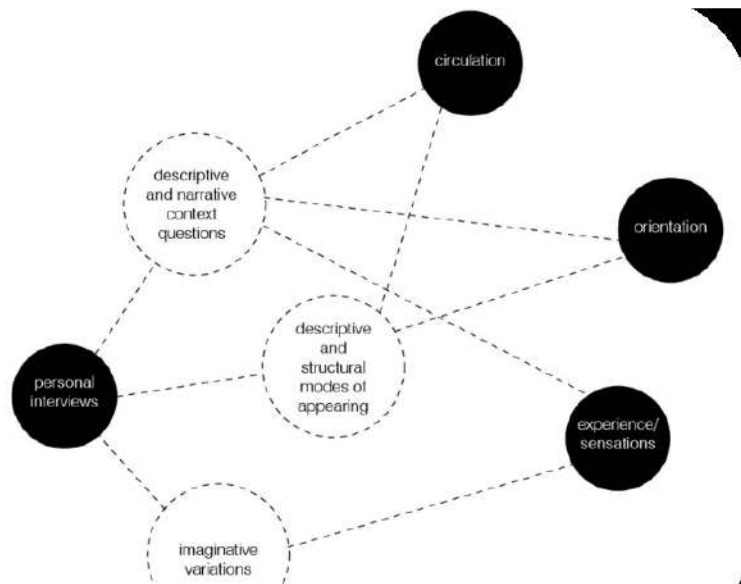


Table 8 - Table of Subjects and Spaces Selected for the Experiment

#### 4.4.2. Interviews

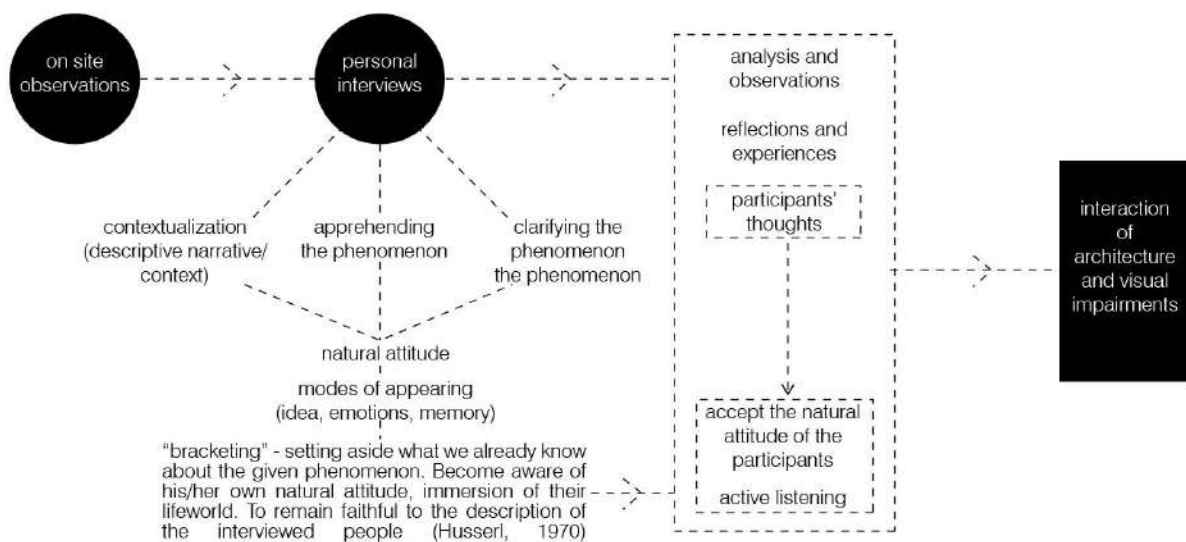
After the physical encounter with the chosen spaces, several questions were made to each of the participants, in order for them to experience the spaces not influenced by the questions. The questions were articulated in a form of an interview, focusing on the nature of the lived experience of the visually impaired for understanding the phenomena of experiencing architectural spaces from a visually impaired’s perspective. Due to this, it is important to make an existential investigation, firstly by exploring the personal experience



of each subject depending on their condition. Thus, the structure of the interview is provided by three methods according to the nature and aim of the questions: 1) *Context questions*, which aim to understand the natural attitude of the interview of his

Figure 69 – Structure of the Interview

own condition; *Questions of modes of appearing*, in order to apprehend the phenomenon of experience and exploration of space from visually impaired; and *imaginative variations*, which aim to clarify the phenomenon by putting the interviewed in an imaginative process. The categories of questions are divided in three groups based on their main focus: Experience or Sensation, Orientation and Circulation. Firstly, it is important to obtain the knowledge from the subject's experience by setting aside the personal experience and knowledge or data obtained from previous findings and theories of this research. Known with the term "Bracketing", this was defined by Husserl, and also means to become aware of the participant's natural attitude by active listening. Secondly, open questions, which provide descriptive answers and imaginative situations, are important to obtain the subject's personal point of view of experiencing architecture. The experience is subjective and determined by the context, each subject lives. As a result, the interview is phenomenological in nature, which attempts to describe, reflect upon and interpret experience. From observations made during the experiments and from the data collected during the interview, results were summarized for each of the participants, in a form of



cataloguing.

Table 10- Table of Questions of the Interview

Method	Category	Question
Descriptive or Narrative Context Questions	Experience/Sensation	"Describe the phenomenon of having your visual impairment? How do you feel about it and how you felt when you realised the condition?"
Descriptive and Structural Questions of Modes of Appearing	Experience/Sensation	Which are the biggest difficulties from you condition (the difference when you had sight)?"

Descriptive or Narrative Context Questions	Circulation	Describe your everyday routine.
Descriptive and Structural Questions of Modes of Appearing	Experience/Sensation	Describe the familiar space (space 1)
Descriptive and Structural Questions of Modes of Appearing	Orientation	Which objects/elements did you use as landmarks?
Descriptive and Structural Questions of Modes of Appearing	Orientation	Which are the obstacles in this space?
Descriptive and Structural Questions of Modes of Appearing	Orientation	Did you hear any particular sound? Any particular elements of reflecting sounds?
Descriptive and Structural Questions of Modes of Appearing	Orientation	Were there any particular smells?
Descriptive and Structural Questions of Modes of Appearing	Experience/Sensation	How did you experience light? What about temperature?
Descriptive and Structural Questions of Modes of Appearing	Experience/Sensation	Describe the unknown space (space 2)
Descriptive and Structural Questions of Modes of Appearing	Orientation	Which objects/elements did you use as landmarks?
Descriptive and Structural Questions of Modes of Appearing	Orientation	Did you hear any particular sound? Any particular elements of reflecting sounds?
Descriptive and Structural Questions of Modes of Appearing	Experience/Sensation	How did you experience light? What about temperature?
Descriptive and Structural Questions of Modes of Appearing	Orientation	Which were the obstacles?
Descriptive or Narrative Context Questions	Circulation	Do you prefer curvy/straight walls?
Descriptive or Narrative Context Questions	Orientation	Do you prefer high or low spaces?
Descriptive or Narrative Context Questions	Circulation	Do you prefer narrow or wide spaces?
Descriptive or Narrative Context Questions	Experience/Sensation	Are there any preferable materials/textures/surfaces you like to touch?
Descriptive or Narrative Context Questions	Experience/Sensation	Are there any inappropriate materials for you?

Imaginative Variations Varying of Structure Questions	Experience/Sensation	Is light an obstacle for you? If so, describe your ideal light environment for you.
Descriptive and Structural Questions of Modes of Appearing	Circulation	How to you feel in transitory spaces such as main entrance, doors, windows and corridors? How do you find them?
Descriptive and Structural Questions of Modes of Appearing	Circulation	How do you access and find stairs?
Descriptive or Narrative Context Questions	Orientation	Which are the most appropriate colours for you?
Imaginative Variations Varying of Structure Questions	Experience/Sensation	Do you have an ideal space in mind? If so, can you please describe how you imagine it?

#### 4.4.3. Subject 01

##### **Space 1 - Individual Residential Area**

The subject enters the apartment from a staircase, which provides access from below levels of the building to the terrace level. A corridor provides direct access from the staircase to the kitchen, which is the main entrance of the apartment; also allows direct access to the living room and toilet. The staircase ends with a glass door to the terrace level and provides indirect natural light. The user does not circulate in this level. For movements in the staircase, the person uses the white cane, since there is a sense of insecurity present in this space. This is not because the subject considers stairs as an obstacle, in contrary; he considers the stairs as the safest space, since there is no other object placed in this area. It is an open space, which is easily explored through “ascending and descending technique”, partially combined with trailing technique. The obstacle to him is when the height of raisers or their width is not constant. In his case, some of the stairs are not the same in dimension from others. He is conscious about this change and has created a memory; as a result, he becomes more careful and slows his body movement while using the stairs.

The main access for the subject remains the kitchen, which has access to the bedroom and living room. From observation of the subject’s pattern of exploration is object-to-object, meaning that the person in order to navigate has direct contact with furniture while walking. As a result, the participant uses furniture as landmarks. Since the person is depended on these objects, movable furniture is considered as an obstacle to his

navigation. This is mainly considered as an obstacle in unfamiliar spaces. Nevertheless, a sense of security is present while he navigates in space, which is also resulted in the alternating white cane use with hands and arms technique, which follows with the direct contact with the objects and architectural elements.

The pattern of exploration defines the most active areas of the apartment, which are the corridors, balcony and the kitchen, which is often used by the subject, also because it is the area where the main entrance is situated. Furthermore, the subject is highly sensitive to smells, most of which are concentrated in the kitchen, which provide him the information of which direction to take. The smellscape of the apartment provides additional information about objects and other factors for creating a mental map, for instance the smell of different materials of the furniture. Such odours are important for the subject's experience, since they provide memories related to his childhood and bring past memories in the apartment. Furthermore, the sound produced by specific materials helps him identify elements. Concerning the acoustic environment of each space, it is different in each room, due to the level of contact with the sounds coming from the outside. Subject 01 prefers tranquillity as an acoustic atmosphere, defining the most preferable spaces, which are actually those spaces exposed from sounds coming from the outside, such as the wind and rain. The bedroom is the place, which he prefers, in terms of the acoustic character, because it offers the possibility to feel the wind, through the presence of the trees, or the presence of the rain and where there is no interference from other sound sources such as people or cars. Furthermore, he prefers spending more time in this area because of the source of natural light coming inside the space. The sizes of this space are considered to him as small in dimensions, which to him offer more comfort and the feeling as if the walls embrace his presence. For him small spaces are more preferable, considering them as areas where one is able to feel the atmosphere of a room and its warmth. Even though, he is not capable of seeing, he can feel the changes in intensity of sunlight through thermoception. In general, the subject defines this aspect as quite important for his well-being and which actually he feels as not very present in his home.

Doors are quite important for the subject, since he considers them as landmarks of defining the limits of spaces. He considers the sliding door that connects the staircase with the living room as the most appropriate for allowing movements. He considers such doors as easier to circulate because sometimes when other doors are closed become as obstacles of communicating with two different spaces. The subject avoids the use of the white cane because it does not allow him to be in direct contact with elements, except from the staircase, where dynamic touch is necessary. Through active touch, he is

capable of recognizing textures and patterns, considering them as surfaces, which to him are never completely explored.

### **Circulation:**

- Pattern of exploration: object-to-object;
- Spatial reference frame: egocentric;
- Furniture as landmarks, but sometimes movable furniture is seen as obstacle;
- Doors are considered as strong landmarks, but occasionally become barriers, as a result he prefers sliding doors;
- Kitchen is the central directional space, since it provides multiple sensorial information;
- Staircase not considered as an obstacle, since other objects are not found along the way. Safety is provided as long as raisers have the same height;
- Insecurity moment in staircase: passage in the raisers that have different heights;
- Generally there is a sense of security while moving from one space to another;
- “Hands and arms technique”, combined with “trailing technique” and in staircase “tools extending bodies” technique.

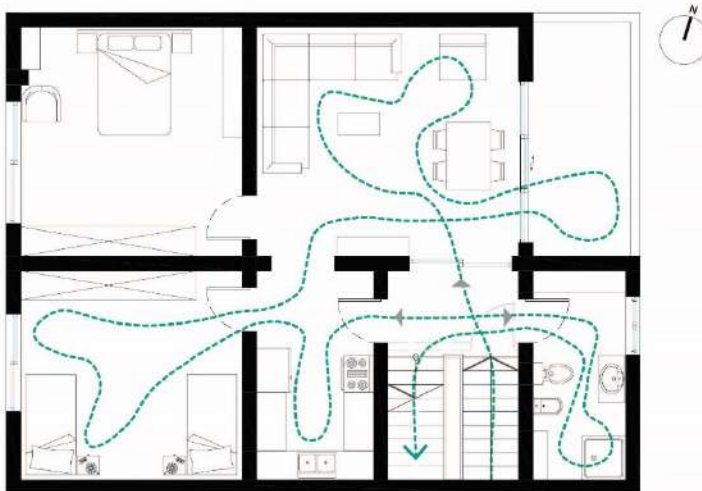


Figure 70 – Subject 01, Pattern of Exploration: Object-to-object

### **Areas of Activities:**

- Corridors and balcony as the most active areas for circulation;
- Prefers small rooms, which are enclosed by walls;
- Kitchen as a very active space;
- Bedroom is acoustically more preferable, since it is not exposed to external factors and provides tranquillity in order to perceive natural factors, such as the wind from the trees and the rain.
- Avoids corners.

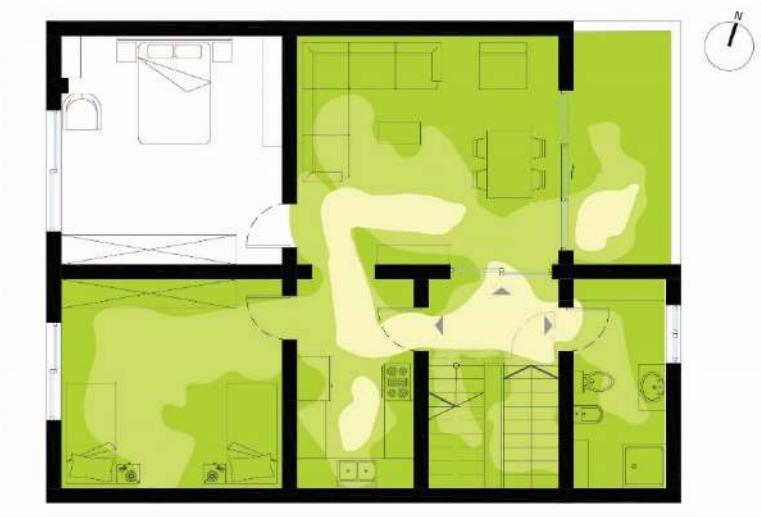


Figure 71 - Subject 01, Areas of Activity

**Smellscape:**

- Highly sensitive to scents and odours;
- Uses smell as a wayfinding system and bring memories of childhood;
- Prefers the balcony while he smells different outdoor scents, but
- Particular smells (spices and herbs) in the kitchen, which helps him to find the kitchen, and the cooking process is easier;
- Smell of wood from the furniture in the bedroom and living room.



Figure 72 - Subject 01, Smellscape

### **Soundscape:**

- Highly sensitive to sounds;
- Disturbed by sounds coming from the balcony, but do not disorient him since he is familiar to the soundscape of his house;
- Knows every sound of the house (cracking sounds of furniture, electric appliances) which help him to move around easily;
- Each of the rooms has a different acoustic environment;
- Particular interest of the sounds of the trees from the presence of wind;
- Bedroom considered as the most preferable acoustic environment.

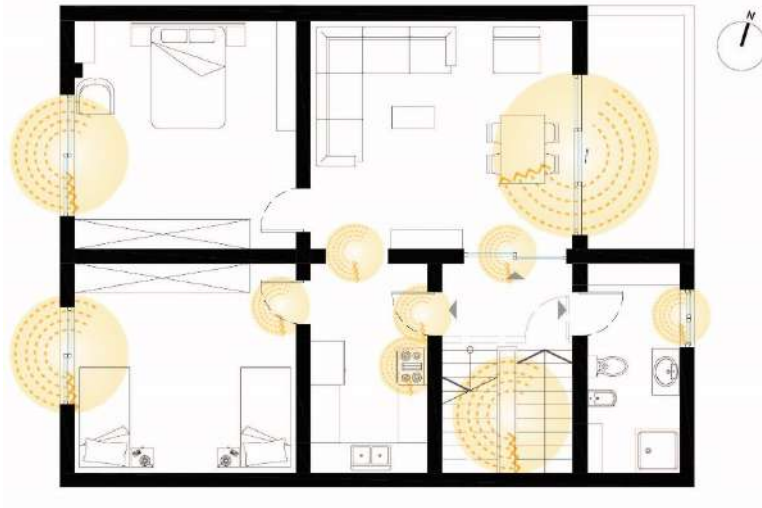


Figure 73 - Subject 01, Soundscape

### **Active and Dynamic Touch:**

- Often touches the landmarks (furniture, door frames, windows);
- Trailing technique along the walls;
- While using the stairs, he touches the handrail interruptedly;
- Recognizes textures and patterns through fingers;
- Recognizes the flooring through feet, but not textures;
- Dynamic touch through the white cane is avoided, except from the staircase.



Figure 74 - Subject 01, Active and Dynamic Touch



### Passive Touch:

- Artificial light sources serve as landmark through the produced heat;
- Warmer temperatures are present in the bedroom and mostly in the kitchen;
- Small spaces to him feel warmer;
- Balcony is the favourite place concerning passive touch as he feels more the presence and the direction of the wind, along with its impact to the body. It means to him to have knowledge of his own body;
- Sensitive to air flow especially in the staircase and corridor.

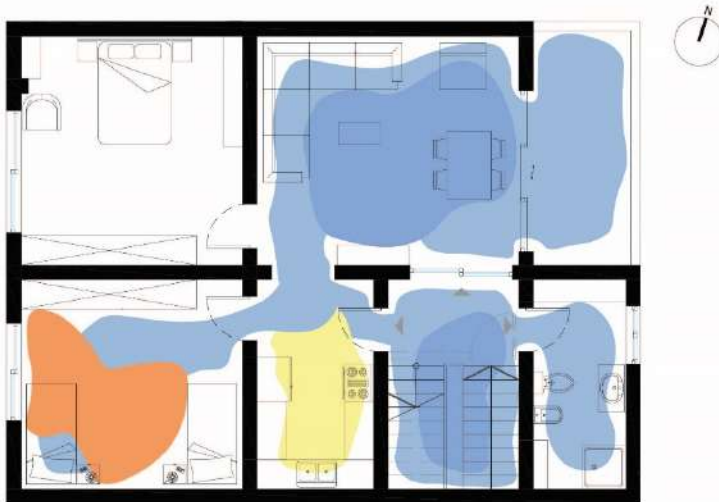


Figure 75 – Subject 01, Passive Touch

### Light and Darkness:

- Unable to see light, but feels the intensity and changes of natural light from one space to another;
- Lack of strong sunlight in almost each space.

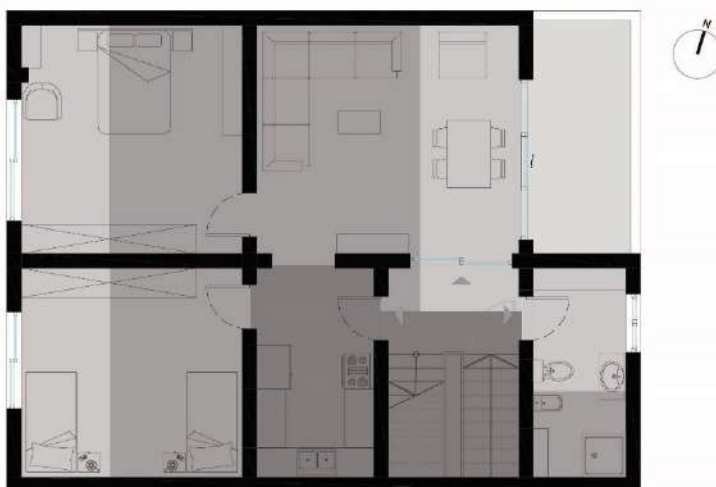


Figure 76 - Subject 01, Light and Darkness

**Reflective Surface:**

- No visual information.

**Visual Field:**

- No visual information.

**Space 2 – Public Space****Religious building, “Catholic Church” of Tirana**

The subject enters the front court yard with assistance and by using the white cane. The presence of the stairs is not considered as an obstacle, as he ascends them slowly. However, he appears insecure from the passage from the street, which to him is considered as a space full of obstacles. In order to reach the external stairs from the main gate the subject needs assistance since to him it is not clear which directions to take. Through the white cane, he is able to recognize the starting point of the stairs and his circulation starts to become independent. The subject assures he is in the main entrance by touching walls and the doorframe of the main entrance. The identification of the position of the main entrance is provided by the change of air pressure and echoes coming from voices of people inside the building. As he enters the building, the first noticeable elements are the presence of people and scents. Voices in this case function as landmarks, while he understands focal points of which areas to access primarily. Furthermore, the indoor space is not crowded which provide to him the necessary amount of acoustic information for creating a cognitive map of landmarks. However, in the entrance hallway, the subject appears confused of identifying the direction of the acoustic source through echo, especially in the back corners of the building.

The subject circulates firstly along the nave through dynamic touch along the pavement, tapping of the furniture with the white cane, while he is able to approach the stairs of the chancel. In this area, he feels the double height of the building and is able to find the location of the altar through ticking sounds he produces with mouth in order to obtain acoustic hints. Identification of echoes in the nave consumes more time since the height of this area is considered as high and not very efficient for providing a good echolocation. However, he is able to orientate himself through the smellscape, identifying the scents that become more intense in the chancel, in this case they play a crucial role for guiding his direction. As approaching the chancel, he becomes more aware of the change of floor texture, which he feels by using the white cane. He uses the altar as the key landmark for this part; especially the rectangular shape provides him the information of directions to take. If the shape were square, identifying directions would have been more difficult, and the altar would not have been considered as a crucial landmark. In the apse, he begins to

activate active touch, as he feels the presence of the walls and decorative elements. These decorative elements provide an obstacle to his navigation, since they are positioned in a height level below his body height.

The participant circulates around the altar and is capable to find the stairs for going back to the starting point. Reaching the entrance area, he starts exploring from the starting point the side aisles, through a combination of dynamic and active touch. In this case, he uses the furniture and columns as landmarks. Even though this space provides a limited circulation area, he feels more secure to move as he is capable to feel the closure from both sides. However, the end of the aisles becomes confusing spaces, since are more enclosed spaces and the area of circulation that connects this space with the nave is very narrow to circulate. The subject is very aware of changing of air temperature, where in the nave is cooler as airflow is more evident, while in the aisles becomes warmer, especially in the ending space.

**Circulation:**

- Pattern of exploration: grid;
- Spatial reference frame: egocentric;
- Furniture and columns used as landmarks;
- Staircase not considered as obstacle;
- Aware of the double height and of the width of the space;
- Prefers circulation along the nave;
- Feels more secure in the side aisles, concerning pacing zone, since he considers the space as embracing.
- In terms of circulation, passage from the end of the side aisles is not very comfortable since is very narrow in size and confusing from the presence of the stairs;
- Width of a space not in accordance with the body movement, such as hands and arms technique.

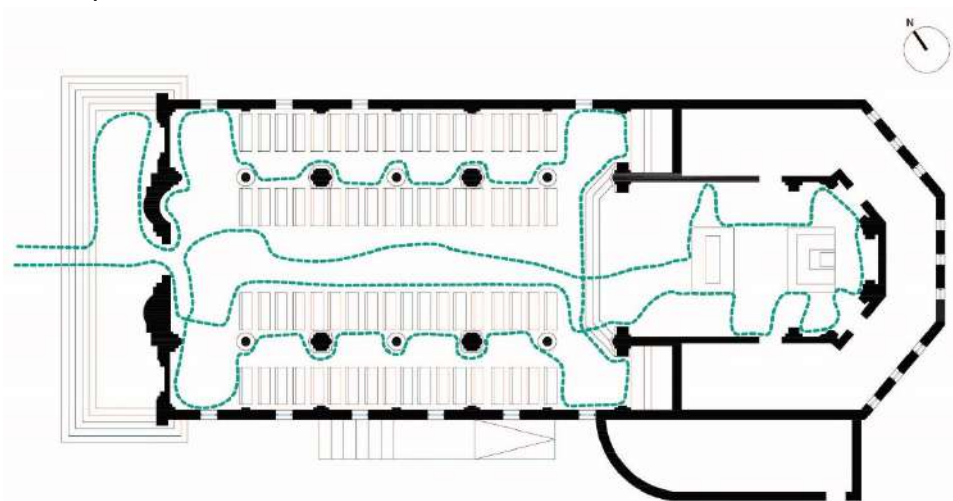


Figure 77 - Subject 01, Pattern of Exploration

### Areas of Activities:

- Most preferable space remains the apse and altar (chancel);
- The nave remains the most active space.
- Most preferable pacing zone is the end of the side aisles.

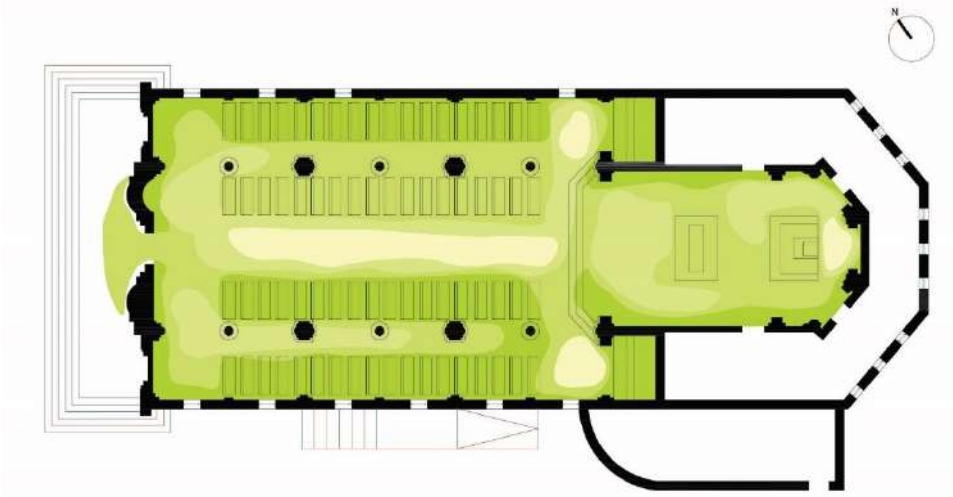


Figure 78 - Subject 01, Areas of Activity

### Smellscape:

- The subject is fully aware of the characteristic scents in the building, which make the building very identifiable;
- Scents of candles and burnt frankincense dominate;
- Scents become more intense in the inner parts and provide hints for taking further directions when confused.

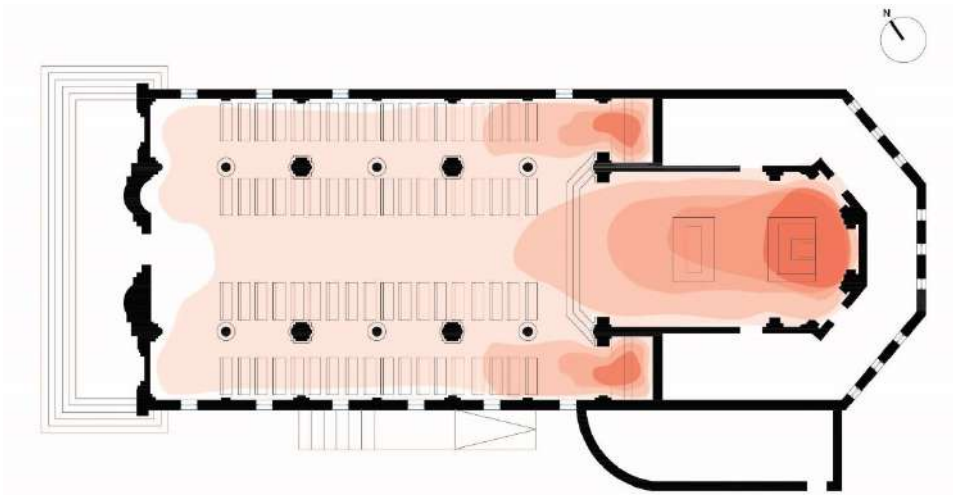


Figure 79 - Subject 01, Smellscape

### Soundscape:

- In the entrance, especially in the entrance hall corners, echoes are confusing;
- Echoes in the central area as orienting information, however the height of space suggests missing echoes;
- Acoustically feels more comfortable in the chancel.

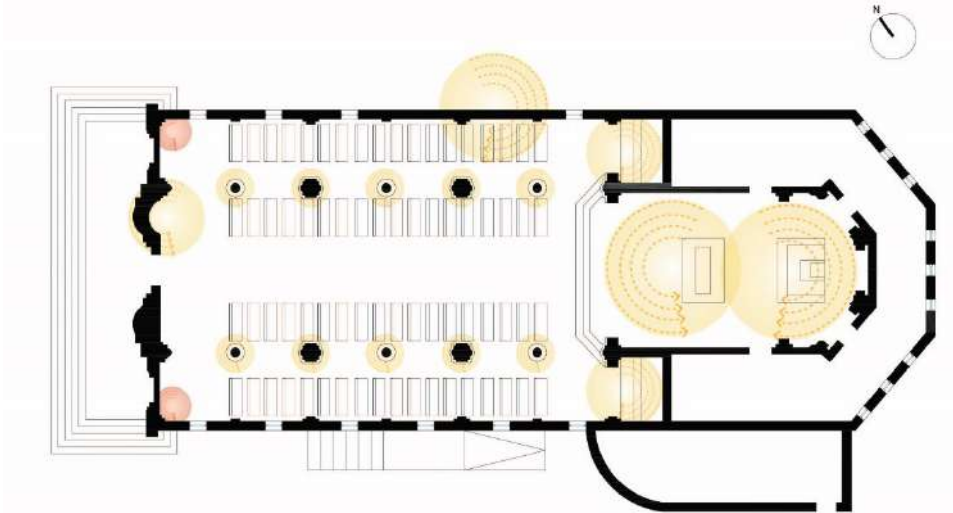


Figure 80 - Subject 01, Soundscape

### Active and Dynamic Touch:

- Dynamic touch along the nave, stairs and chancel;
- Hand and arm technique frequent in the chancel and altar;
- Direct contact with structural elements and furniture;
- Circulating around the altar and continuously touching it;
- The space is rich of tactile information;
- When sounds are confusing, active touch leads to affirmation.

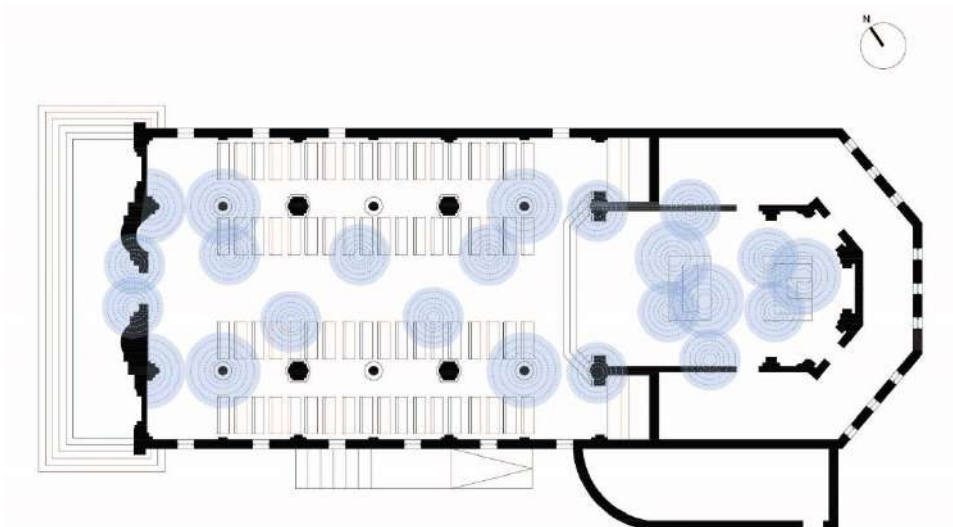


Figure 81 - Subject 01, Active and Dynamic Touch

### Passive Touch:

- Feeling air pressure in the nave and chancel makes these areas the coolest;
- The airflow directs to the main entrance;
- Warmer temperature along the side aisles;
- Little sense of feeling the position of windows and light;
- Feels the heat from candles in the end of the side aisles.

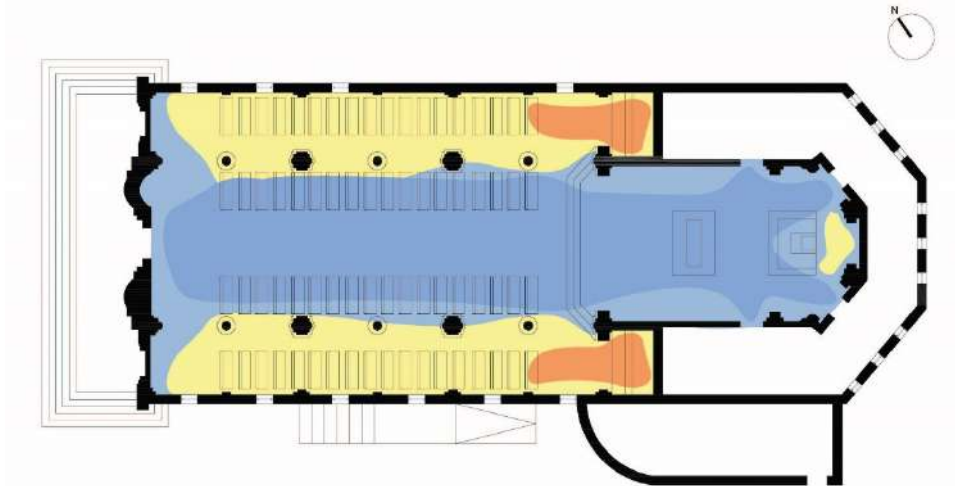


Figure 82 - Subject 01, Passive Touch

### Light and Darkness:

- Unable to see light, does not detect in this case the presence of light.

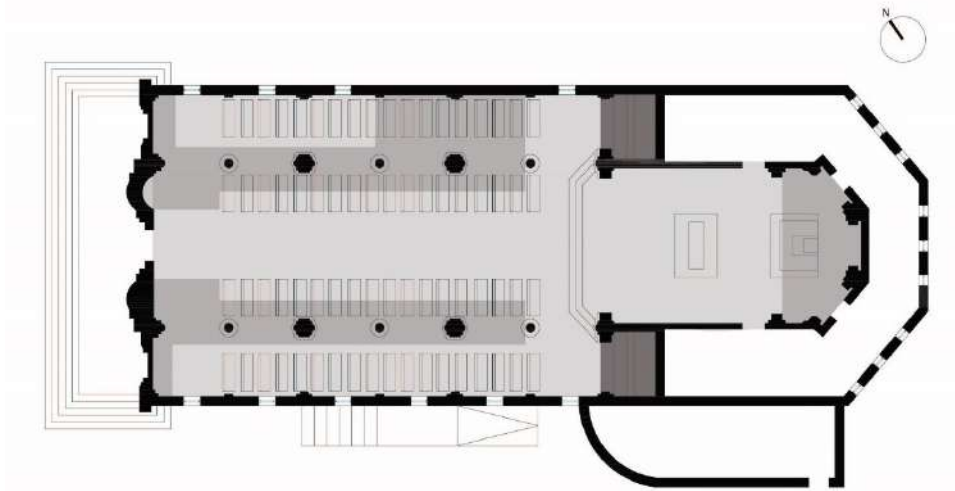


Figure 83 - Subject 01, Light and Darkness

### Reflective Surface:

- No visual information.

### Visual Field:

- No visual information.

#### **4.4.4. Subject 02**

##### **Space 1 - Individual Residential Area**

The participant accesses her apartment generally from the elevator, since the stairs consumes more time. The subject combines techniques in order to circulate in the apartment, using hands and arms technique and tool extending body technique. The subject lost sight in young age but still has memory of some objects or elements in her home from her childhood. As a result, the subject prefers to stay most of the time inside her apartment as she feels more secure and comfortable. Losing sight suggested her different level of consciousness for a different realisation of body in space. However, losing sight has not stopped her from being active in her everyday routine. The pattern of exploration is perimeter combined with cyclic, which means that the subject moves along the perimeter of spaces, by having various contacts with objects or architectural elements, which she considers as reference points applying the cyclic motions around them. For instance, the wall that divides the corridor from the living room is crucial for understanding the limits of space, or the coffee table located in the living room which is a landmark since it is rectangular, counting the corners help her understand the layout of the living room. Even the dining table is a landmark for understanding recalling the position of the kitchen and balcony. Using several reference points for understanding the location of other objects or her position in specific rooms, provide an egocentric spatial reference.

The most active areas remain the corridors, the living room and the balcony. The balcony is a very important space to the subject since she feels more in contact with the outside. The voices of people, the sound of the rain and wind are very comforting; as a result, she spends a lot of time in the balcony. Such space is important for understanding the outside factors and smells coming from outside. The living room and kitchen are spaces, which are warmer and provide olfactory information. The corridor close to the entrance is the coldest place and the most uncomfortable due to the echoes coming from the noises inside the stairway of the building. However, the most problematic spaces remain the living room and the kitchen, which are not well defined from enclosures and sometimes leads to confusion for the subject.

##### **Circulation:**

- Pattern of exploration: perimeter combined with cyclic;
- Spatial reference frame: egocentric;
- Furniture as landmarks especially counting corners when rectangular in shape;
- Prefers furniture to be positioned as close as possible to the wall in order to clear space from obstacles and to obtain a better circulation;
- Remembers important objects;

- Generally there is a sense of security while moving from one space to another;
- Hands and arms technique combined with tool extending body technique,
- Living room and kitchen sometimes confusing spaces since are not well defined.

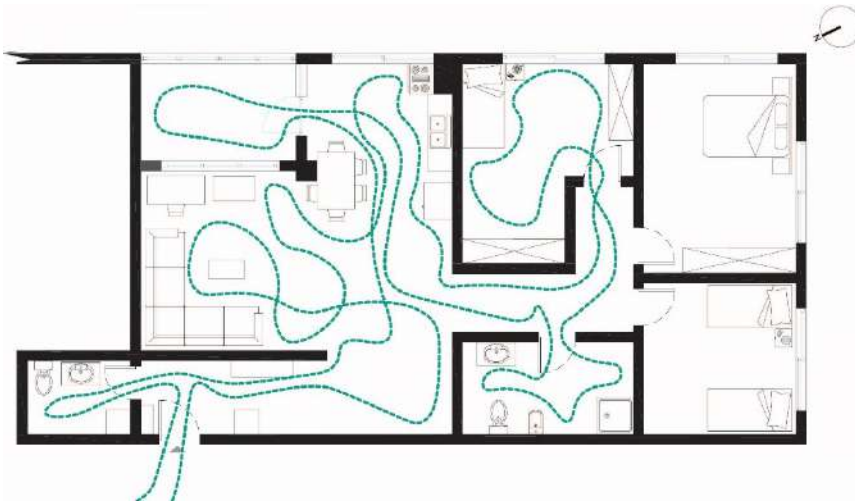


Figure 84 - Subject 02, Pattern of Exploration

#### Areas of Activities:

- Spaces with no obstacles, such as corridors and living room area as the most active areas functioning as transit spaces;
- Prefers places of circulation, where movement is more active;
- Avoids corners;
- High number of corners leads to disorientation;



Figure 85 - Subject 02, Areas of Activity

#### Smellscape:

- Highly sensitive to scents;
- Uses smell as a wayfinding system;
- Prefers the living room while he smells different scents from the kitchen;
- Smells from outdoor spaces.





Figure 86 - Subject 02, Smellscape

**Soundscape:**

- Highly sensitive to sounds, especially after losing sight ;
- Prefers the balcony and the kitchen to be in contact with sounds coming from the outdoor area;
- Different echoes from walls, floor or other architectural elements provides knowledge to recognize materials but not textures;
- Uses outdoor sound as landmark for recognizing functions in indoor spaces.



Figure 87 - Subject 02, Soundscape

**Active and Dynamic Touch:**

- Often touches the landmarks (furniture, doorframes, windows) and frequently touches walls;
- Recognizes textures and patterns through fingers but not through cane;
- Recognizes flooring through feet, and cane, but not textures;
- Became more conscious about touch after becoming blind;
- Prefers warm materials;
- Identifying objects by combining active and dynamic touch.

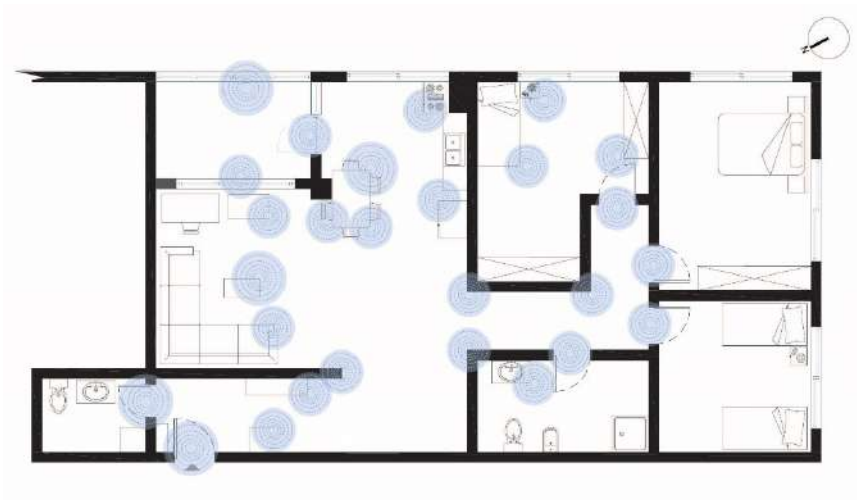


Figure 88 - Subject 02, Active Touch

**Passive Touch:**

- Orients through sunlight in order to recognize spaces;
- Does not prefer high contrasts of changes of temperature;
- Differences in air temperature of indoor spaces can be felt in changes of seasons.



Figure 89 - Subject 02, Passive Touch

**Light and Darkness:**

- Unable to see light, but is highly sensitive of detecting changes of natural light amount.



Figure 90 - Subject 02, Light and Darkness

**Reflective Surface:**

- No visual information.

**Visual Field:**

- No visual information.

**Space 2 – Public Space**

**Historical building, “The Roman Amphitheatre of Durrës”**

The subject enters in the main gate with assistance, since there is a considerable change of ground level present in the ticket area, which is not properly accessible and can be considered as a first obstacle in the second space. In order to access the underground area, the subject needs assistance since the stairs are quite old and change of width and height is present. Furthermore, the height of the raisers is not appropriate for descending. While accessing this area, the subject feels very insecure and makes several rests. The change of light from the entrance area to the first point is very evident and is recognized by the subject with the change of temperature. He recognizes also the presence of airflow changes and high levels of humidity. In different spots of the first arrival point, a series of holes is present on the walls, which are recognized acoustically by the subject rather than by passive touch. Those became hints for recognizing spaces, because not only they provide air circulation but also the distinctive soundscapes. These became the most preferable pacing zones for the subject. The openings in the walls provide high echoic information for the subject, as he directs his moves. He is able to recognize access to the outdoor space and location of stairs. The most echoic information is obtained in the last separated chamber where the echo becomes more intense in the ending point of the

space. While in the other separated chamber, echoes are felt only in the entrance, while in the deeper part of the space are lost.

In this first area, the subject tests the echo by self-produced sounds and is able to recognize the low height of space. Furthermore, she is able to feel the presence of earth through the distinctive smell from the direct contact with ground. Echoic information is also provided by the changes of the ground, which sometimes appears of a wooden material, which provides olfactory information, but also a distinguishable acoustic information. In some areas, the paving is of stone, which the subject is able to feel through white cane, feet and in several cases, kneeling and touching with hands to confirm his sensorial input.

The changes of temperature are related to the contact with the sky, which from time to time this connection is present, even though the building is partially submerged. Temperature changes and differences in air pressure allow the subject to locate direct contact with outdoor areas.

Circulation from the main gallery to the north separate galleries is quite difficult and is necessary to be assisted, due to changes in levels. The first gallery, in the north-west direction, provides a very distinctive experience due to many factors. Firstly, through passive touch the subject is able to recognize the lack of light inside this area along with the high level of humidity, which allows the subject to distinguish the space's typology, specifically as a submerged volume. The missing echoes, due to the height of the space bring a level of discomfort and sense of loss. This area is considered as the space where the subject felt anxiety and a sense of disorientation. On the other hand, the second gallery, which is more opened, because it is furnished with natural light coming from south, provide another form of experience, which is more pleasing for the subject. To this character contributes the effective echo reflection for the subject.

### **Circulation:**

- Pattern of exploration: perimeter;
- Difficulty descending stairs;
- Combined hand and arms technique in pacing zone, while for circulation there is the necessity of the use of the white cane;
- Confusing distribution of corridors;
- Assistance for approaching the entrance;
- Assistance for stairs and outdoor passages.

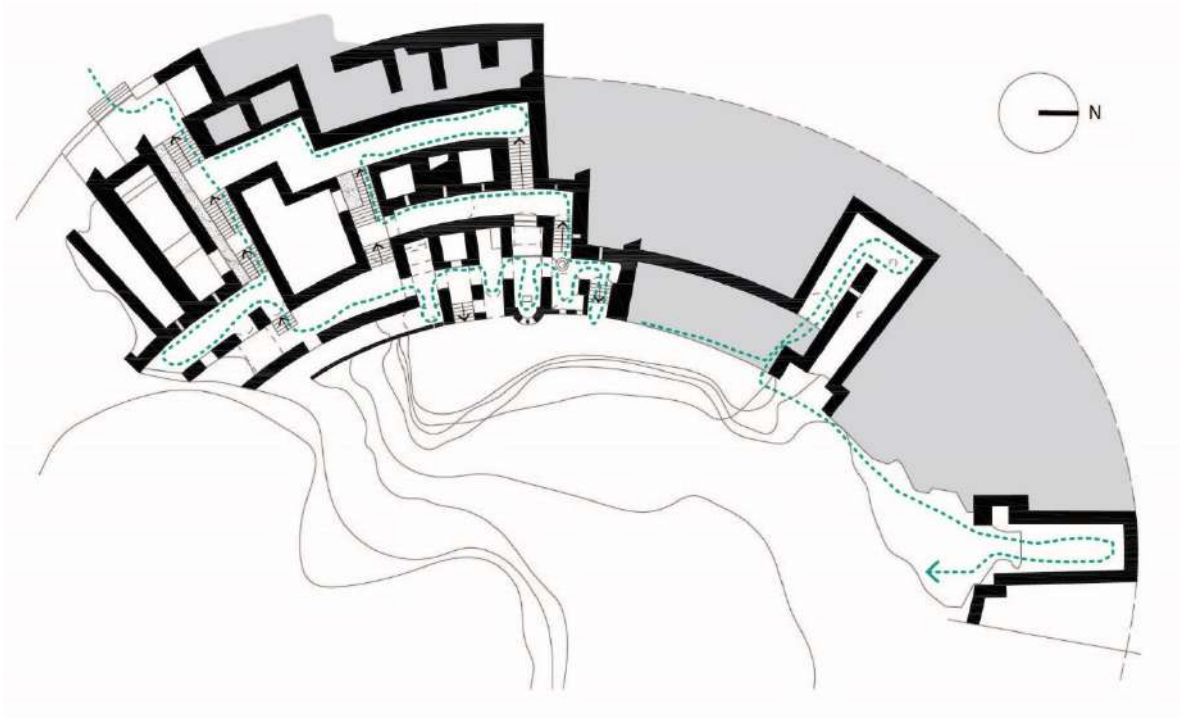


Figure 91 - Subject 02, Pattern of Exploration

**Areas of Activity:**

- Spaces where there is direct contact with sky are more preferable;
- Prefers spaces where she is able to use echolocation for navigation, such as the separate gallery in the north, and those places where openings are present in the walls.

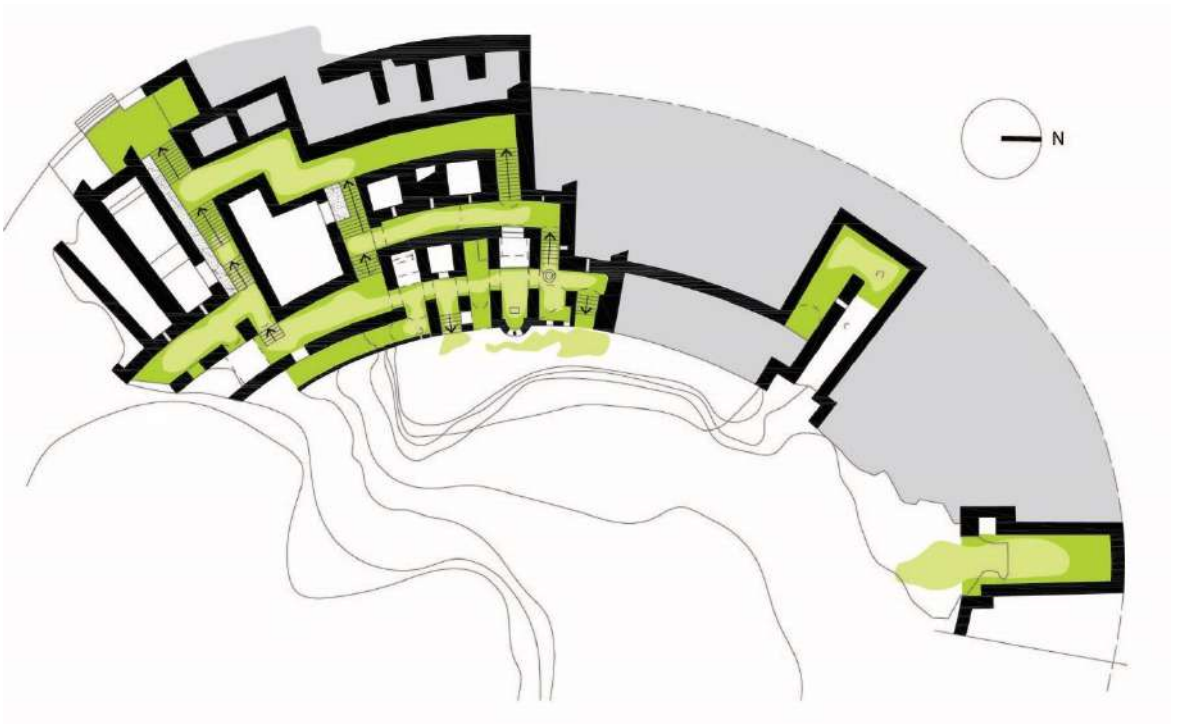


Figure 92 - Subject 02, Areas of Activity

### **Smellscape:**

- Very attentive to scents;
- Recognizes spaces through scents, generally the smell of soil or even the wooden paving in specific areas.

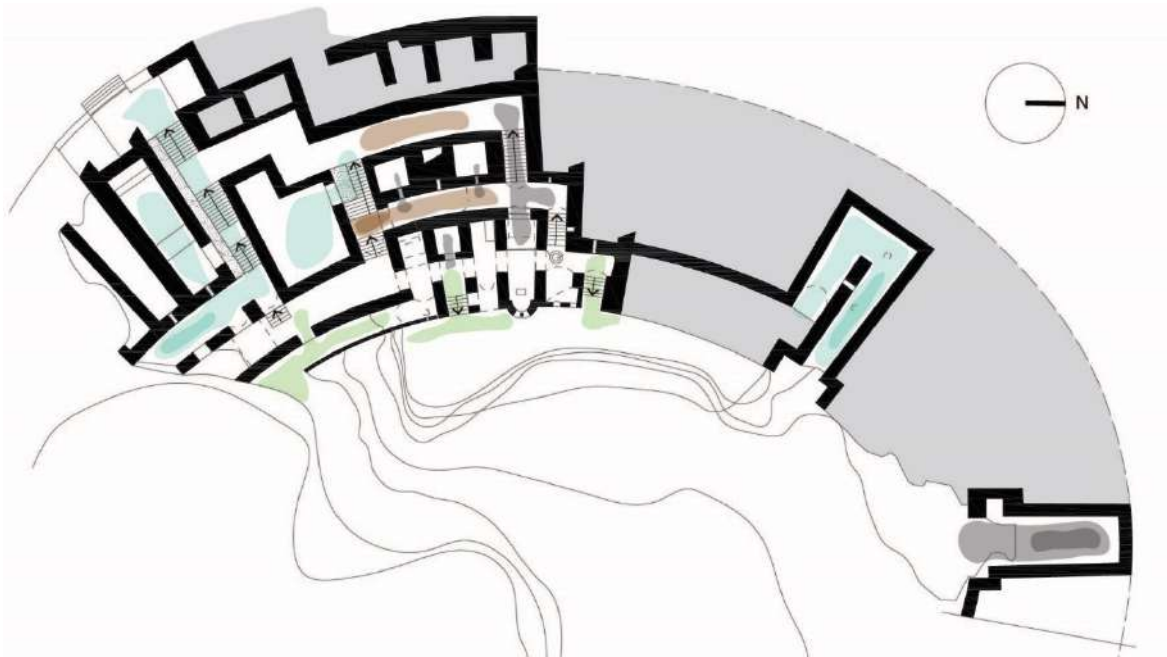


Figure 93 - Subject 02, Smellscape

### **Soundscape:**

- Landing of stairs good echolocation points;
- Openings on the walls as acoustic information source;
- Tranquillity characterizes the acoustic atmosphere of these spaces, since there is no presence of other external factors, such as people.
- Good echolocation in north gallery;
- The north-west gallery provides no acoustic information, only in the entrance. Such thing results in considering such space as anxious and bringing the sense of loss.

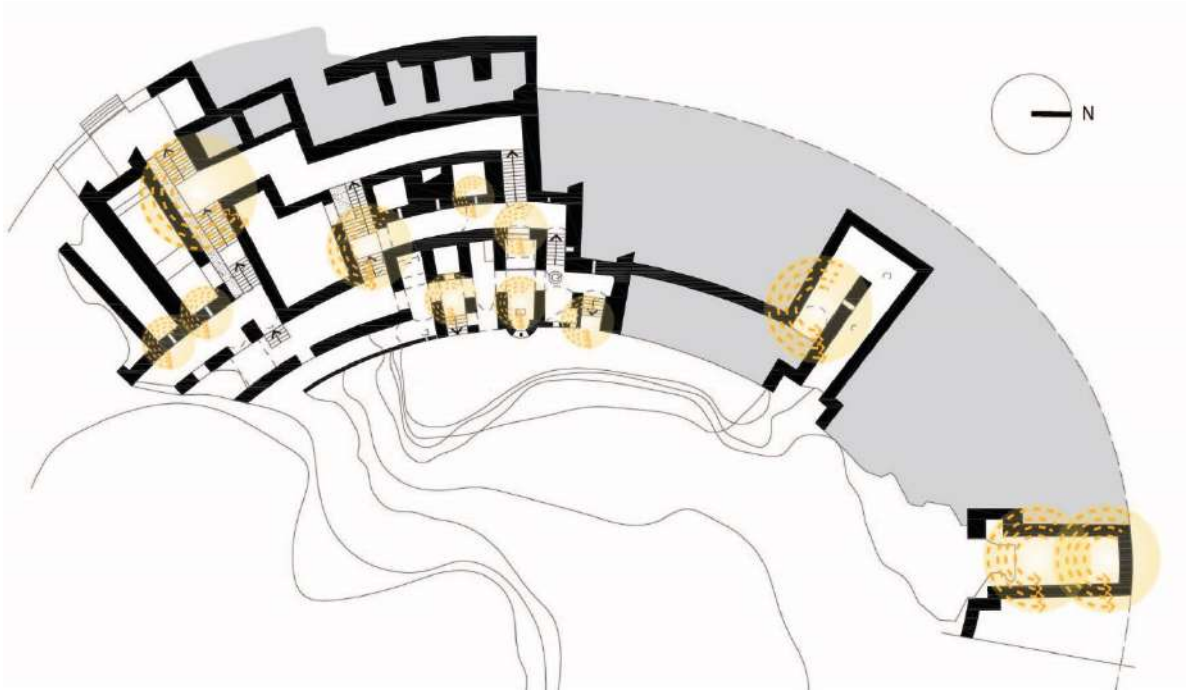


Figure 94 - Subject 02, Soundscape

**Active and Dynamic Touch:**

- Frequent active dynamic touch during circulation;
- Active touch in stopping points;
- Hands and arm technique, in pausing spaces;
- Recognizing types of surfaces through dynamic and active touch.

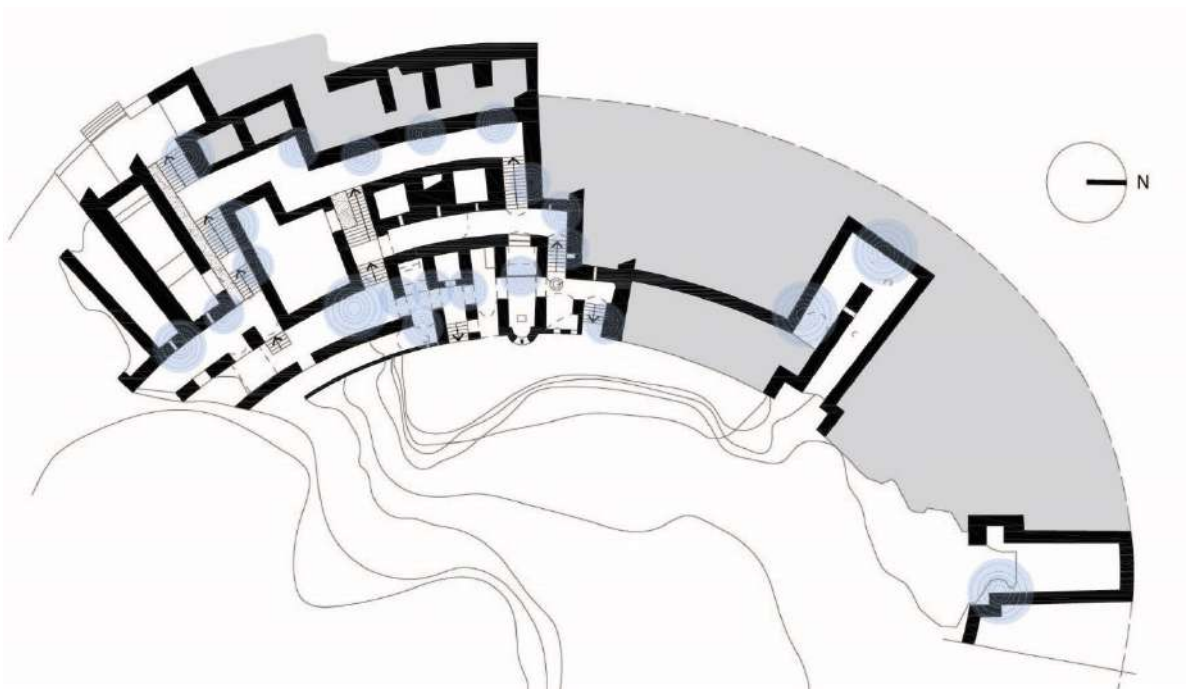


Figure 95 - Subject 02, Active Touch

**Passive Touch:**

- Higher air pressure in stairs and corridors, these are the coldest places;
- Drastic changes in temperatures, from indoor to outdoor spaces.

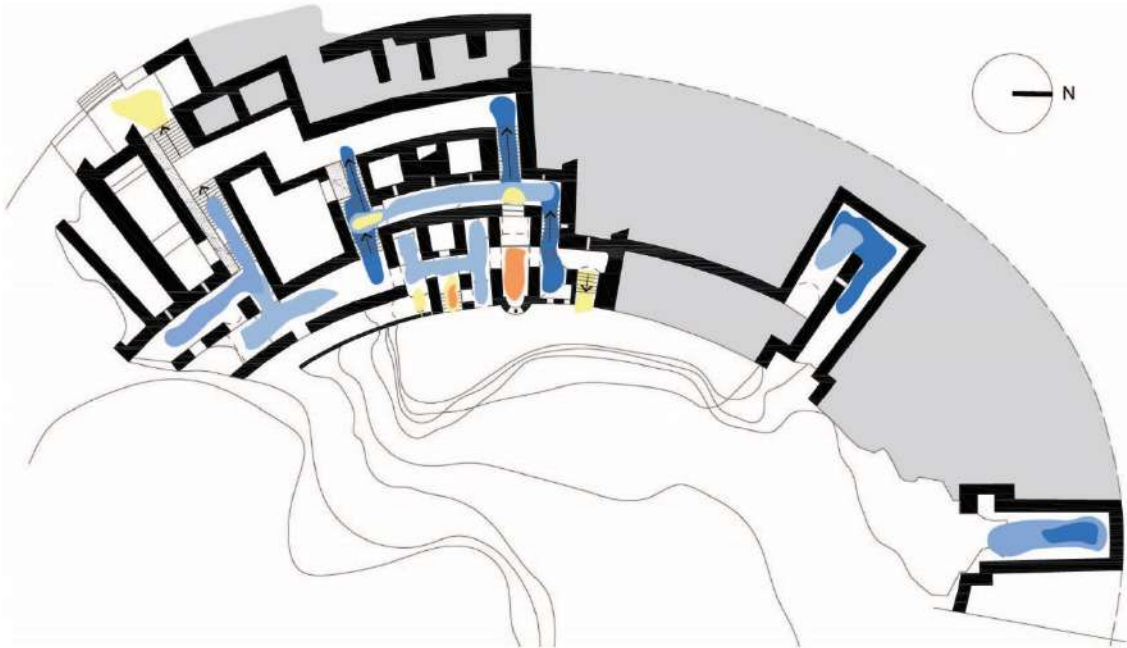


Figure 96 - Subject 02, Passive Touch

**Light and Darkness:**

- Unable to see light, but is highly sensitive of detecting changes of natural light amount.

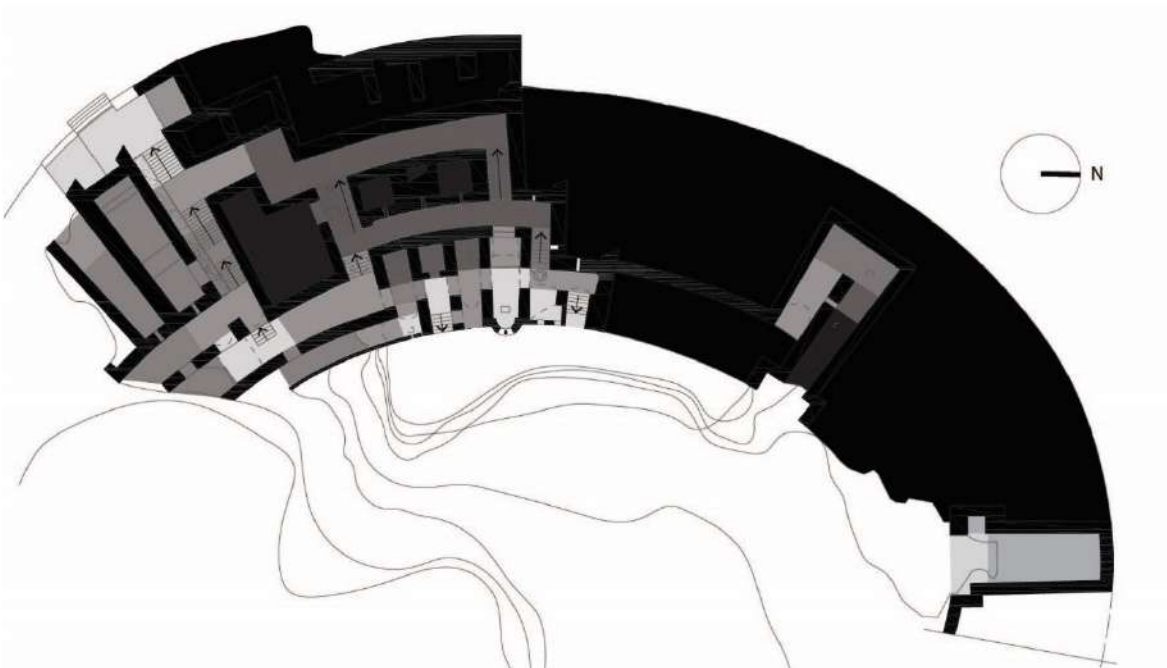


Figure 97 - Subject 02, Light and Darkness



**Reflective Surface:**

- No visual information.

**Visual Field:**

- No visual information.

#### **4.4.5. Subject 03**

##### **Space 1 - Individual Residential Area**

The subject's condition consists on damaged peripheral vision. As a result, for the subject, central vision is crucial for circulation and for investigating objects. Such loss, affects the ability to distinguish the ambient mode in spaces and as a result, the atmospheric awareness is lower in comparison to others with peripheral vision. Furthermore, the subject's condition is related with the degradation of cones in the retina, which are responsible for processing light, and as a consequence is very sensitive to contrasts of light.

The subject uses all of the spaces of the residence, since he lives alone. He considers the size of the apartment as appropriate for his activities but minimal for navigation. The most active area remains the living room, where he spends most of his time for doing his daily activity, and the corridor, which distributes the other rooms of the apartment. This space does not allow him to circulate freely and many times furniture becomes obstacles while circulating. He is not very sensitive to smells; accept from the smells coming from kitchen area. This area is located in the living room and is exposed to several sounds coming from the balcony of the living room. Furthermore, the glazed door of the balcony is disturbing for the subject due to reflections created from sunlight, making this space also the warmest and with a high amount of brightness. The transition of light contrasts from the living room to the corridor is gradual and is not considered as problematic for the subject.

One of the problematic of the subject concerning circulation is relation to objects, which to him are not considered as landmarks but as obstacles in many cases, causing collisions. The subject is able to recognize objects and use them as landmarks, but finds difficulty interacting with them. However, the subject follows objects through touch, following a grid pattern of exploration.

**Circulation:**

- Pattern of exploration: mainly perimeter;
- Spatial reference frame: allocentric and egocentric;
- Turning head constantly;
- Rigid body posture;
- Sense of security while moving from one space to another;
- Objects occasionally becoming obstacles.

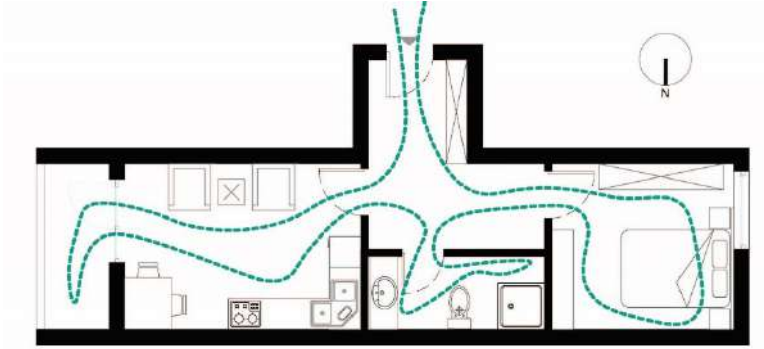


Figure 98 - Subject 03, Pattern of Exploration

**Areas of Activities:**

- Spaces with no obstacles, such as areas of circulation are the most active;
- Prefers places of circulation, where movement is more active.



Figure 99 - Subject 03, Areas of Activity

**Smellscape:**

- Not very conscious about scents, except those coming from the kitchen.

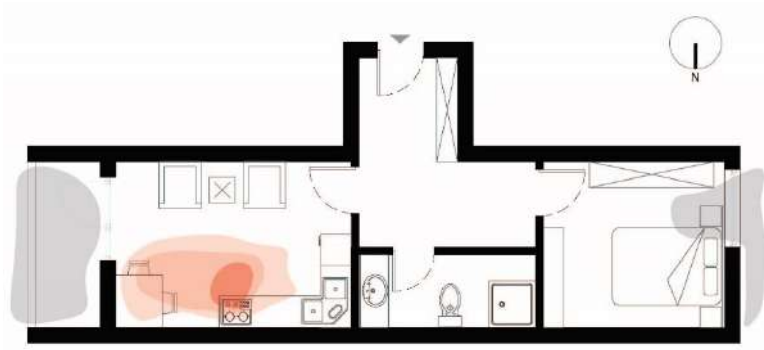


Figure 100 - Subject 03, Smellscape

### **Soundscape:**

- Not very sensitive to sounds and echoes.



Figure 101 - Subject 03, Soundscape

### **Active and Dynamic Touch:**

- Occasionally touches the landmarks (furniture, door frames, windows) and walls,
- Recognizes materials, textures and patterns through fingers.

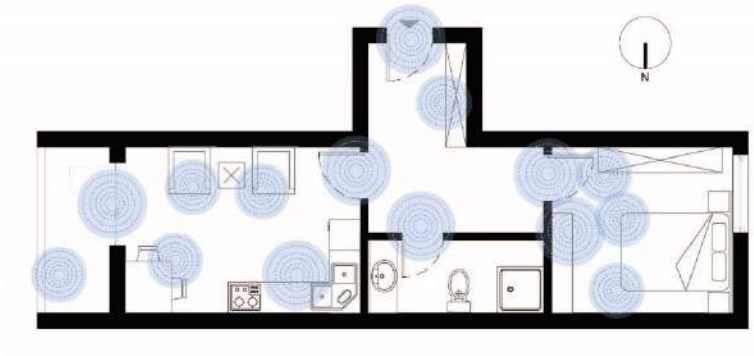


Figure 102 – Subject 03, Active and Dynamic Touch

### **Passive Touch:**

- Changes in temperature of rooms, associated with the natural light levels.

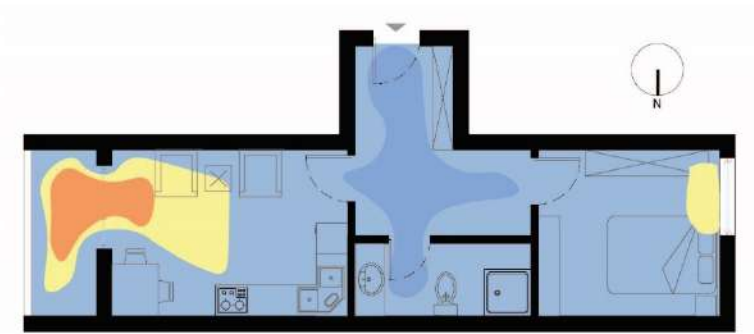


Figure 103 - Subject 03, Passive Touch

**Light and Darkness:**

- Not disturbed by high intensity daylight,
- Disturbed by high contrast of changes in light levels.

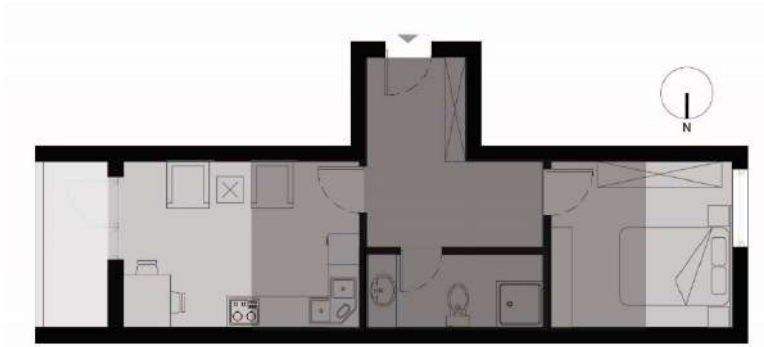


Figure 104 - Subject 03, Light and Darkness

**Reflective Surfaces:**

- Glare effect from the balcony door.

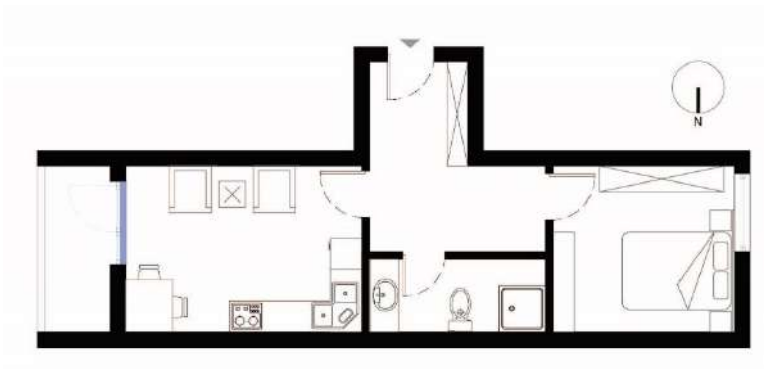


Figure 105 - Subject 03, Reflective Surfaces

**Visual Field:**

- Lack of peripheral vision, causing high level of concentration for investigating objects;
- Central and paracentral visual field as source of visual information.

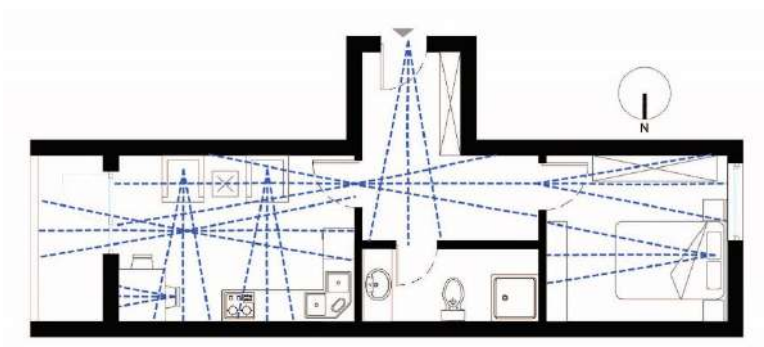


Figure 106 - Subject 03, Visual Field

## **Space 2 – Public Space**

### **Educational building, “University Polis”, Tirana**

The focus in this building was to understand the confrontation of the subject with circulation spaces, which can be considered as active spaces with a high frequency of movements. The subject does not obtain information from peripheral vision; this causes frequent head turning in order to obtain the full ambient information from central vision, information missing from peripheral vision. As a result, the subject in some cases veers while walking in the main corridor. Drastic light intensity changes and reflective floor surfaces bring discomfort to the subject, which indicate the quality of the visual information obtained from tubular vision. The subject finds difficulty recognizing objects or faces in the dark, specifically in the direction to the main hall, due to the high brightness coming from the main hall and not being distributed evenly to the corridor. Orientation becomes more difficult when going from one bright place to a dark place, which needs time for the subject to process such information while adjusting vision.

The emergency signage positioned on the floor is guiding for the subject, especially along the stairs, which are one of the main obstacles for him. Through active touch he continuously follows the handrail when he descends and ascends the stairs. Furthermore, while there are persons in the stairs, movements become slower. The movement is slower and very controlled, something reflected from the posture of the body. Recognition of depth is the subject's main difficulty, which brings difficulty for circulating stairs or other differentiations in floor level. Such obstacle is considered more in small changes that are difficult to be visually recognized by the subject, for instance, the electric cables floor covers, which can become source of tripping incidents.

The subject is not sensitive to any scents or echoes coming from spaces. The only sounds that he recognizes are the voices of people and the presence of the highway, since the university is located along Tirana-Durres highway.

Another aspect concerning his perception is the inability to recognize nuances of colours, which he considers as an ability that he is losing with time.

#### **Circulation:**

- Pattern of exploration: mainly perimeter;
- Spatial reference frame: allocentric and egocentric;
- Turning head constantly;
- Rigid body posture;

- Sense of insecurity while moving in stairs;
- People sometimes seen as obstacles.

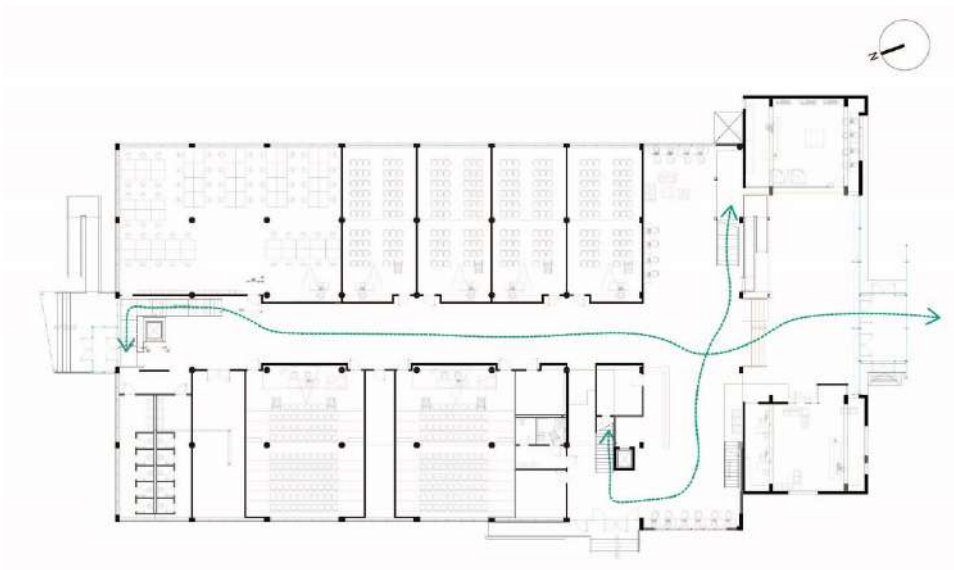


Figure 107 - Subject 03, Pattern of Exploration

**Areas of Activities:**

- Does not prefer narrow spaces;
- Difficulty circulating along stairs.



Figure 108 - Subject 03, Areas of Activity

**Smellscape:**

- Not very conscious about scents.



Figure 109 - Subject 03, Smellscape

**Soundscape:**

- Not very sensitive to sounds and echoes;
- Identifies location of people through voices.



Figure 110 - Subject 03, Soundscape

**Active and Dynamic Touch:**

- Occasionally follows movement through touching walls;
- Touching hand railings in stairs;
- Does not use white cane;
- Using active touch only.

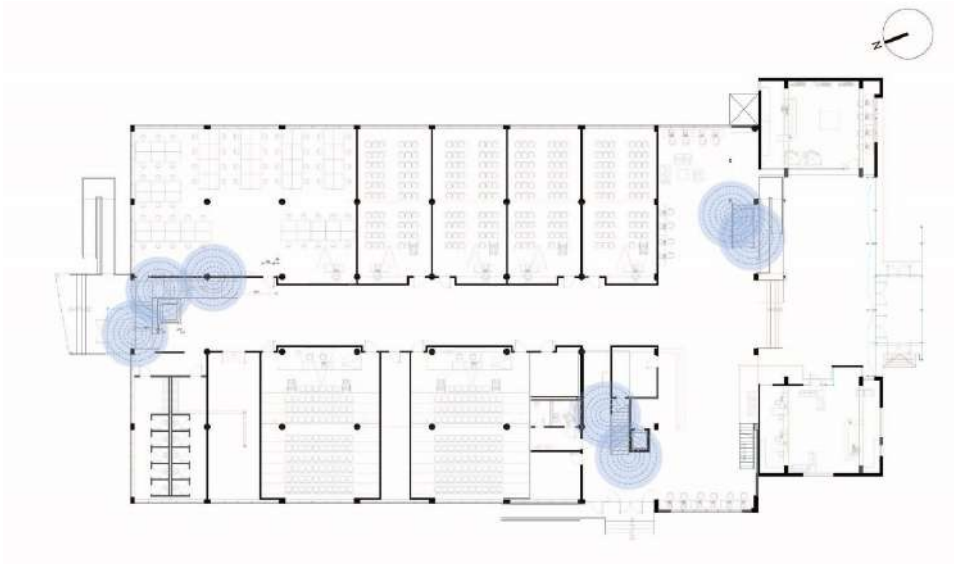


Figure 111 - Subject 03, Active Touch

**Passive Touch:**

- Changes in temperature of rooms, associated with the natural light levels;
- Recognizes changes in temperature also through visual information.

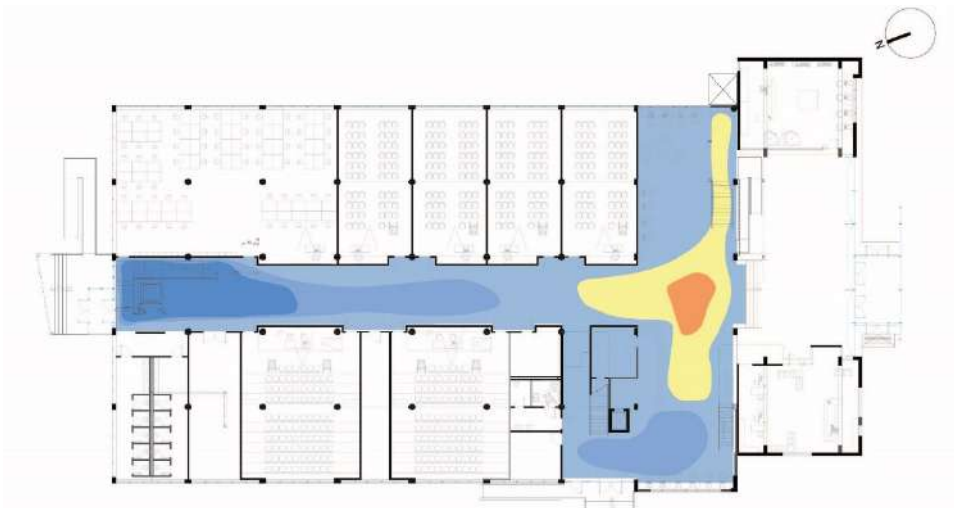


Figure 112 - Subject 03, Passive Touch

**Light and Darkness:**

- Not disturbed by high intensity of daylight;
- Difficulty seeing in dark spaces;
- Disturbed by high contrast of changes in light levels



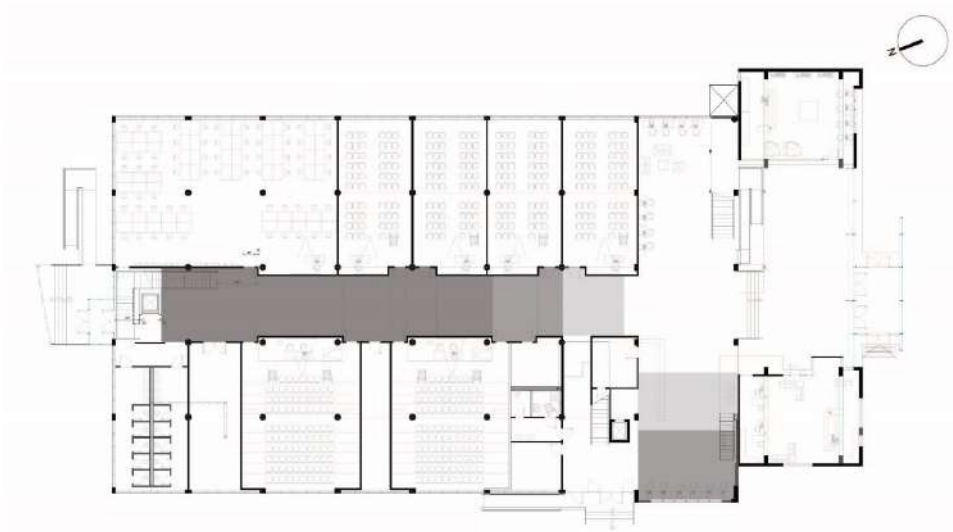


Figure 113 - Subject 03, Light and Darkness

**Reflective Surfaces:**

- Glare effect in floors of corridor.



Figure 114 - Subject 03, Reflective Surfaces

**Visual Field:**

- Lack of peripheral vision;
- Central and para-central visual field as source of visual information.

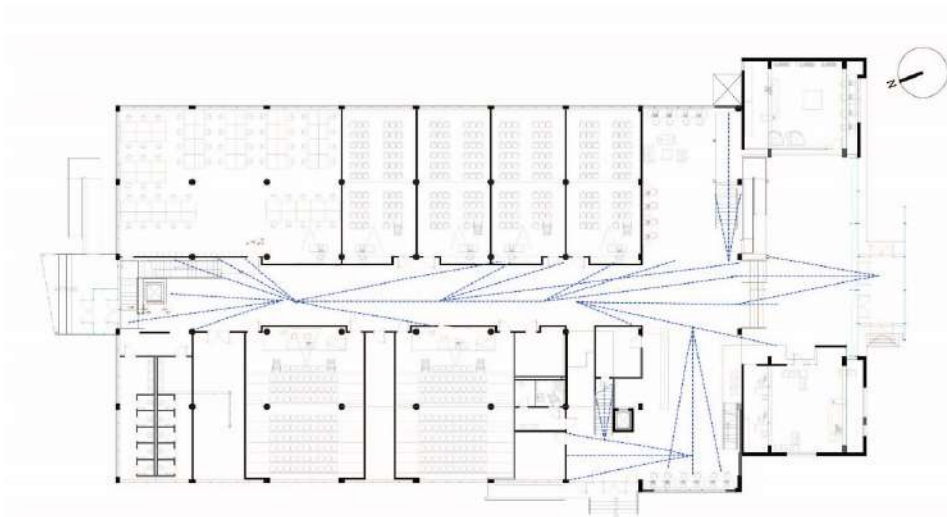


Figure 115 - Subject 03, Visual Field

#### **4.4.6. Subject 04**

##### **Space 1 - Individual Residential Area**

Subject 04's condition is high degree myopia, which consists of loss of visual acuity and distorted vision. Such condition causes misconception of objects in shape and size. As a result, straight objects appear wavy, flat surfaces as rounded, shapes and faces as distorted and objects appear smaller or larger. Considering objects' size, the subject sees objects as smaller and with rounded round borders. Such condition brings to the subject difficulty in performing everyday tasks and navigation especially in unknown spaces.

The participant accesses her apartment generally from the elevator, since the stairs of the building are irregular and causes her more confusion. The most active areas in the apartment are the corridor, living room and the balcony, which connects the bedroom to the living room. Generally, there is a sense of security while circulating, but in the common space of the residential building, there is a sense of insecurity accessing the stairs. The subject is not very sensitive to smells and acoustic details. Mostly she is very aware to sounds coming from the common space of the building and from the outdoor environment through the balcony. Concerning her relation to objects, furniture is not a reliable source of information. Complicated shapes and patterns disrupt her perception, while small objects are difficult to perceive. Sometimes accidents occur due to the difficulty for understanding the exact position of the furniture as a cause of her visual impairment. As a result, she has avoided many decorative objects in her space. The configuration of the room is highly important. She prefers rooms with few corners and regular shapes in order not to confuse from the visual information obtained. The only reflective surface, which is considered as disturbing, is the floor in the main corridor in the entrance of the building.

**Circulation:**

- Pattern of exploration: perimeter combined with cyclic;
- Spatial reference frame: allocentric and egocentric;
- Sense of security while moving from one space to another, but occasionally appears insecure while walking;
- Furniture is not a good landmark since they appear deformed in shape and size often.

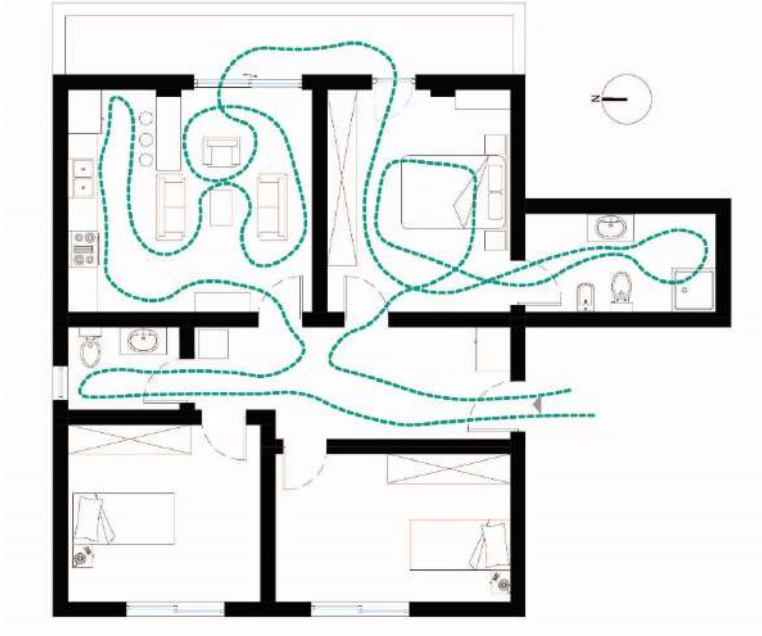


Figure 116 - Subject 04, Pattern of Exploration

**Areas of Activities:**

- Areas of circulation, kitchen bar and living room;
- Prefers places of circulation, where movement is more active.

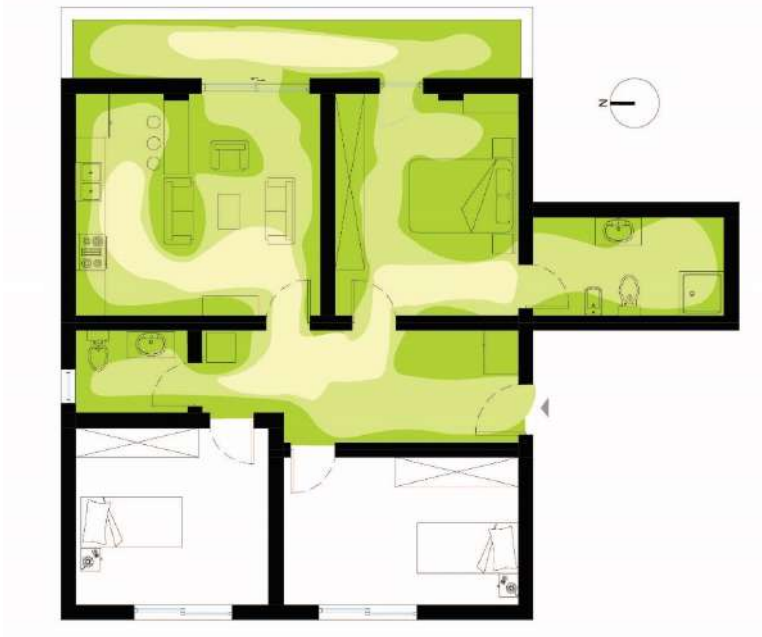


Figure 117 - Subject 04, Areas of Activity

## Smellscape

- Not very sensitive to scents, but aromas coming from kitchen while cooking.

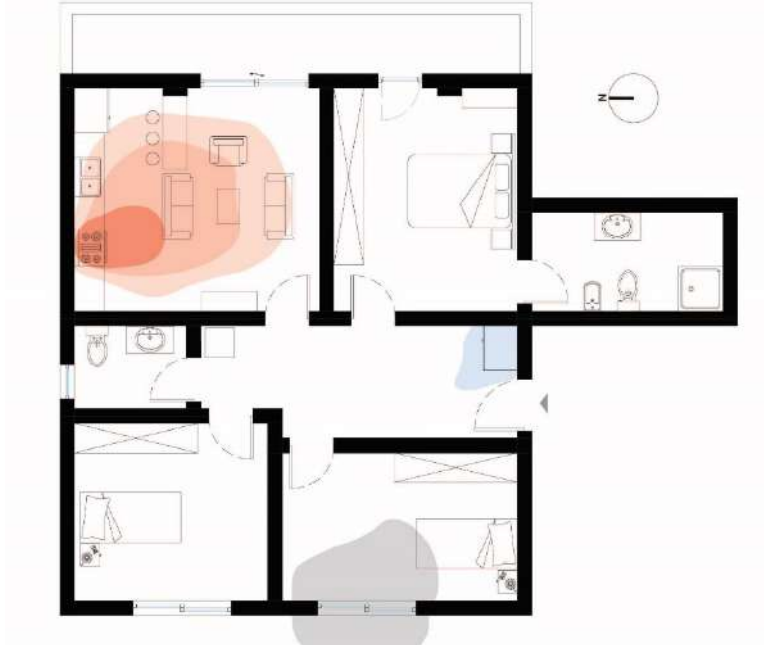


Figure 118 - Subject 04, Smellscape

## Soundscape:

- Sounds that come from outside bothers her.

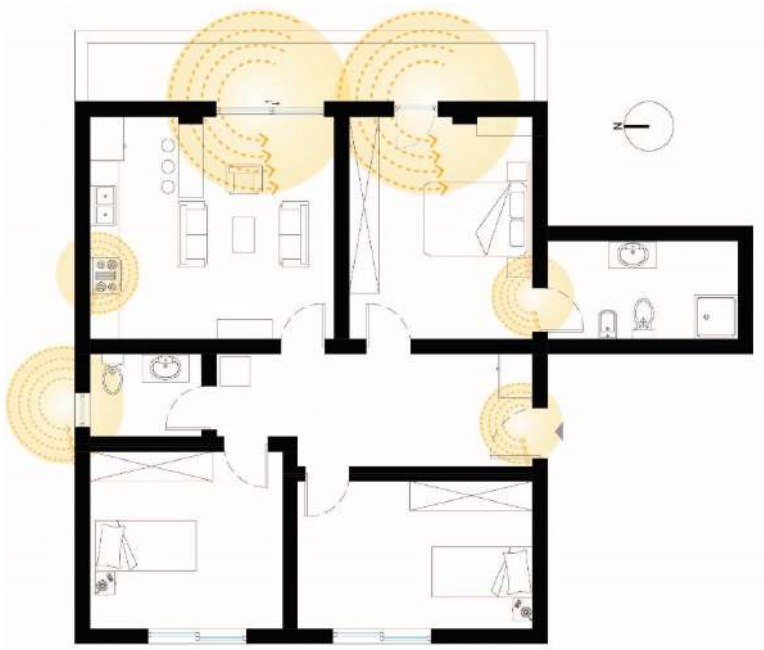


Figure 119 - Subject 04, Soundscape

### Active and Dynamic Touch:

- Often touches objects in order to create a clear idea in mind about the shape and size;
- Kitchen bar a reliable haptic landmark from the presence of its corners;
- Recognizes textures through touch, but not clearly patterns visually,

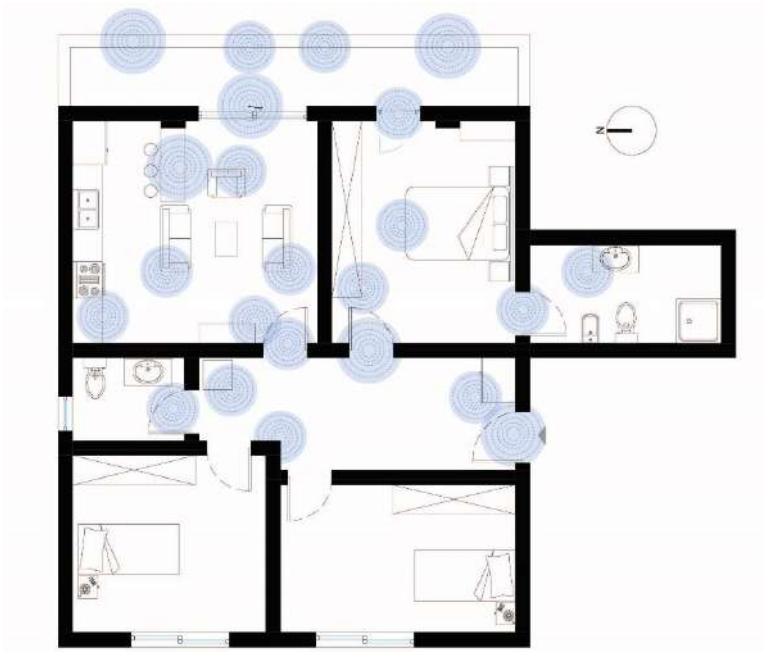


Figure 120 - Subject 04, Active Touch

### Passive Touch:

- Gradual changes in temperature of rooms;
- Comfortable air temperatures.



Figure 121 - Subject 04, Passive Touch

**Light and Darkness:**

- Disturbed by high contrast of changes in light levels.

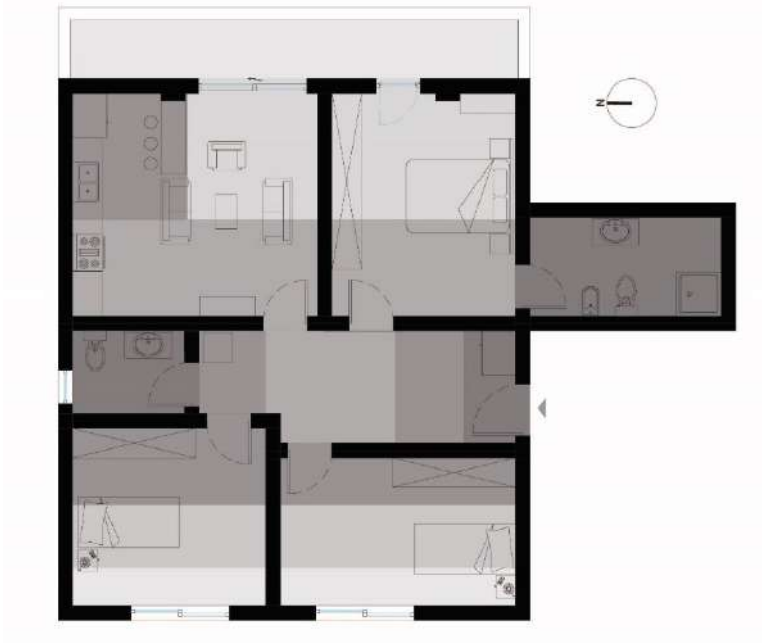


Figure 122 - Subject 04, Light and Darkness

**Reflective Surfaces:**

- Glare effect from the corridor floor.

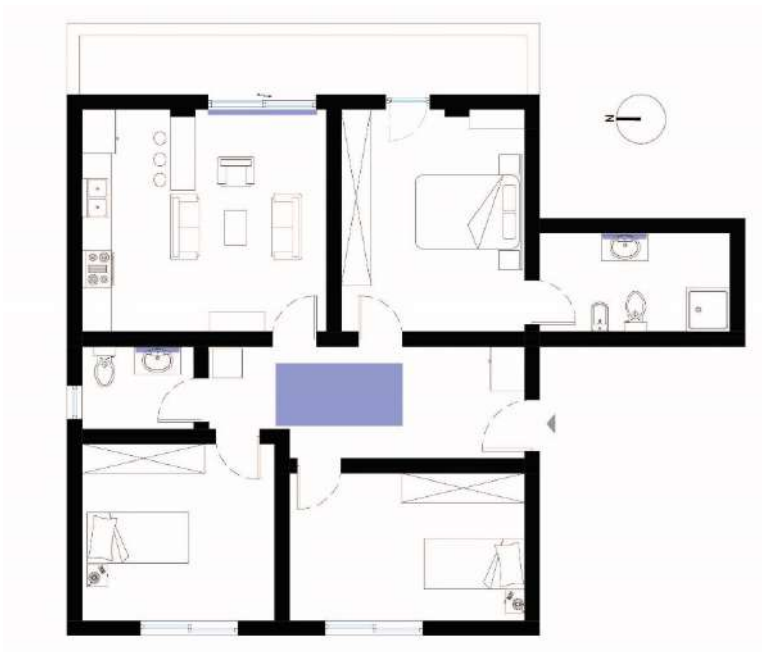


Figure 123 - Subject 04, Reflective Surfaces

**Visual Field:**

- Central visual field not a reliable source of visual information,
- Difficulty in perceiving small objects.

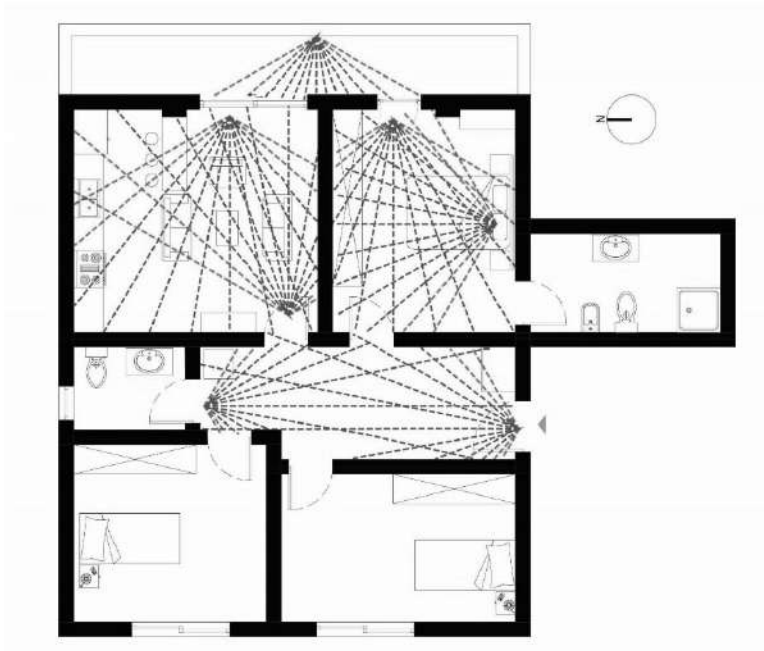


Figure 124 - Subject 04, Visual Fields

**Space 2 – Public Space****Cafeteria at the “Opera & Ballet Theatre” of Tirana**

The circulation is provided through the spaces left free from furniture. The subject finds difficulty in approaching a table since the presence of many objects and people distracts her vision. This space is not comfortable for the subject, since it has many objects close to each other and some of them appear distorted. The most problematic areas are the stairs, where the subject is very careful while descending, due to the mircropsia<sup>15</sup>. As a result, she chooses the space without people and tables to descend the stairs and supports her body while starting to descend at one of the wide columns of the building. She does not use the white cane, which prolongs the time of movement. The subject is aware of the smellscape and soundscape. Sounds are actually confusing to the subject, since this space is very crowded with people, leading to difficulty in concentrating and using sound as landmark.

While sitting by the table, she is disturbed by the view presented in front of her. The disturbance is caused by the reflective stone pavement of the public space located in the west.

<sup>15</sup> Micropsia is the condition of seeing objects smaller, while macropsia is the condition of seeing objects as larger in size.

**Circulation:**

- Pattern of exploration: undefined – dependent on the empty space;
- Spatial reference frame: allocentric and egocentric;
- Sense of insecurity while moving from one space to another;
- Furniture is not a good landmark since they appear deformed in shape and size often.

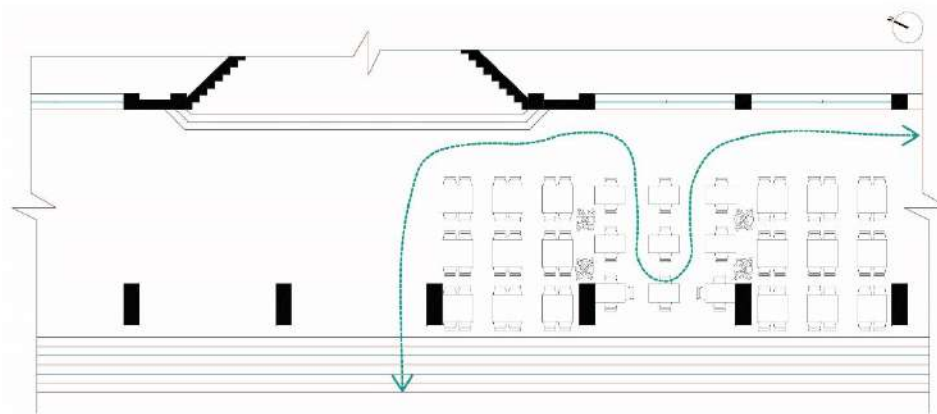


Figure 125 - Subject 04, Pattern of Exploration

**Areas of Activities:**

- Areas of circulation.

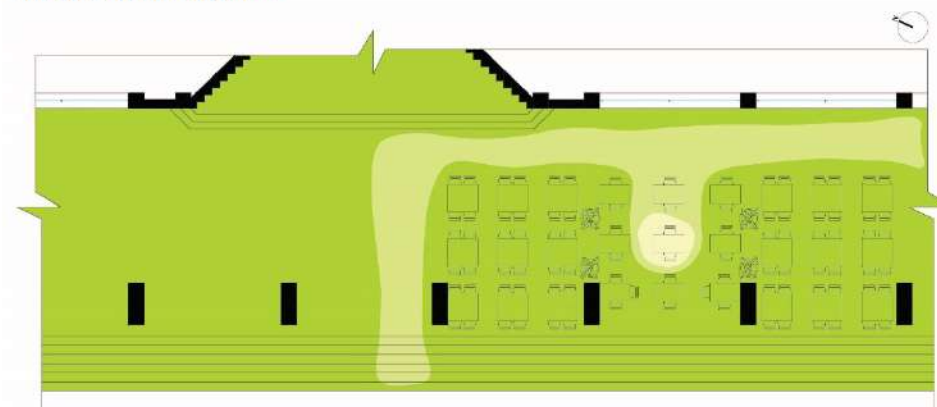


Figure 126 - Subject 04, Areas of Activity

**Smellscape:**

- Sensitive to scents but does not use them as landmarks.

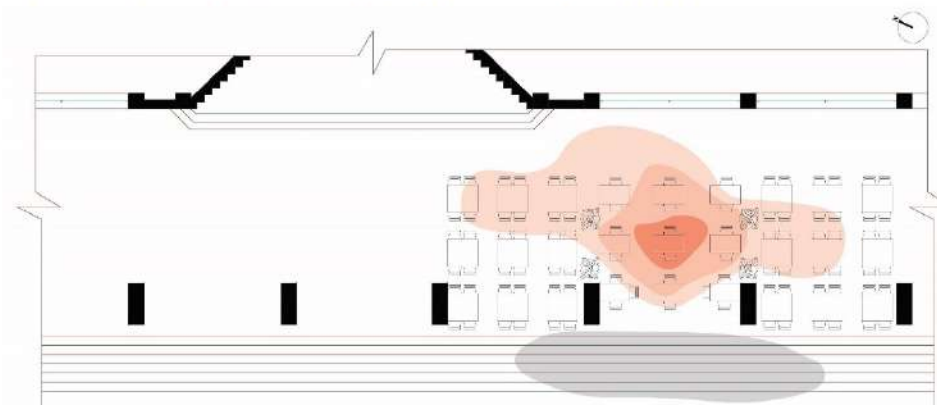


Figure 127 - Subject 04, Smellscape



**Soundscape:**

- Sounds confusing due to presence of many people.

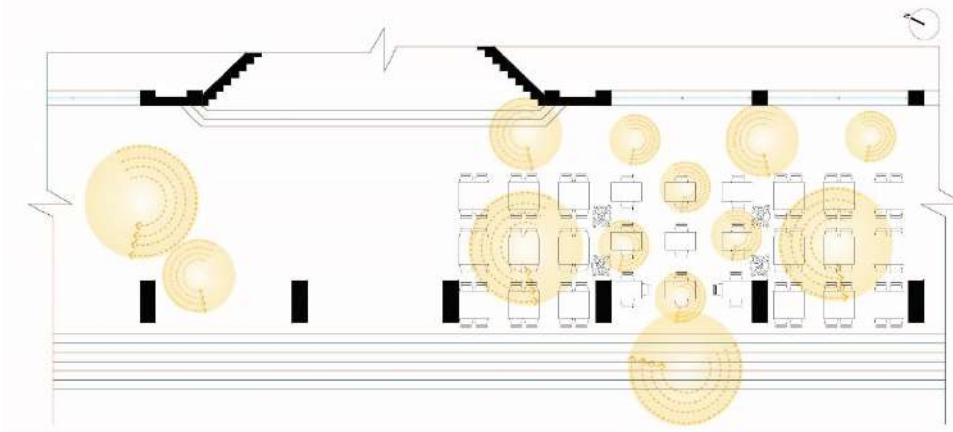


Figure 128 - Subject 04, Soundscape

**Active and Dynamic Touch:**

- Body interaction is not very active;
- Does not touch objects in this case;
- While descending stairs, follows movement through touching the walls.

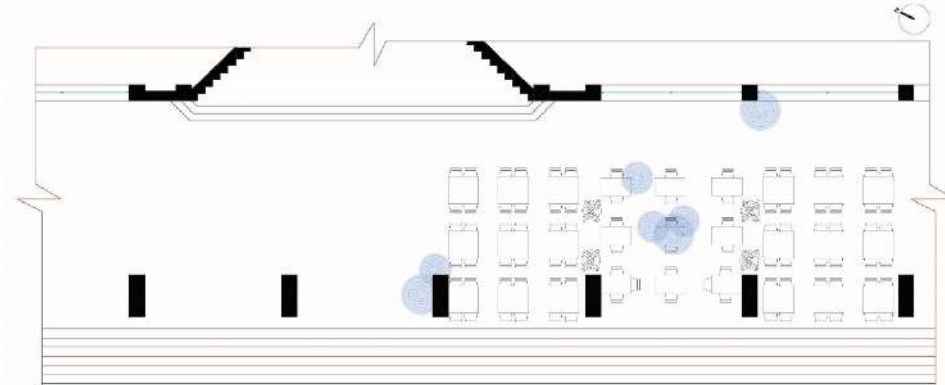


Figure 129 - Subject 04, Active Touch

**Passive Touch:**

- Comfortable air temperatures.

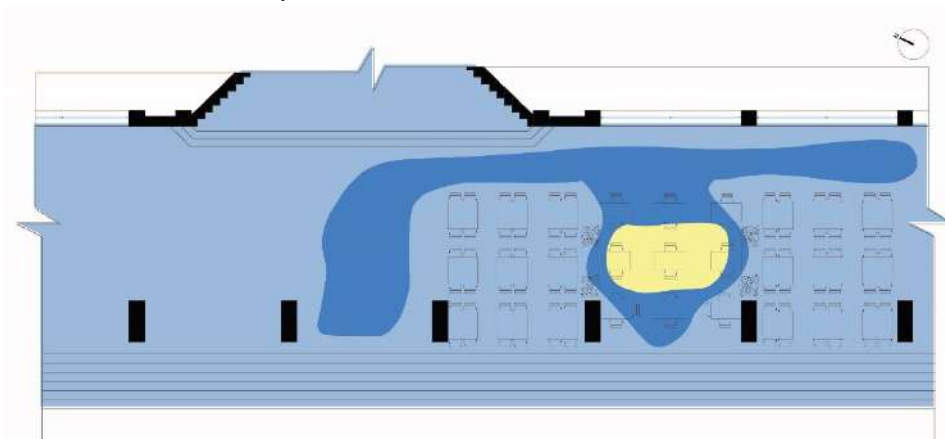


Figure 130 - Subject 04, Passive Touch

### Light and Darkness:

- Disturbed by high contrast of changes in light levels;
- Disturbed by reflection from the paving of the square in front of the cafeteria.

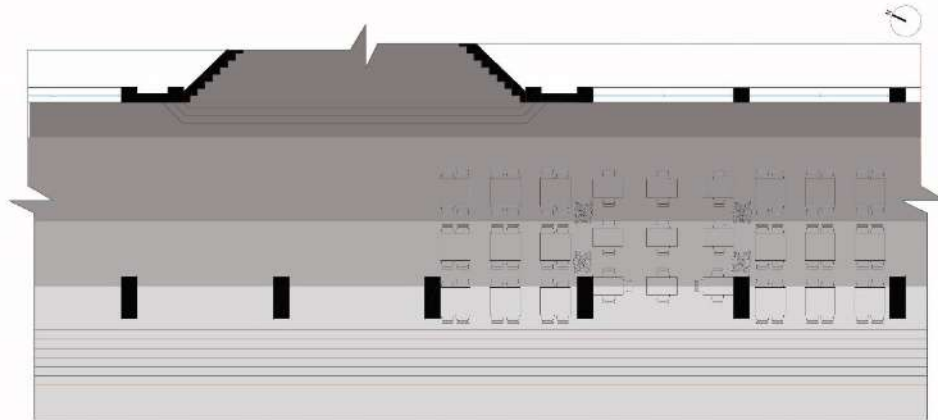


Figure 131 - Subject 04, Light and Darkness

### Reflective Surfaces:

- Glare effect from the surfaces in front of her.

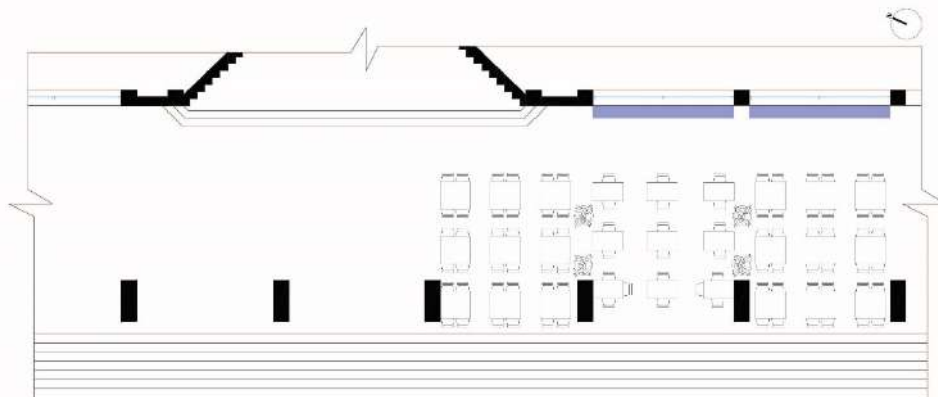


Figure 132 - Subject 04, Reflective Surfaces

### Visual Field:

- Central visual field not a reliable source of visual information.

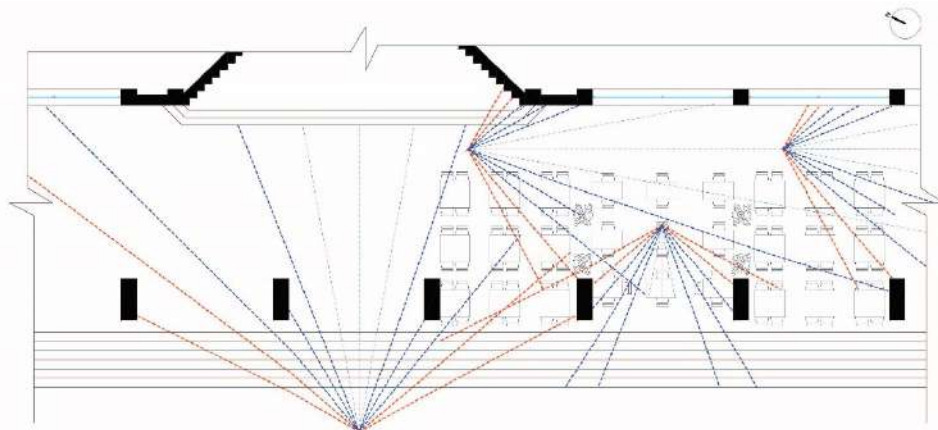


Figure 133 - Subject 04, Visual Field

#### 4.4.7. Subject 05

##### Space 1 - Individual Residential Area

Subject 05's impairment consists in reduced visual acuity and light sensitivity (photophobia). Such condition does not allow the person to feel comfortable in spaces that are very bright and furnished with high intensity of daylight. The subject circulates very comfortably in the apartment. The most active space remains the corridor, which distributes all the spaces of the apartment. He is not very attentive to the smells and echo coming from spaces, only considers sounds coming from the outdoor environment or other rooms but not specific sounds.

The subject prefers staying in cooler areas of the apartment, since there is no light present. The only concern to him remains relation to light and avoiding reflective surfaces. For this, he has placed thick curtains to block intensive light coming inside space and placing rugs on the floor in order to avoid reflection from floor surfaces.

#### **Circulation:**

- Pattern of exploration: no distinctive pattern;
- Spatial reference frame: allocentric and egocentric;
- Sense of security while moving from one space to another.

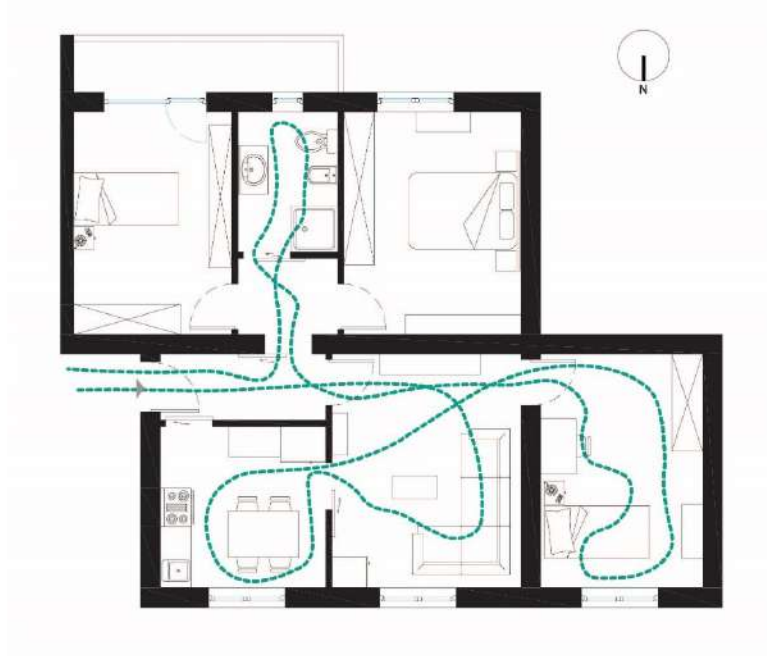


Figure 134 - Subject 05, Pattern of Exploration

**Areas of Activities:**

- Areas of circulation;
- Prefers living room, kitchen.



Figure 135 - Subject 05, Areas of Activity

**Smellscape:**

- Not very sensitive to scents, but aromas coming from kitchen while cooking.

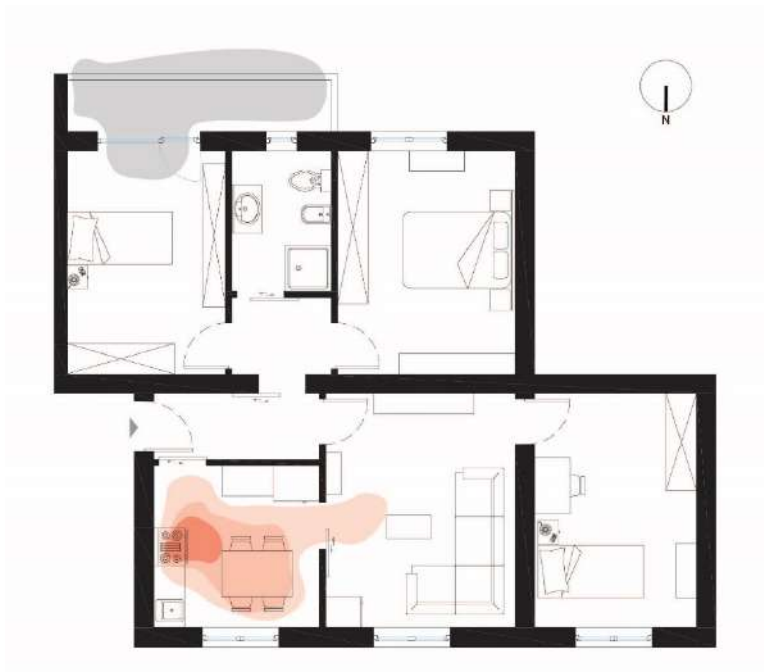


Figure 136 - Subject 05, Smellscape

**Soundscape:**

- Sounds that come from outside;
- Different sounds coming from other activities in other rooms.

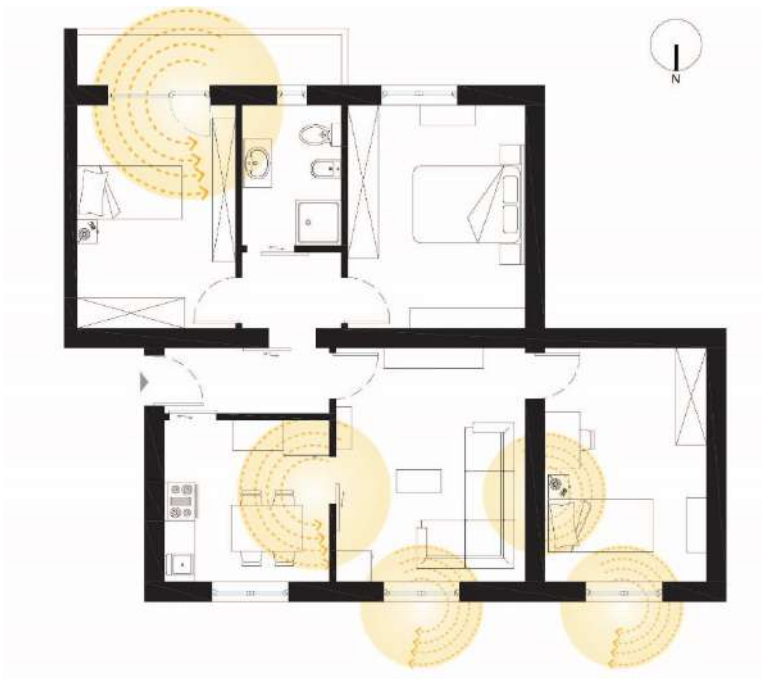


Figure 137 - Subject 05, Soundscape

**Active and Dynamic Touch:**

- Occasionally touches objects and walls,
- Haptic sensitivity not presented
- Recognizes textures through touch and vision.

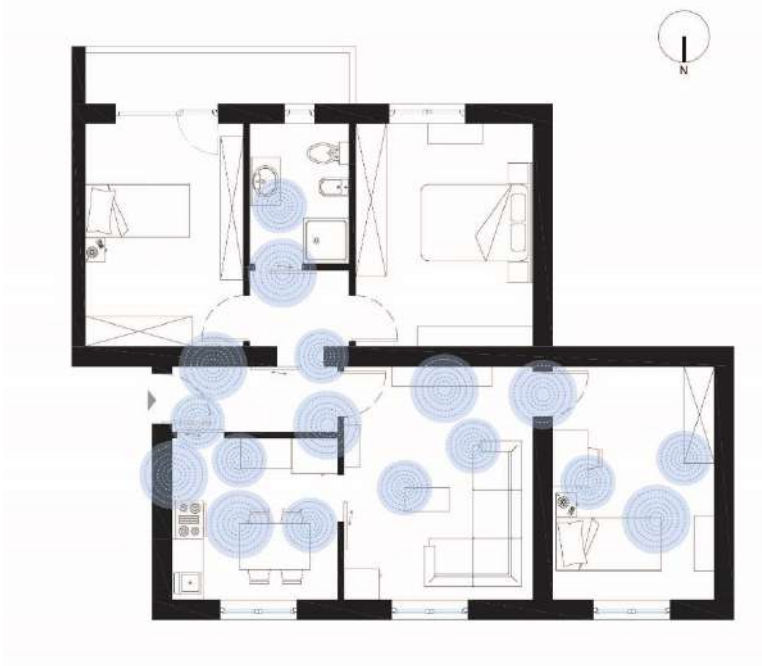


Figure 138 - Subject 05, Active Touch

**Passive Touch:**

- There is not intense daylight in rooms, which is considered as comfortable.

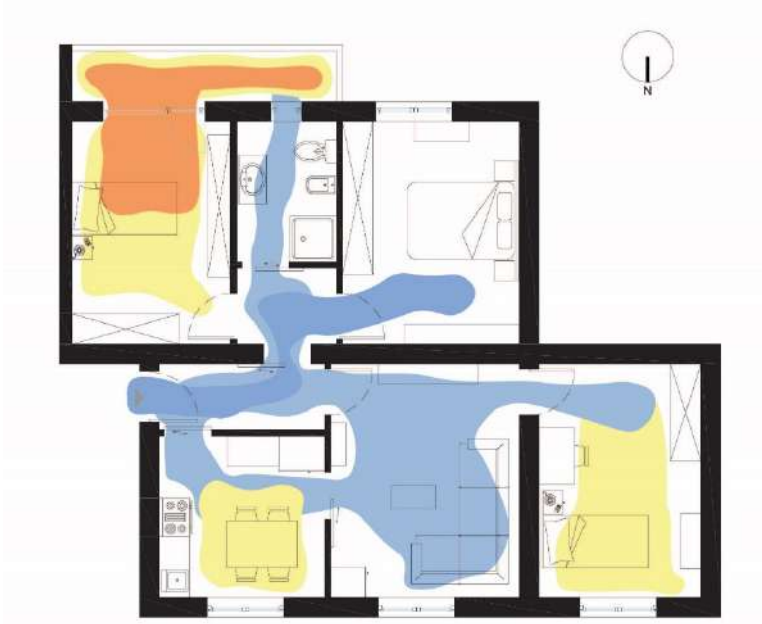


Figure 139 - Subject 05, Passive Touch

**Light and Darkness:**

- Disturbed by high intensity daylight,
- Disturbed by high contrast of changes in light levels,
- Shading system is very necessary,
- Light bulb not fluorescent,
- Artificial light not white or blue.

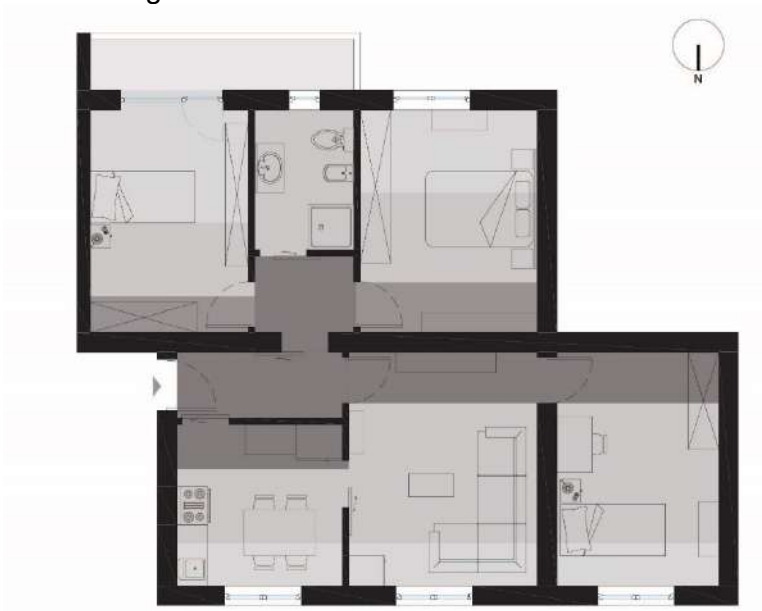


Figure 140 - Subject 05, Light and Darkness

**Reflective Surface:**

- No disturbances from floors, only from reflective materials, which he has covered with curtains/rugs.



Figure 141 - Subject 05, Reflective Surfaces

**Visual Field:**

- Disturbance from glare and high intensity of light is obtained from the central visual field.

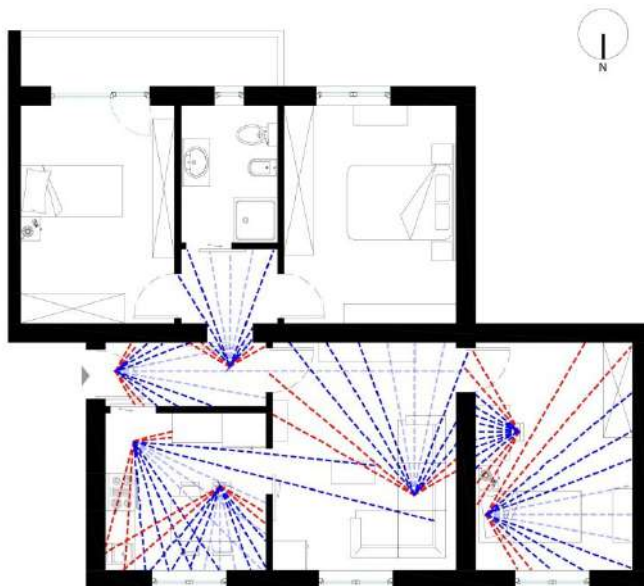


Figure 142 - Subject 05, Visual Field

## **Space 2 – Public Space**

### **Cultural building, the “Archaeological Museum” of Durrës**

Sense of security characterizes subject’s movements inside the building. The movements are not associated with touch and dynamic touch is not active, since the subject does not need the assistance of the white cane. The subject has the necessity to follow, from time to time, his movement with touch, but in the museum is not allowed. The general pattern of movement is walking along the corridors created by the positioning of objects. However, the most active space remains the central hall of the museum, since it is characterized by diffused daylight. Floor surfaces appear problematic to the subject, while walking they become disturbing for his vision because are very reflective. Light intensity is not disturbing, since the daylight come diffused from window openings that are positioned not in the eye level of the subject.

#### **Circulation:**

- Pattern of exploration: no distinctive pattern;
- Spatial reference frame: allocentric and egocentric;
- Sense of security while moving from one space to another.

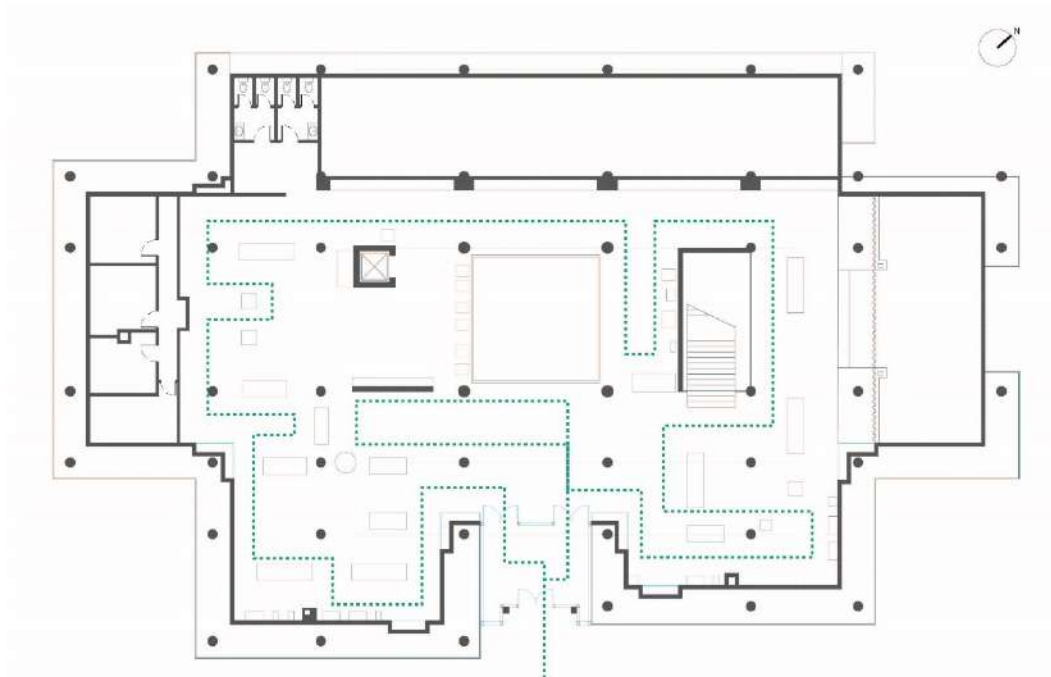


Figure 143 - Subject 05, Pattern of Exploration

#### **Areas of Activities:**

- Areas of circulation;
- Prefers the central space as the most spacious due to the atrium and double floor height.



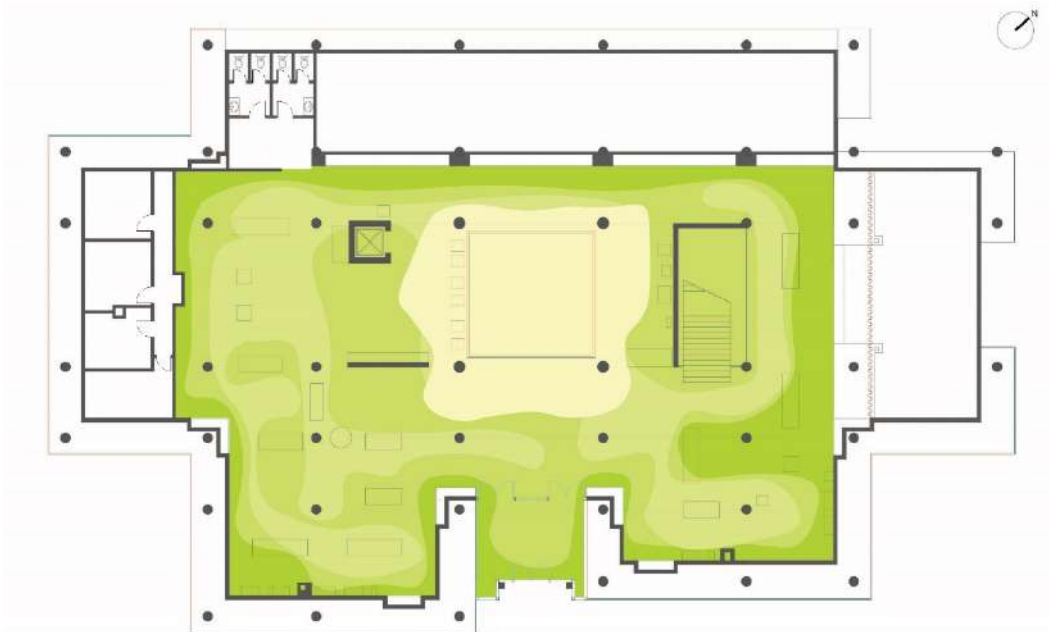


Figure 144 - Subject 05, Areas of Activity

**Smellscape:**

- Not very sensitive to scents, but feels the soil present in two specific areas in the central space.

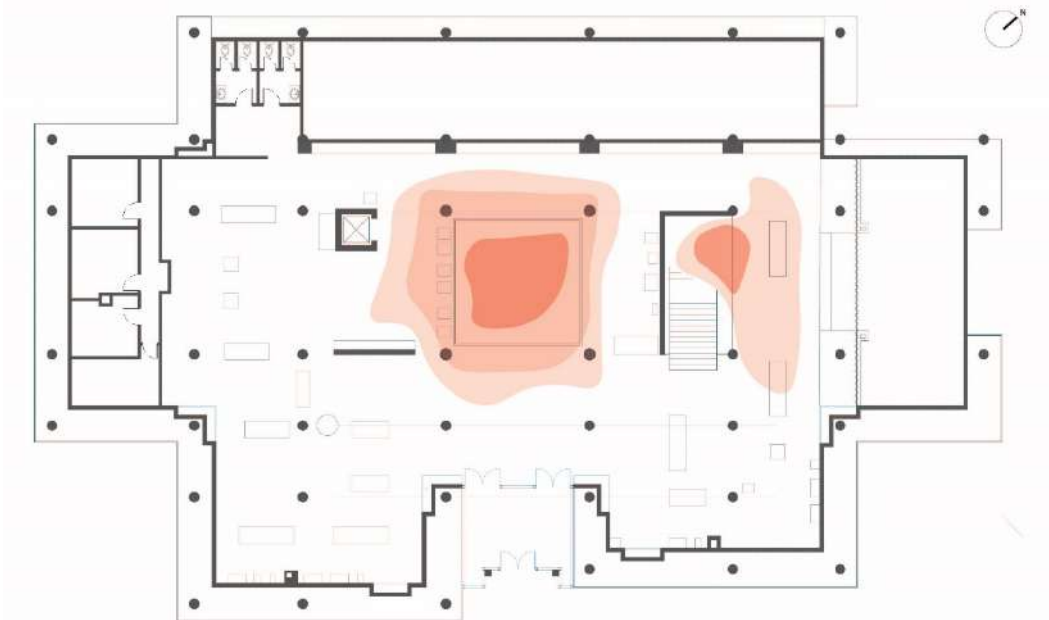


Figure 145 - Subject 05, Smellscape

**Soundscape:**

- Echo changes of voice in the central area, under the stairs and in the entrance;  
 - Not sensitive to other sounds.

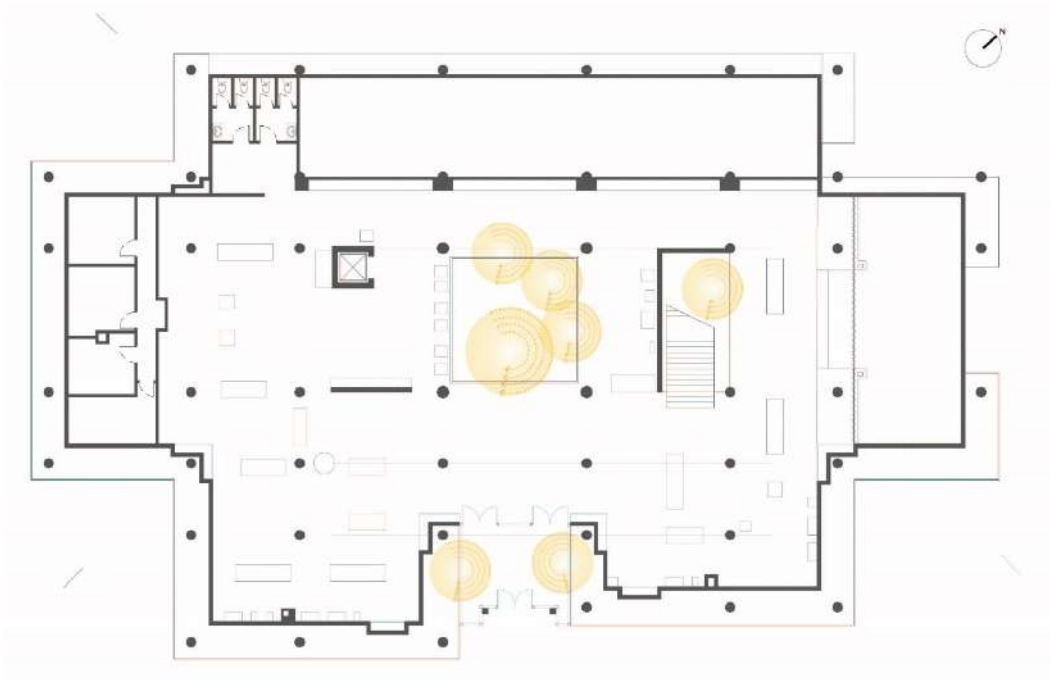


Figure 146 - Subject 05, Soundscape

**Active and Dynamic Touch:**

- Occasionally touches objects and walls,
- Haptic sensitivity not presented
- Recognizes textures through vision.

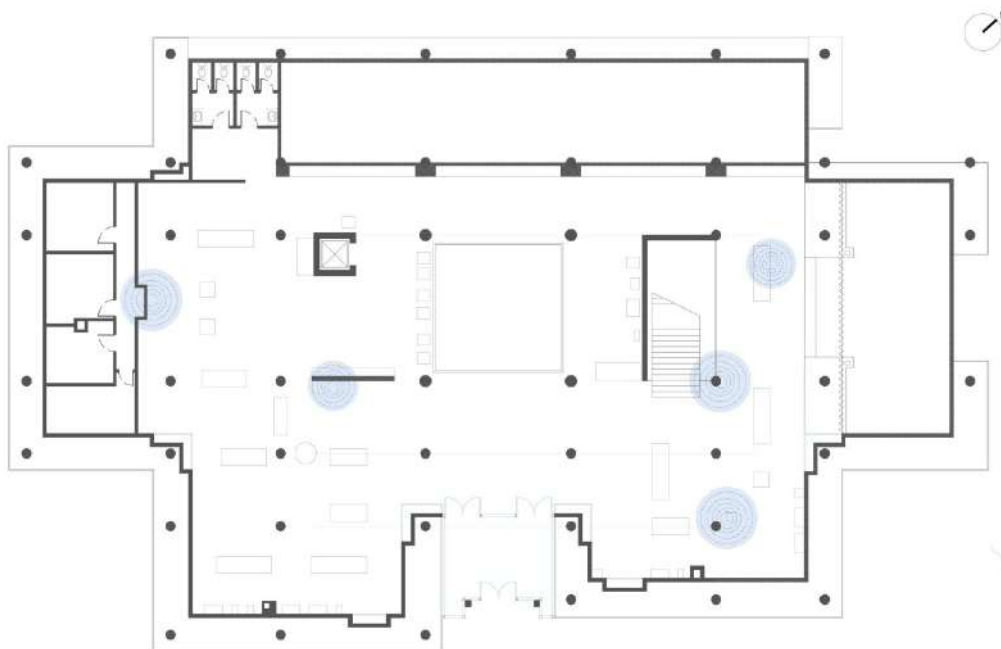


Figure 147 - Subject 05, Active Touch

**Passive Touch:**

- There is not intense daylight in areas, which is considered as comfortable;
- Pleasurable light coming from the atrium, making this space as the warmest;
- Passive touch depended on vision.

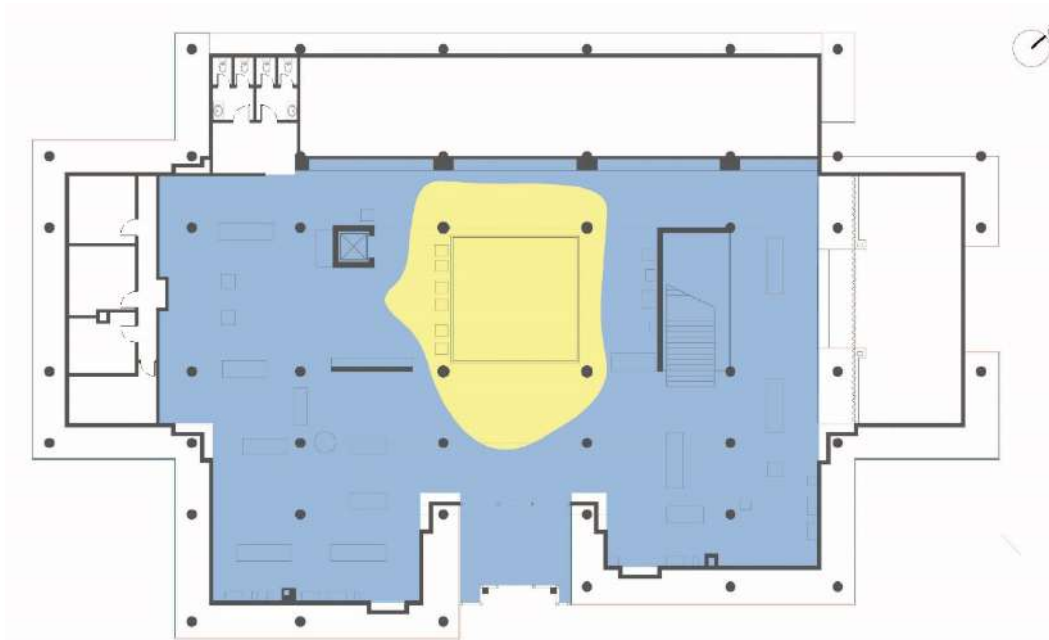


Figure 148 - Subject 05, Passive Touch

**Light and Darkness:**

- Disturbance from the fluorescent lights;
- The pocket spaces appear slightly problematic due to the change of light contrast;

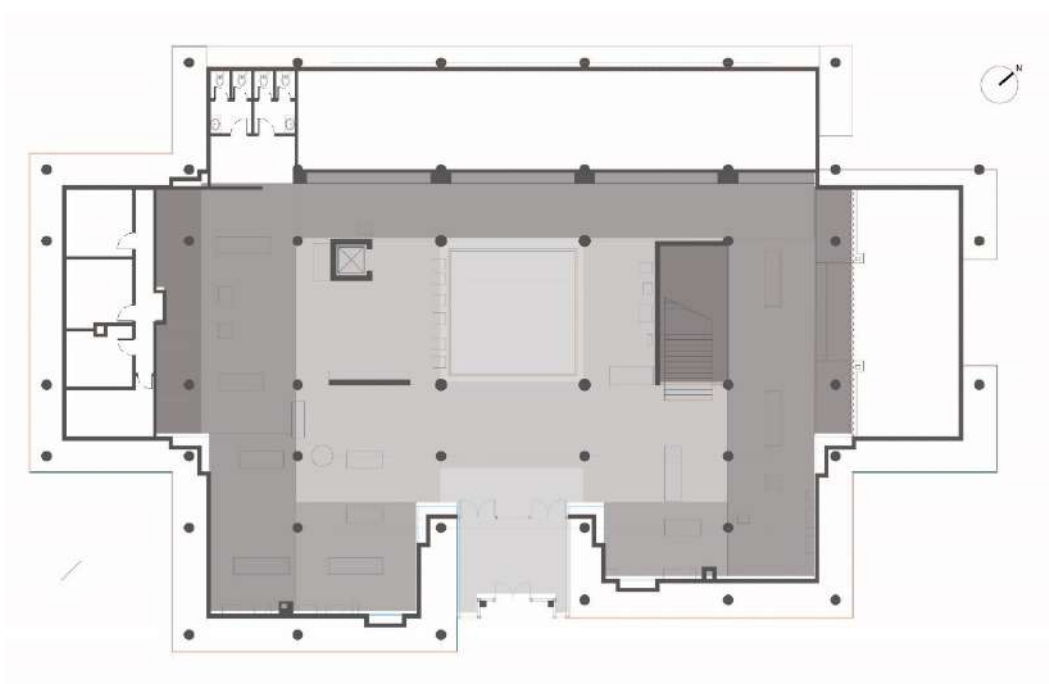


Figure 149 - Subject 05, Light and Darkness

**Reflective Surfaces:**

- Floor very reflective;
- Inappropriate material for the pavement.

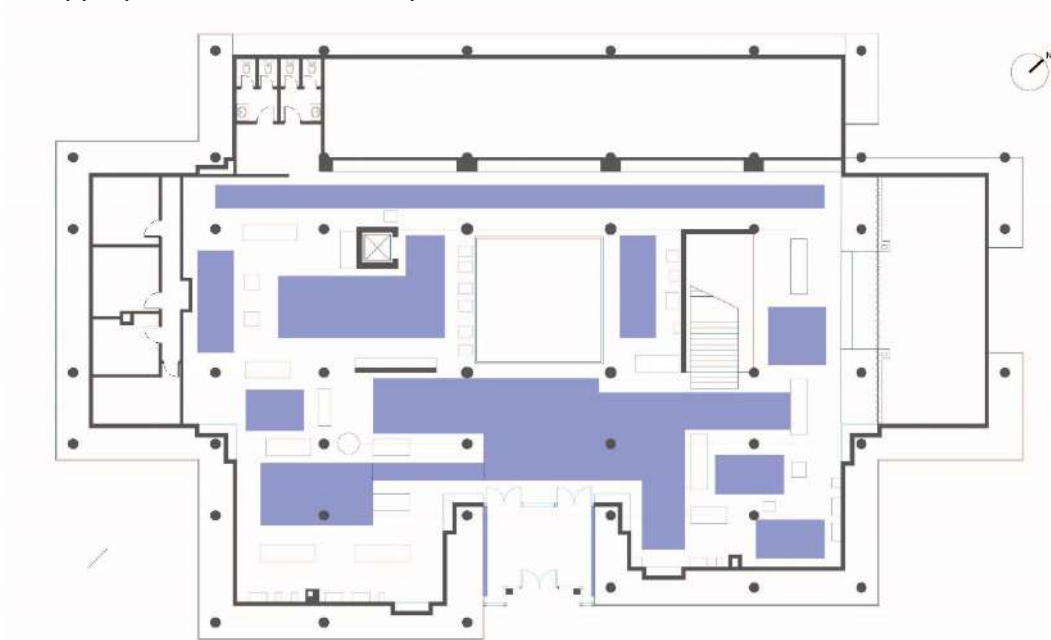


Figure 150 - Subject 05, Reflective Surfaces

**Visual Field:**

- Full information obtained from both visual fields.

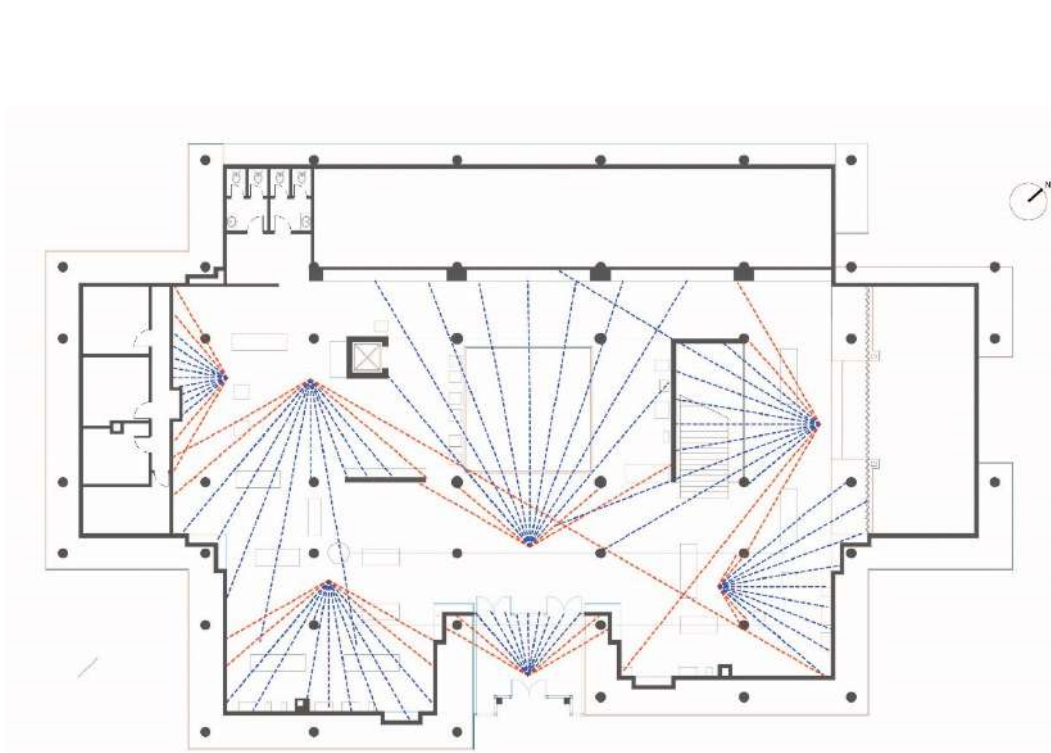


Figure 151 - Subject 05, Visual Field

## **5. EVALUATION TRACK**

Learning from Visual Impairments

## 5.1. Findings from the Experiment and Interview

The observations made from the experiments and the results obtained by the individual interviews with each subject, provided findings concerning the perceptual nature of the subjects and their architectural experience in their domain and the selected public building. Such findings emphasize the different nature of the perceptual process of the visually impaired from the “normalized” perception. Differences were observed even between the blind individuals and the visually impaired, some of which were also contradictory from one another. As a result, it is necessary to make a comparison between these two main groups.

	S01	S02	S03	S04	S05
Pattern of Circulation	Perimeter/ Object-to-object	Perimeter/ Cyclic	Perimeter (Avoids Objects)	Perimeter (Avoids Objects) with exception to home	No distinctive pattern
Areas of Activity	Circulation space (not narrow spaces)	Circulation space/ Landing in stairs	Circulation space	Circulation space/ Spaces free from objects	Circulation space/ Atrium
Smellscape	Sensitive	Sensitive	Moderate Sensitive	Moderate sensitive (Too much stimuli appears problematic)	Moderate Sensitive
Soundscape	Sensitive	Sensitive	Moderate Sensitive	Moderate sensitive (Too much stimuli appears problematic)	Moderate Sensitive
Active (A) and Dynamic Touch (D)	A + D Very active	A + D Very active	A Very active	A Moderate	A Moderate
Passive Touch	Sensitive	Sensitive	Depended on vision	Depended on vision	Depended on vision
Light and Darkness	Depended on passive touch	Depended on passive touch	Dark spaces problematic/ drastic contrast changes	Very bright spaces problematic	Very bright spaces problematic/ drastic contrast changes
Reflection	No information	No information	Sensitive	Sensitive	Very Sensitive
Visual Field	No information	No information	Central vision	Peripheral vision	Both

Table 11 - Comparison between the selected subjects

The main aspect concerning the comparison of the perceptual experience of the blind subjects and those partially sighted is the particular difference between their cognitive maps, which provides distinctive spatial exploration. This is directly connected with the relation of the subject to the objects and their sensory zone, which is also indicated by the sum and the nature of obtained visual information. Concerning the sensory zone in blind individuals, it appears more active than those partially sighted. This is due to the fact that in blind individuals there is no misperception resulting from the visual information, while the partially blind do not obtain the full exact visual input from the surrounding. As a result,

blind subjects tend to be more sensitive and assertive to other clues obtained by other sensorial modalities. On the other hand, subjects that are partially sighted do not seem to have high levels of sensitivity to other sensorial stimuli, since their attention is concentrated in processing the partial visual stimuli. Their visual condition becomes an obstacle not only to orientation but also to the ability to be attentive to other sensorial stimuli, such as auditory or olfactory, except from the tactile sense, which remains active and aids their circulation. Such information is an indicator for the creation of the cognitive map through the selection and use of landmarks, which are of any sensorial nature. Furthermore, the sensory zone in the second selected spaces, the public spaces, was influenced by other external factors, such as people's voices or traffic noises. Such disturbance was more evident in the case of the cafeteria, where the subject was not capable to distinguish auditory stimuli as landmarks, due to the high amount of auditory information. This leads to concluding that the overload of sensorial stimuli prevents creating clear landmarks for orientation and mobility. However, in blind individuals was observed discordance from auditory information, which was strictly related to the architectural configuration of spaces.

Partial visual information does not create the possibility to direct attention to other sensorial stimuli, since the subjects focus on processing and interpreting incomplete information. Such thing resulted in a non-clear structure of the cognitive map created by the partially sighted subjects, which is reflected in the lack of use of landmarks and to a not clear circulation pattern. The pattern of circulation in most of the subjects was mainly perimeter, except from subject 05's circulation, which remained unspecified. However, in blind individuals was observed the clearest and more organized pattern for circulation, especially in unfamiliar spaces. In both cases, the pattern of exploration depended from the typology of space, indicated by the level of familiarity of the subject with the specific space. Such thing is more evident in the case of the blind individuals, congenitally blind or late blind, since they do not require any visual information and their frame of reference remains egocentric.

The main distinction between the blind subjects and the visually impaired remains the relation to objects, which were considered as elements of a dualistic nature, as orienting or as obstacles. The affinity to objects or to architectural elements, defined the most active areas for each of the subject, which conceited in most cases with circulation spaces, especially in the visually impaired, where the space freed from objects was the most active in terms of circulation. These spaces were generally places that were found in between spaces, as transitory areas, which function as orientating elements, as pacing zones or as reference points. However, a high number of connecting spaces with complex

configuration for circulations were considered as areas of confusion rather than orienting. Navigation in these spaces required assistance for the subjects, which means lack of independency.

Tactile contact remains one of the main distinctions between the blind and the partially blind. During the experiment, it was observed that body schemas of these two groups differentiated in terms of body posture during the exploration of space, which was more rigid in the case of subject 04 and 05. Active touch was not quite applicable compared to blind individuals, which was combined with dynamic touch. Regarding passive touch, all of the subjects were active, especially the partially sighted subjects, which obtained additional information visually through the presence of light in space. Furthermore, they were capable to distinguish the differences of light contrasts, since they were highly sensitive to these changes. All of the partially sighted subjects were very sensitive to light and were able to distinguish reflective surfaces.

While comparing the subjects, contradictory preferences were found, such as the preference of the height of space. For subject 05, who is very sensitive to light, the presence of the atrium was satisfying in terms of atmosphere, while for the blind individuals high spaces were considered as disorienting, since it interfered with their echolocation performance. However subject 05, considered that space as appropriate since the light was diffused and not of high intensity. Hence, it is important to understand and translate the results in order to understand which the problematic spatial elements for the visually impaired are, in order to provide knowledge of the architectural attributes that facilitate mobility and provide multi-sensoriality to architectural spaces.

## **5.2. Discussions**

Due to the phenomenological approach of the experiment and the conducted interviews, the knowledge acquired from the case studies is distinctive for each individual, thus, constitutes of potential information for obtaining results in the use of architectural practice. Such information can be obtained by reconsidering phenomenological aspects of the main elements of the architectural spaces from the viewpoint of the visually impaired. As a result, considering the required qualities of spatial elements for providing comfort in space, it is necessary to evaluate the meaning of each of the main spatial elements in architectural buildings. The experience and relation to spatial elements in blind persons is of a different nature from a sighted one, due to dependency from the amount of the visual information obtained by the environment. This approach can firstly provide the knowledge for reconsidering these spatial elements when designing spaces, and secondly, provide



us the possibility for finding several solutions for all users in accordance with the needs of the visually deprived.

## **Phenomenology of Spatial Elements in People with Reduced Vision**

### **The Window**

For a sighted and, partially, sighted person, the window provides a connection of the outside and inside of the building from distance, since he visually locates this element. While a blind person feels this presence in a closer distance through other sensorial inputs. In distance, the person is capable to distinguish this presence of the window from auditory cues, but such thing depends on the amount of the auditory stimuli, which might not be distinguished from a distance, if not very recognizable. Such information might be positive but on some cases confusing, depending on the amount of the stimuli. However, a blind person understands the presence of light from a closer distance. As all spatial elements, the window has its own area of influence, which is created by air circulations, auditory or olfactory clues and thermoceptive information. When personal space of a blinded person is overlapped with this area of influence, he/she is capable of perceiving the spatial aspects of space and gathers information about the spatial element and his location related to cardinal directions. From such information, the blind person recognizes the window as a boundary line between what is considered as private and as public, while perceiving the amount of light present in space. By being able to recognize the position of the window, he/she uses it as a landmark for circulating in space. In some cases when there are many windows present in a physical space, since many auditory cues are coming from the outdoor environment. It is important for him/her to be in closer contact with the outdoor environment, especially natural elements that are fixed landmarks in terms of location, but changing in the effect of time, such as the presence of changing seasons or weather, by which he/she is engaged to the time – space dimension. On the other hand, the presence of many windows in space is translated in high intensity of light, which is quite disturbing for the visually impaired that mostly are very sensitive to light. This disturbance is related to glare effect created direct light and reflective surfaces.

As elements found in-between the private and public, a blind person in many cases considers windows as places where privacy is invaded. This is due to the panopticon effect the window generates, as in the case of a sighted individual, but in this case is stronger, since he/she does not obtain any visual information. Such aspect, transforms this space in a territory of anxiety and paranoia. However, they are crucial elements of space, especially in terms of providing natural light, an aspect that for a partially sighted is quite important, since for most of the visual impairments, sensitivity to light is one of the

difficulties faced. The high contrasts of light and darkness remain as the most problematic for the visually impaired, since it causes visual discomfort; while for a blind, such contrast is quite meaningful, since they are capable to distinguish spaces easily, but in many case being confused of spaces at the same time. As a result, formalistic qualities and their orientation are definitive for the level of contrasts or reflection inside space, which should be considered while designing space. Form and dimension is important for a blind, since through passive and active touch he/she gathers information about the position of the element, which should be reachable physically from the person. A window should provide thermal comfort, visual comfort and auditory comfort in order not to create an interference with indoor sounds, which are necessary for echolocation. Most importantly, it should avoid the feeling of invaded privacy, which can be reflected in terms of material qualities and accessories.

### **The Door**

Similarly to the window, the door is considered as a threshold between private and public, but in this case, through such aperture allows the person to physically access these two environments. Doors are easily identifiable for a blind person. Without sight, the person is more attentive to non-visual clues, as he/she is capable to recognize their location to air flows. As a result, the relation of window with door is a relation that defines the level of identification through passive touch.

The door is an important landmark for providing navigation and psychological acceptance to the person. It is necessary to first consider the main entrance for all the users, in order to provide easier access and identification for them, which brings along the sense of acceptance. A hidden entrance does not provide the psychological comfort for all, especially for a visually impaired. Such identification can become easier by considering the relation of the street environment to the entrance door space, which from the observations made from the experiments, was a space of obstacles. As a result, it should capable to provide accessibility and sensorial hints for directing the user to the main door.

Through active and passive touch the blind is capable to orientate and find the limits of spaces, defined by the doors, which should not be considered as separation but as connection. It is necessary to consider the possibility of the kinesphere of a person (in this case "door plane") for providing the necessary size to understand its limits. This is translated in terms of width and framing, which are crucial for identifying a door and allowing flow of movement from one space to another.

### **The Roof**

A blind person cannot feel directly the roof when it is out of the reach of touch. He/she is capable of distinguishing this closure from acoustic quality of space or even thermal quality, which can be obtained as information when apertures are present. Such closure envelopes the body and is crucial for providing psychological security, which is transmitted acoustically. As for the sighted, this sense of “home” is visually defined by the traditional formal of roof, for the blind, formalistic elements are important for defining the soundscape, which specifies parameters for echolocation and atmosphere. The higher the ceiling, the more the sound is lost, resulting in failure of echolocation.

### **The Wall**

This is a spatial element that not only directs movement, but also provides support. The wall may be a starting point for navigation, in terms of the strategic body techniques in the case of a blind person; and is considered as supporting element for secure movement in space, through which trailing technique is performed. A space without walls does not provide effective orientation and circulation. Furthermore, in terms of shape and configuration, it shall provide the possibility for successful echolocation.

A partially sighted person considers the wall as a vertical surface that should not be disturbing to sight, since complicated textures or reflections do not allow comfort during navigation. As a result, it is important to consider the material, which provides comfort active touch, by which is obtained the atmosphere of the space through material's properties.

As mentioned in the Empirical Track, personal space of a person is defined by culture. In the case of the blind and visually impaired, this space may be affected by the types of touch and physical landmarks. Concerning reachable space, the blind does not provide it through the field of vision, or in the case of the visually impaired such area is not complete. In the case of the blind subject the loss of vision suggests that head-centred peripersonal space consists of auditory cues and not visual. Moreover to the hand-centred peri-personal space is added the white cane, which provides additional information from the environment, especially the areas above feet. In the case of the visual impaired with the absence of peripheral visual field, the ambient of extra personal field is not perceived totally. Such imaginary boundaries are affected not only by the presence of other people but also by sensorial data. In the case of the blind subjects, the presence of vertical plane is necessary in order to navigate independently. In trailing and cane technique, the subjects associate movement from one side of the body supported by a wall. Such thing

suggests that the position of the wall affects the peripersonal spaces of the person depended on his/her position. The side position which affects the head-centred space, which in a blind person is auditory; and the back position which affects far rear space and head-centered peripersonal space. This suggests that the structure of their personal space differentiates from the sighted person and as a result approach to spatial elements.

### **The Corridor**

In terms of orientation, such space is the most important for directing movements in other spaces. It is important to consider that this space for a blind person is a place of fear, due to the possibilities of getting lost, which are indicated by two important factors. Firstly, the presence of external factors, such as people. Corridors are spaces of circulation; as a result, these are the most intense spaces, where the presence of many people does not allow echolocation in a blind individual. It visually becomes disturbing for a partially sighted, since it affects both central and peripheral vision, leading to overload of visual stimuli. Secondly, repetition and symmetry does not provide the identification of elements that differ from one another in order to use them later on as landmarks. These two factors dictate the level of orientation in a space, which if it is not provided, might lead to incidents or feeling of anxiety.

### **The Stairs**

Stairs are the spaces, which require more effort for both groups. However, not for all the visually impaired stairs are considered as an obstacle since it is a space freed from objects and opened for circulation, as a result, easily accessed. In addition, escalator is safer for providing vertical connection. The most important aspect of stairs for each of the subject was the identification of the beginning of the stairs, or warning that he/she is approaching the staircase and continuity of stairs, which should be translated in the use of constant width and height in order to provide an accessible ascending and descending.

### **Structural elements**

Columns are not only the skeleton of a building; their function is also architectural, especially in the case of a visually impaired. Columns divide space and function. As a result, they serve as important landmarks for the perceiver, which are used as points of references for the environment. These elements complete the “scene gist” obtained by the peripheral vision, which means structuring the atmosphere of space.

## The Furniture

Furniture is considered not only as elements that provide bodily comfort, but as potential landmarks. By furniture the blind is capable to elaborate a more detailed mental map of a space, as being as more frequently in contact with. Such relation defines a more intimate contact of the person, which can be even emotional and psychological. It is important the shape of the furniture to provide tactile comfort and to be fixed in order to become a stronger landmark for navigating space. Furthermore, it should be identifiable in terms of shape and form to provide a better understanding for the further taking direction of movement.

The approach of the visually impaired to spatial elements, bring out a set of aspects that are quite important in order to provide mobility and experience in architectural spaces. These two provide spatial comfort, by which it means a space that provides security, control and the freedom of movement. All of these are obtained by experience and quality of the environment. Perceptual experience is based on physical and physiological factors, which include the body condition, sensitivity to environmental stimuli and cognitive functions which provide the creation of the mental map. Furthermore, this experience is depended on the individual and social activities in a specific space. All of these dictate the level of interaction of the person with other bodies, objects and spatial elements. In addition, perceptual experience is interrelated to the properties of the environment, transmitted through atmosphere to the users.

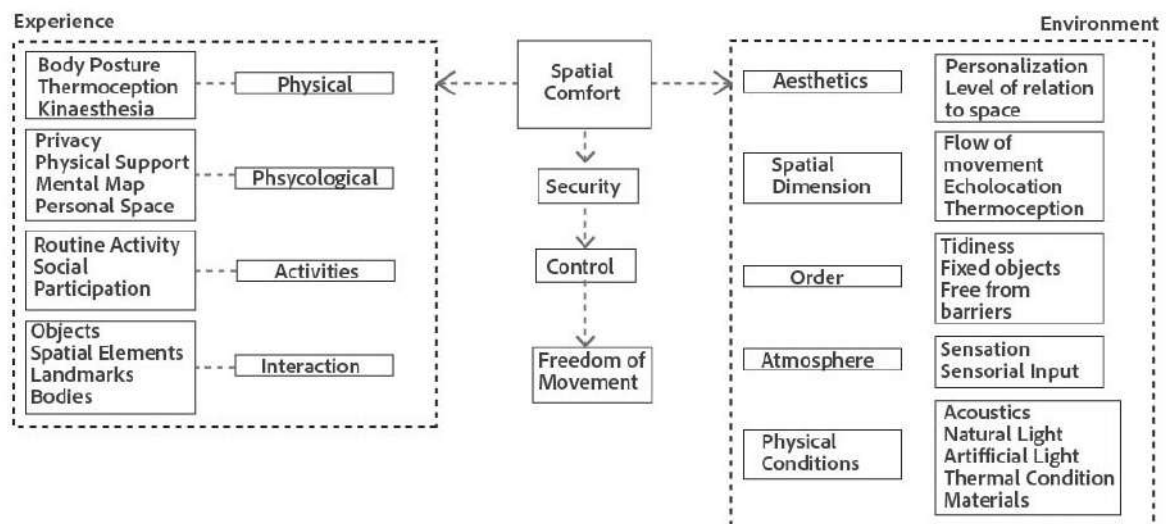


Table 12 - Indicators of Spatial Comfort

People with visual deficiency perceive the built environment much more differently from those that obtain full visual information. They are more assertive to the tactile, haptic, auditory and olfactory aspects. This aspect gives an understanding to the importance of

other sensorial information in perceiving architecture. Furthermore, navigation of space through the strategies of a blind person's technique creates a deeper connection with the built environment, since also the level of attention and awareness is much higher than with vision. As a result, the memory of a blind person is better than of a sighted individual. The strategies for spatial exploration require the ability to combine and compare to perceive special elements, leading to a stronger bond between the blind and the built environment.

Before designing and creating spaces it is quite necessary to provide a deep understanding of human response to the environmental stimuli. Neuroscience has proved the linkage between built environment and behaviour, and how architecture affects the brain plasticity through the physical interaction. A dialogue between the architect and the specific target group provides a perceptual knowledge from a different perspective and leads to a better understanding of the vast possibilities an architect has to promote more accessible and multi-sensorial spaces towards architectural design.

## **5.4. Conclusions**

### **Learning from Visual Deprivation and Blindness**

The case of Visual Deprivations and Blindness reinforces the discussion that the body and space are inseparable entities, constantly informing each other. By analysing perception of the blind, it questions how well we know our own conscious experience. Furthermore, a better understanding of "disabled bodies" should become an inspiration for architectural practice for avoiding being trapped in old patterns, bringing novel creations. It is important to consider the visually impaired experience as a source of knowledge to be applied in architectural design.

Body is an instrument of investigating space, which in the case of a blind person it is a different concept from several aspects. Firstly, it is important to consider blindness not as a condition of misperception of information, but in contrary, as another level of perceiving space. Such misinformation is because visual impairments are seen as a condition of limitation since there is no visual information. However, if we speak about spatial limitations, the visual field might be considered as a limit. It is conditioned by the presence of light, attention, altered by the conscious state. Blindness should not be considered as a limitation but as a way of perceiving without the visual information and, on the other hand, of being more aware of other information that actually is suppressed by vision. It should be considered as a different perceptual level from the "normalized" perception, and open new

possibilities for architects to develop their design and their practice, furthermore, to reconsider architectural experience with the blind person in mind.

Designing for disabilities has concluded in standardizations which is mostly concentrated on providing accessibility by leaving aside the behavioural aspect the architectural elements have and leaving behind the multi-sensorial experience, which should be provided not only for people with sensorial impairment but for all the users without distinguishing them from this aspect. Architectural qualities are transformed in technical solutions, which actually are considered as a limit for the architect and as a result, influence the process of creativity. Creation of these standards results from the lack of knowledge of the architectural experience in people with reduced vision. In fact such knowledge can provide not only more accessibility for the buildings, but the possibility to create various design and aid conceptual thinking for architectural buildings of any typology.

Generally the architectural standards dedicated to the blind are more developed concerning outdoor space, since it is of first interest for providing accessibility of the person from home to other destinations and also is more exposed to other factors which can reduce the sensorial information of the blind. However, in built environment, the standards mostly consider the creation of a signage system as an additional element to indoor spaces and not developing more other aspects related with the conception of space.

Creating possibilities for all the users to move in space provides the possibility for them to explore his/her body capacities and their relation to space. In the case of the blind person, it was observed that movement was strategic and not as freely as a sighted person. This signifies how strong is the bond a person develops with the environment and also the level of awareness and attention to present stimuli and objects. Actually, this is another aspect differing from a sighted person, who obtains most of the information from visual contact, which is possible even in distances. Such thing, allows the person to develop a general knowledge from the environment, but in a selective manner, which is more ocular-centric in nature, a phenomenon which is reflected in time and movement. The strategic movements in a blind person consist on being more aware of the sensorial stimuli present in space and using such information for locating their body and other bodies in space. Another aspect differentiating a blind person from a sighted one is the use of allocentric frame of reference. While most of the sighted individuals have an egocentric frame of reference, since they can find the location of their body in space through visual information, blind individuals perceive elements present in space, find their position

through movement and sensorial stimuli, as a result, create a system of identifiable elements which serve to locate themselves in a present environment. These elements are considered as potential landmarks by which is depended the quality of space.

Spatial elements are important for creating the identity of a space and its structure. Furthermore, through them it is made possible perception of space in terms of knowledge, memory and direct experience. Spatial elements serve as landmarks for providing the planned navigation in blind individuals. It is their quality that provides the possibility for a spatial element to be considered as focal points which are part of a way finding system for spatial navigation. The physical and chemical qualities of architectural elements provide latent information for orientation and recognizing space. These qualities or attributes define the level of distinction of spatial elements from those considered as landmarks.

Furthermore, they dictate the experience of architectural space, which can be perceived not only visually but also through other sensorial means. These attributes enable the identification of the character and structure of a specific space, becoming referential elements in order to navigate space and to provide a bond between the user and space.

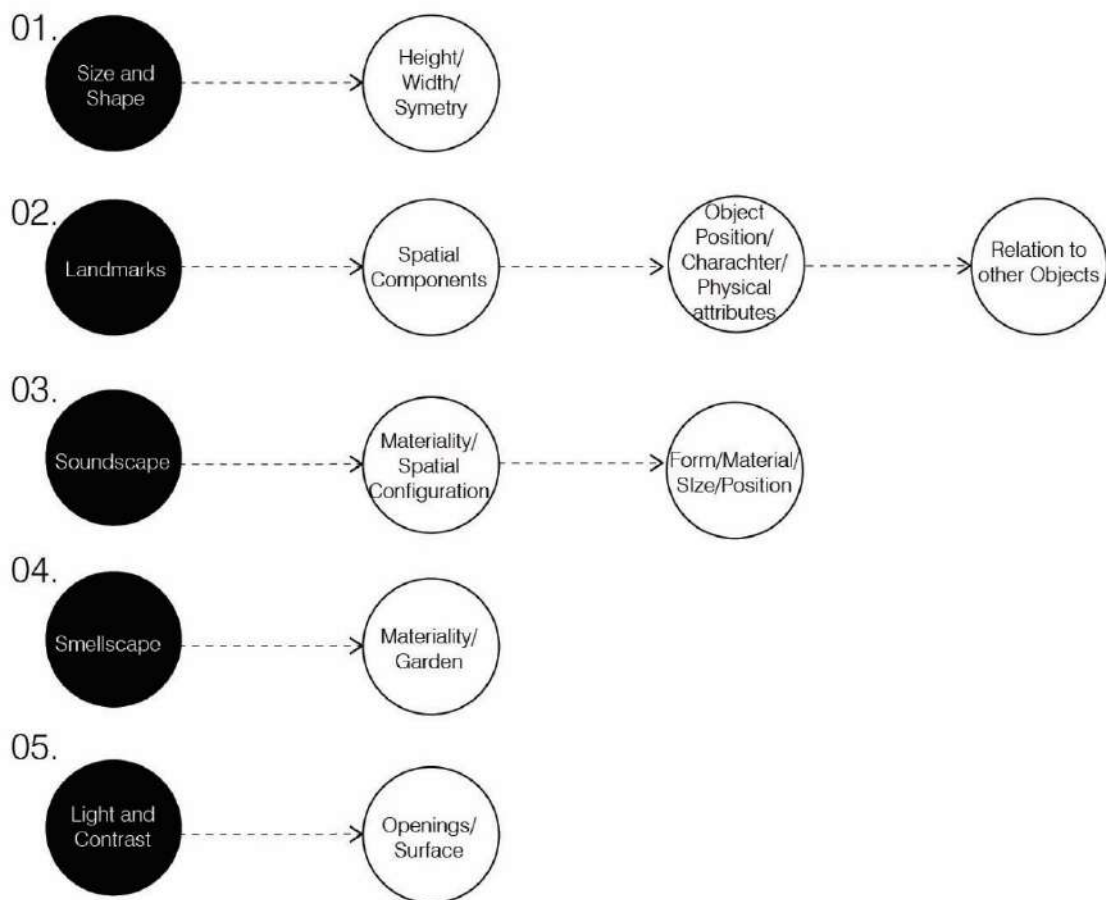


Table 13 - Table of Spatial Attributes



1. **Size and Shape** – These qualities define the level of possibility for spatial elements to become potential focal points during navigation through patterns of exploration. Such quality is physical in nature, and is not necessarily associated with shape, but mostly with the amount of information provided. By this, it is understood the amount of sensorial stimuli obtained by these elements, for instance the sounds which are more identifiable in volume and frequency. Obtaining a set of sensorial information from the qualities of a spatial element, provide a better understanding of the environment or object. However, this amount when excessive becomes a limitation for the blind. The size or shape consists also on the quality of a sound, which if it is high in quality brings the possibility to become more recognizable by the perceiver and becomes distinctive information for orientation. As a result, volume is very important in order to provide a successful echolocation. In order to obtain this, it is important to use a height close to human scale, in order for the echoes to come back to the perceiver. High ceilings do not allow echoes to come back, but sounds are lost in the highest level, which results in lack of auditory information. In addition, the shape of walls defines the amount of reflected sound to be used for echolocation. Based on the observations made from the experiment with Subject 02, which was a late blind individual, the spaces inside the amphitheatre were considered in comparison to other subjects as spaces where echolocation was made properly. Such thing may be of two causes, firstly, because of the structure of the building and relation to site, which was developed in escalation, secondly, due to developed echolocation skills. As a result it is suggested to use heights as close to human scale, or in cases where this height is necessary, space can have variation of heights in order for the blind to identify the zones of different volumes and create a cognitive map for navigation.

Another important aspect is the symmetry and corners. Symmetry does not allow easy identification of spaces, especially when two sides of a space are identical or pocket spaces connected with a central one. The person loses the points of reference, unless additional landmarks are positioned in order to allow the recognition of directions. To avoid disorientation it is necessary to avoid symmetry and repetition, or in cases where such thing is present it is necessary to provide contrasting spatial elements along the route. Another important aspect is to provide a route with not many turns to avoid confusion and to provide a strategic navigation for the blind. Such thing can be reached by following clear configuration considering route shapes or patterns of configuration: "I", "L", "U", "Z".

In addition, spaces should be designed with the presence of as few corners as possible, since might bring confusion during movement. This confusion might happen not only to the blind person, but also to others, due to the presence of other external factors, such as the presence of other people, which might indicate the soundscape of space.

On the other hand, using rhythmic position of elements is an important aspect for the peripheral vision, which directs better those that do obtain visual information from peripheral vision. The rhythmic repetition can be found in positioning of doors, windows or even structural elements, which are important landmarks also for the blind.

The most inappropriate spaces remain those that are opened and large, since they provided a sense of loss due to the long distances between reference physical elements and lack of auditory data. Such spaces are considered as potential areas for incidents or confusion.

**2. Landmarks** – During the on-site experiments, relation to objects and sensorial data defined the pattern of circulation of the participant. Their role was to function as reference points, positive or negative, in order for the users to orientate and navigate in space. Individuals that were more sensitive to their sensory zone, rather than visual stimuli, were able to select a clear map of landmarks in the unfamiliar space from sensorial clues, such as architectural elements, furniture and other external factors.

Concerning the nature of the landmarks, we can divide them in four groups: 1. Small scale objects, such as furniture; 2. Structural elements, such as columns, door, window, wall, stairs, floor; 3. Natural elements, such as water, wind, rain, etc. 4. Human activity. All of these provide additional information to the context and result to an easier circulation.

Concerning the openings, doors and windows, during the on-site analysis it was observed that blind subjects were more sensitive to passive touch. Since no visual clue is provided to them, they are more sensitive to temperature and air flow changes. For instance, subject 01 was well aware of the position of light bulbs in his apartment, due to the knowledge obtained from previous experience with such space. Such elements served as points for orienting with other object's location, an allocentric approach to objects, which in the blind subjects was quite evident for localizing objects in space. As a result, it is important to provide openings that allow air flows, which can be provided by positioning opening from both sides facing each other. It is also necessary to position openings in the pacing zones, such as in the landings of the stairs. Such openings can provide also framing to natural elements, zen views, in order to provide a better experience of the architectural space.

Kinesphere of a blind person shall be considered as more active rather than a sighted person. Such thing means that the body of a blind person is more dynamic in terms of

contact with the environment, through body techniques he uses for navigation in space. Such thing indicates the level of tactile information obtained from the environment, which is more dynamic in the case of a visually impaired, due to the combination of active and dynamic touch. From observations made during the experiment, the partially sighted used tactile contact for support of their physical accessibility, while the blind both for support but also for obtaining detailed information. In this aspect, it is important to provide the possibility not only for the visually impaired to encourage tactile contact for all users. Through touch a person creates more awareness of the environment and the level of interaction is increased. As touch is considered as an intimate mode of relating with the environment, evokes more attachment to the built space, and as a result activates kinaesthesia, which is necessary to be aware of proprioception.

Active touch is crucial for understanding landmarks. In the case of a window, the framing of the window can be more defined in colour or shape to the interior, or the material of the area around the window to differ from the material of the wall so that its boundaries are identified well. The doorframes remain as crucial landmarks, especially sliding doors that are considered as more flexible elements for providing continuity between spaces. The presence of the door, in the blind individuals is also recognized due to passive touch, changes in air pressure. An aspect, which was not very present in the visually impaired, since they would feel their presence in a longer distance through visual stimuli. In terms of passive touch, the height and width of a space, along with apertures on walls or floors, determine the air flow quantity which makes the space more recognizable by the perceiver. The high sensitivity of the blind and the attention to sensorial clue, provide awareness for the person to such details bringing an identification character to other spaces.

Doors should be easily identified and in order to do so, the material and the colour of the door frame should be different from that of the floor and wall. It is necessary to use curved frames in order to allow a smooth active touch. Furthermore, the doors can be of different heights or widths, as they can be easily identified by the blind and associated with the spaces they are connected to. However, an important aspect remains the width of the door, which should provide the possibility for the person to be actively touching it within the width of the body with opened arms, which is of a dimension of 1.6m-2m.

The entrance door is as important as those that spread circulation inside the building. There must not be many main entrances to the building, since it might provide confusion in circulation. In addition, the entrance should be well defined, which can be an extruded volume in the façade or guided path of a specific material from the outdoor environment. However the exit, from the inside of the building should be found easily. This can be

obtained through olfactory hints, or human activities as landmarks. For instance, positioning a coffee shop close to the entrance, gives a memorable signal to the person when he/she entered the building. Positioning several gardens of different thematic close to the exits or entrances can ease accessibility to the outdoor environment.

An interesting aspect during the experiment concerning the partially sighted and the blind was the identification of details in surfaces related to texture or patterns, which provided tactile information. The blind subjects were able to identify many details, considering it as a pleasurable process for exploring spatial features. Instead, the visually impaired, especially subject 04, was not capable to identify details due to the distortion from tunnel vision. Thus it is important to provide changes in texture or material on walls or floors in order to create a wayfinding system. This system can be also provided by using the water as an acoustic element that is emphasized on the floor by emphasizing its boundary with a different material. Using vibration materials for the floors in specific spaces, not only provides auditory knowledge concerning the material used, but also tactile and proprioceptive in nature.

Mainly walls are guiding elements for a better navigation and supports movement, especially during the trailing technique. Furthermore, the wall was considered as a supporting surface and starting point for navigating in space. Such surface was important in the case of blind individuals, which used the wall as a supporting and reference starting point for their spatial exploration. However, the wall is an important component that organizes the structure of circulation. It is important to have a clear distribution of walls in order to provide a clear spatial configuration.

Stairs are considered as the most secure space, since there are no obstacles present along the way. The number of steps in stairs is not important, but the person should be informed when the last step of stairs is completed. Furthermore, when presented with a circular staircase, it is important for the user to identify if it goes in a clockwise or anti-clockwise sense. The width of the stairs, along with the height of the step should be constant along the stairway. Furthermore, hand railing should be present along both sides, which should provide printed written information in braille to inform the person about the moment stepping starts or end, and about the number of the specific floor. The material used for the stairs should be rough in order to avoid slipping.

The blind individuals rely on furniture as landmarks, especially fixed furniture and asymmetrical objects, which served as reference points for their circulation. Such clue suggests avoiding round shapes, since circle, as a geometrical shape, does not provide

any corner for orientation. While, in the visually impaired furniture was mostly seen as an obstacle rather than orienting, due to the uncompleted or distorted visual information obtained. Although furniture was considered as crucial landmark for the blind, it was necessary to be positioned as close to the walls, in order to provide open space for circulation and not to become barriers for continuous navigation, or in other cases, to provide passage space for circulation along the perimeter of the walls. Most of the subjects during the experiment used furniture as landmarks and preferred those that were fixed and not movable. Such thing was not a subjective preference, but a necessity for having fixed objects that could not be dislocated along their route, in order to locate them easily while returning. In this aspect, not only the furniture but also architectural elements, fixed and distinctive from others are key spatial points for a better navigation in blind and partially sighted individuals.

Concerning the colours of the landmarks, it is important not to have a mixture of different colours or complicated patterns. For a person that has a damaged central vision, he/she only relies on peripheral vision, where some colours are not recognizable, while for those that have a distorted vision, the presence of complex patterns, creates misinformation and overload of visual stimuli, which might lead to discomfort while exploring architectural spaces. As a result, it is necessary to use high contrast colours for different spatial elements in order to make the more recognizable, and use colours of spectrum of the colours yellow, blue, red, black or white. These colours are appropriate to reduce eye fatigue and better recognition of objects.

**3. Soundscape** – In order to provide an appropriate soundscape, there are two main aspects to be taken in consideration, material and form. It is necessary that through these two factors are improved the parameters for providing successful echolocation, which is the reduction of background noises and reverberation. As a result, it is important to provide acoustic analysis for all of the spaces and materials in order to obtain better soundscape for all.

Definition of atmosphere is another aspect, which differentiate in the subjects. For the blind subjects, atmosphere is mainly defined as auditory sensation, which is provided by the size and proportion of architectural elements, and the use of materials. An environment that provides echoes for echolocation and warm materials, which provide smooth and soft tactile experience, provide a warm atmosphere. The presence of many people in space does not provide the appropriate acoustic environment, as a result the proper atmosphere.

Based on the amount of acoustic information obtained and the level of echo created, there are two types of spaces which are inappropriate for echolocation in the visual impaired. Firstly, when echo is coming from different directions, which leads to misguidance of the person, and secondly, in echo-free places, usually large open spaces with lack of objects, no vertical surfaces or are composed of echo absorbing materials. Usually these types of spaces create the sense of fear and disorientation.

Information that can be seen, heard, felt and experienced is considered guidance for the visually impaired. In the case of auditory perception, the guidance can be of any source, such as fountain, elevator, vehicle noise, etc. When the sound does not come directly by the source, but it is reflected on a wall or plants it is considered to be a passive guidance. Active guidance is considered a direct source of auditory information, which is then translated by the visually impaired.

Acoustic ambiances are depended on specific architectural elements or solutions. These are the selection of material, presence of voids, dimensions of a space vertically and horizontally, openings in walls, floors or ceilings, and presence of an atrium.

In the case of the blind users, they orient acoustically in indoor spaces through echolocation by tapping the cane on the ground or making ticking noises with tongue. The sound is transmitted on the walls and they can understand the positioning of obstacles or other objects around them. Meanwhile, in overcrowded spaces or in spaces with other sources of noise, echo coming from different directions may create disturbances and misguidance for obtaining the clear auditory information. As discussed previously, late blind individuals do not have the same relation with echolocation as congenitally blind, since they rely on visual memory present in their brain map. Some of those that have a higher amount of preserved images from previous experiences as sighted individuals find echo as a constraint. As a result, it is necessary to take in consideration the amount of sound reflective surfaces and the material used. It is important to specify the types of materials that do not create a high amount of echo and do not fully absorb sound. Interior tiles (ceramic, porcelain) are not an appropriate material for managing echo, since provides a high amount of sound reflections, giving echo from unnecessary sounds. Wood is the perfect material for providing the best echolocation. It reduces echo by absorbing unnecessary echoes. Matts or carpets absorbs the whole sound and does not provide echolocation.

**4. Smellscape** - Orientation through scents can be obtained in two ways, through the use of natural elements and through materials. Materials and textiles that produce smells are

plaster, paints, leather, timber, fibers, concrete, lime are odorous materials. Tar for flooring/damp proof coating on floor. Wood, earth and porous stones are good “living” materials to conserve odours. Metal and glass material are considered “dead” materials and have their own odour.

Transitory spaces, such as entrances and doors, should have olfactory qualities in order to function as spatial clues.

Channels of water are excellent devices for unifying complicated architectural arrangements and when in contact with specific materials produce specific smell. Waterways can link a series of incidents or provide an element of continuity. Reflective water adds an element of fantasy to architecture by filling shadows with reflected lights, transforming the solidity of stone or brick to shifting water. For instance, a building that provides spaciousness is a building that has a central courtyard, which provides air ventilation and presence of water that gives the feeling of freshness, and the ceiling provides an opening that maintains the contact with the sky and sunlight.

**5. Light and Contrast** - In this category is placed the amount of light, which is dependent by the size of apertures, an aspect very important for thermoceptive perception of a space that defines the level of comfort and warmth of a space. All the participants were able to locate the presence of the windows, although in blind individuals, such process required more time and circulation, depending on the amount of light provided by the windows and the level of external sounds or noise. Identification of windows was provided by changes in passive touch and auditory clues. On the other hand, for the visually impaired, windows were considered as openings which should provide the appropriate level of light in order not to obtain high contrast differences in space. Such contrast was very crucial for the partially sighted participants, since high difference between darkness and brightness causes discomfort.

Visually impaired due to macular degeneration find difficulties seeing due to the field of glare coming from windows, reflection of surfaces, light fixtures, low or too high contrast and light levels. In the visually impaired light is meaningful, since they are capable of detecting forms of objects from this source and to orient themselves. If there is a low level of light, it will be difficult to understand clearly the shapes, and if it is too much it can bring discomfort. It is also important to find a balanced contrast of light between light source and the environment. As a result, glare should be minimized enough for distinguishing objects or other barriers. There are two possible solutions to avoid discomfort glare. Firstly, by using reduced transmission glass in an indoor environment and secondly, increasing the level of artificial light to reduce the luminous contrast.

Furthermore, surfaces must not be reflective and textures or changes in paving must be distinguishable. Especially paving must not be reflective in order not to create discomfort while walking. It is important to emphasize the avoidance of hazards in flooring, where the changes from material to material in paving must be as smooth as possible in order to avoid tripping incidents.

Based on the interpretations made of the interviews and the experiment, several scenarios are developed in a form of handbook, in order to specify a set of parameters for architectural design dedicated to the visually impaired.

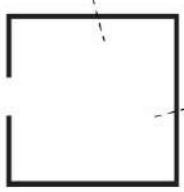


01. size and shape
- number of corners
  - repetition
  - symmetry/asymmetry

inappropriate scenarios

possible scenarios

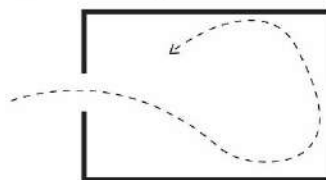
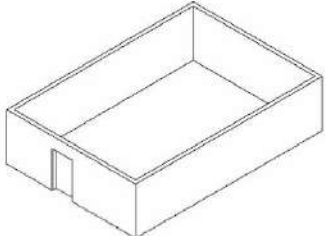
A



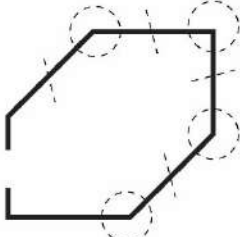
-square space: equal sides

A

- avoiding symmetry,
- easier orientation in rectangular spaces,
- orientation through different width of sides,

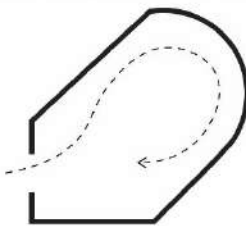
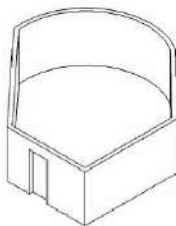
B



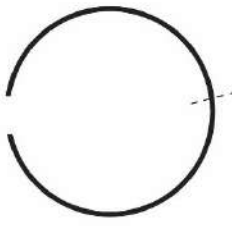
-high number of corners

B

- reducing the number of corners,
- using different angles/shape of corners

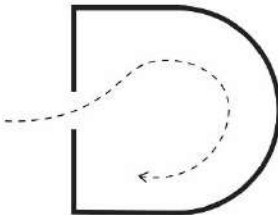
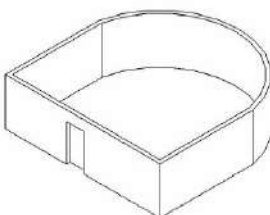
C



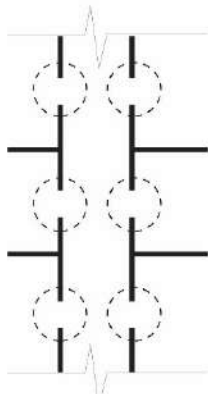
-circular space

C

- using straight/linear elements in a circular space

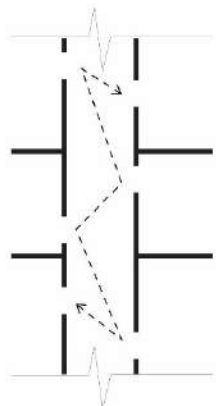
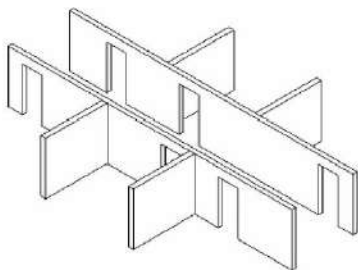
D



symmetry

D

- maintaining rhythm,
- avoiding repetition of elements in a symmetric manner
- creating asymmetrical facing sides

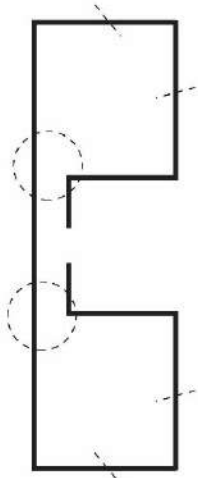
01. size and shape

- number of corners
- repetition
- symmetry/asymmetry

inappropriate scenarios

possible scenarios

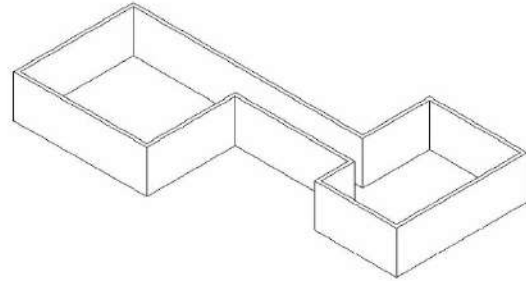
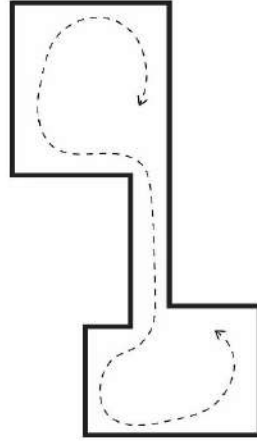
E



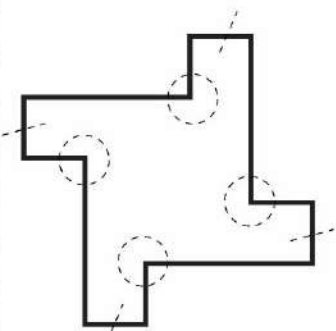
symmetry

E

-avoiding the positioning of identical spaces connected by a corridor



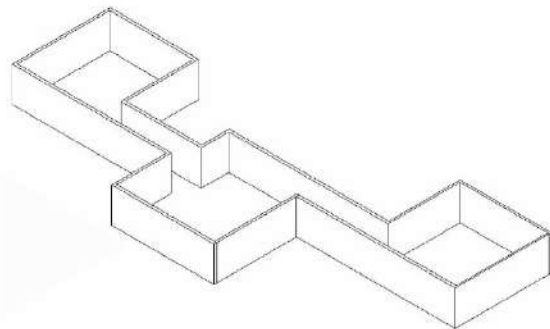
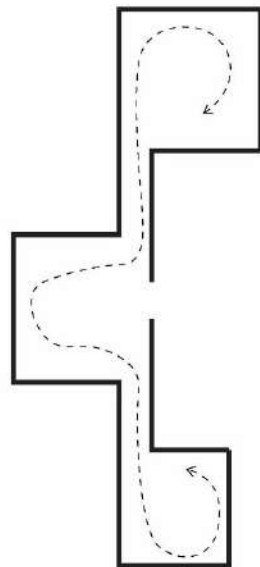
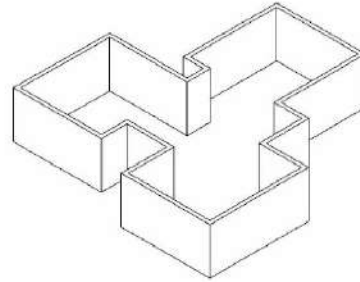
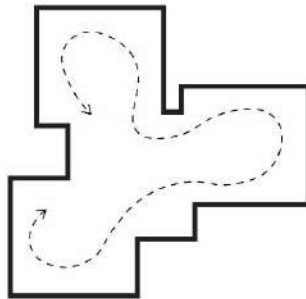
F



symmetry/repetition of corners

F

-avoiding the positioning of identical pocket spaces connected by a central space

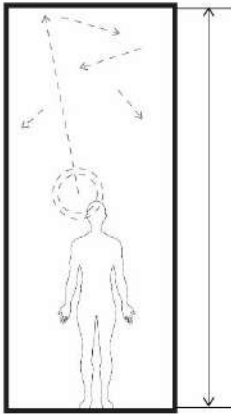


# 01. size and shape

- height
- width

## inappropriate scenarios

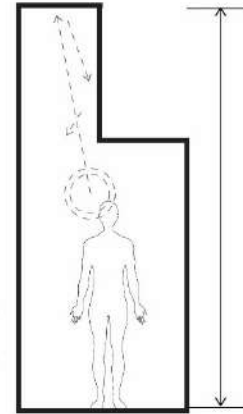
G



- high spaces inappropriate for echolocation,
- narrow spaces do not allow spatial exploration

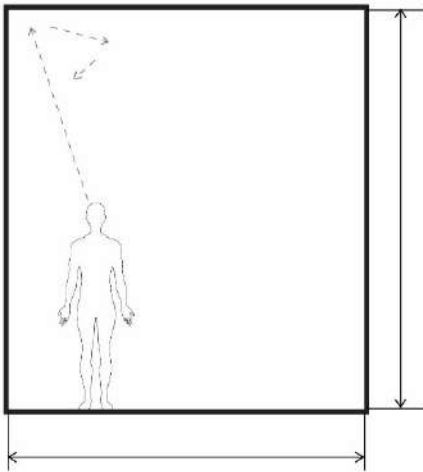
## possible scenarios

G



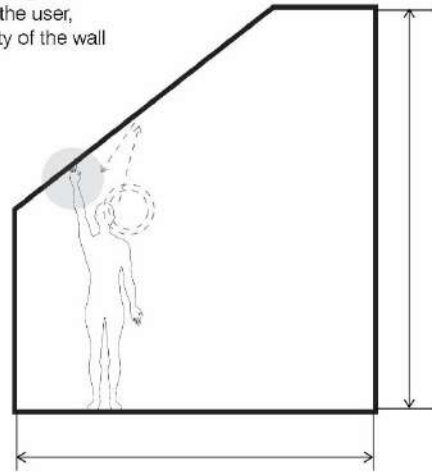
- creating different heights in a space, in order to provide information about the space,
- when large height is necessary, provide lower ceilings in specific areas of the area.

H



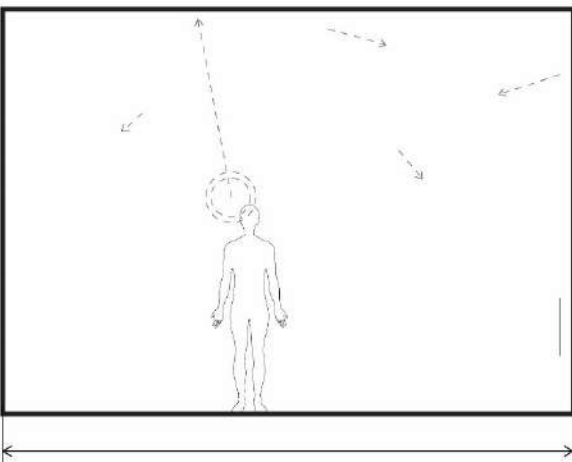
H

- creating sloppy ceiling, provides direct contact with the user,
- ceiling as continuity of the wall



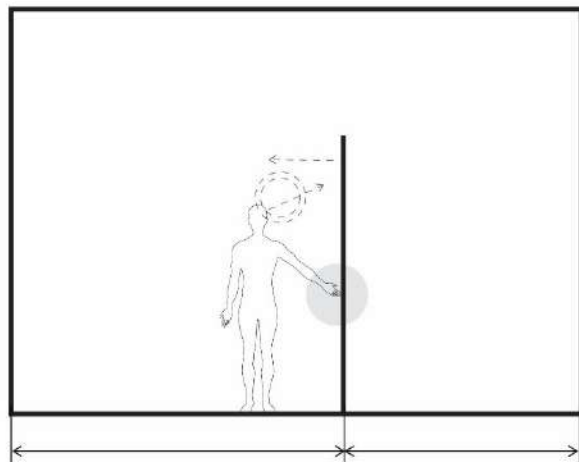
I

- high ceilings inappropriate for echolocation



I

- in the cases of high ceiling, provide vertical divisions in order to obtain echolocation



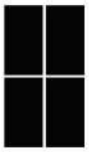
## 02. landmarks

- object position
- character and physical attributes
- relation to other objects

- Landmarks Categorization ----->
- 01. small scale objects ----->movable elements (furniture)
  - 02.structural elements-----> walls, columns, door, window,etc)
  - 03. natural elements -----> (water, wind, rain, etc)
  - 04.human activity

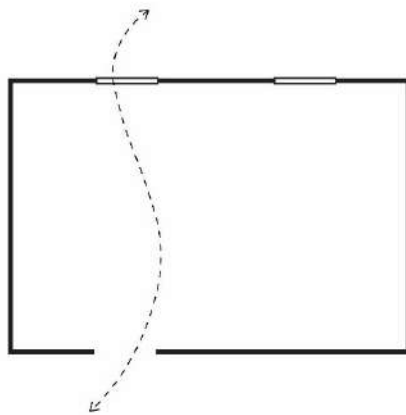
### possible scenarios

#### window

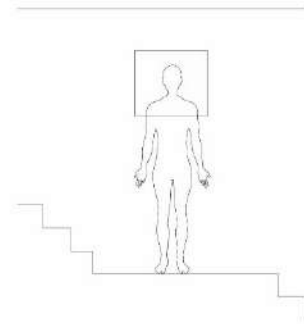


- transitory space
- panopticon effect
- voyeurism
- entrance of light
- ventilation
- frames nature/context
- visual participation (not physical)

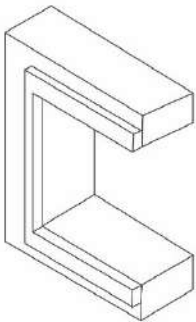
A



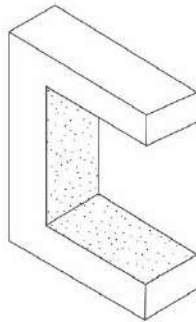
B



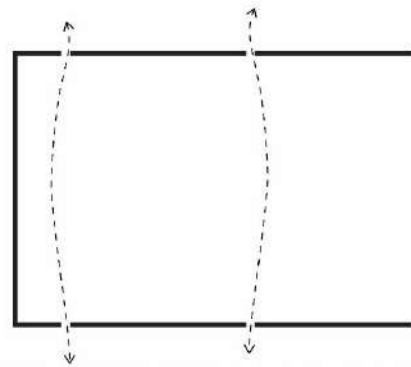
C



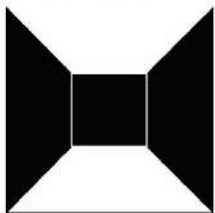
D



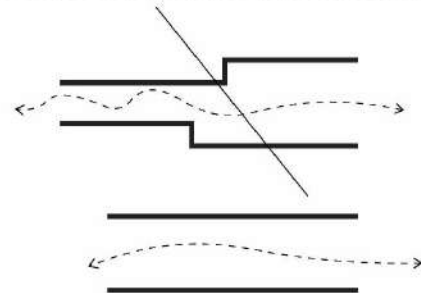
E



#### corridor



- changing social and spatial relationship
- confronted by open plan
- instrument of speed and transition
- physical corridor / visual corridor

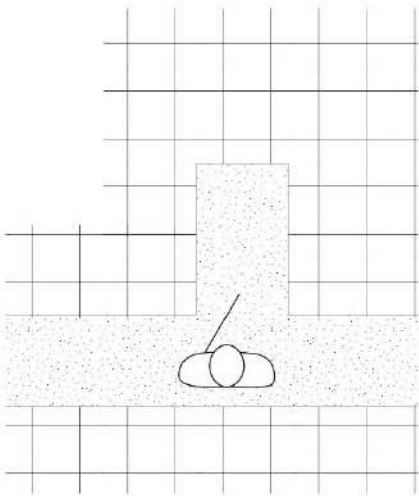


## 02. Landmarks

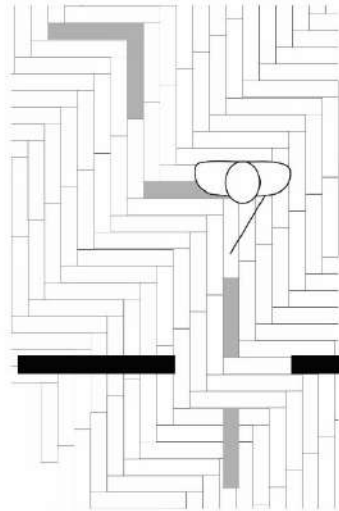
- object position
- character and physical attributes
- relation to other objects

### possible scenarios

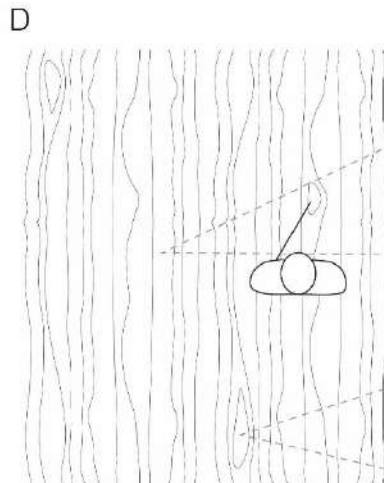
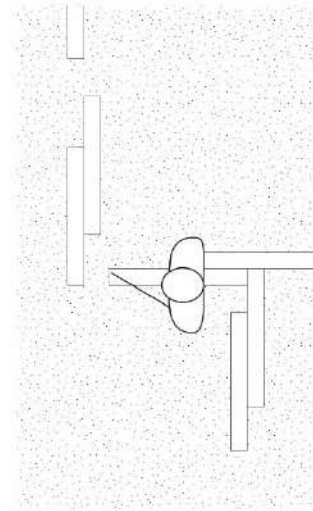
**A**  
identifying the corridor with a different material



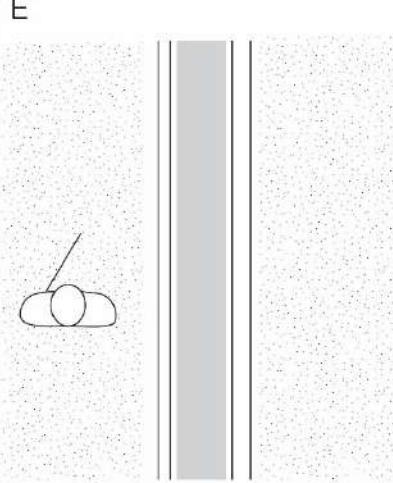
**B**  
using tiles of different material to identify direction



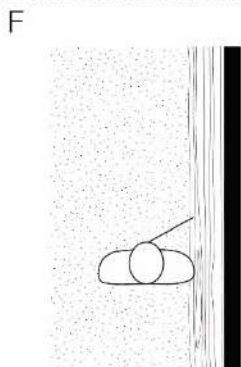
**C**  
using tiles of different material to identify direction



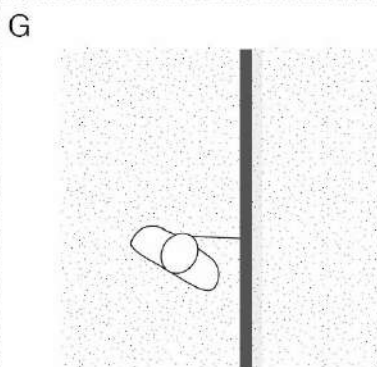
natural materials, with imperfections or irregularities, serve as landmarks especially in a familiar environment



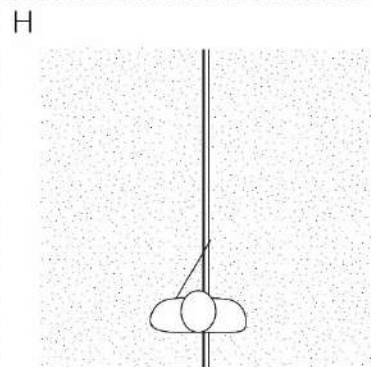
water surface as acoustic landmark  
its boundary defined through changes in the material of the floor



changes in floor to emphasize the presence of wall



contrast edges where there is a change of levels of the floor: through material and color



linear mark (level change / carving / metallic bracket)

## 02. Landmarks

- object position
- character and physical attributes
- relation to other objects

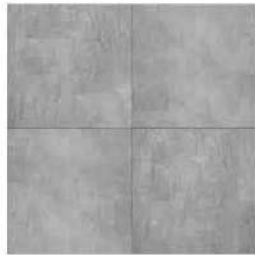
possible scenarios

A

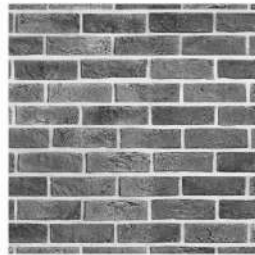
appropriate materials for horizontal / vertical surfaces



laminate



sandstone



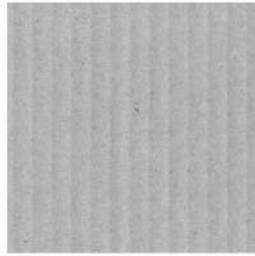
brick



copper bronze



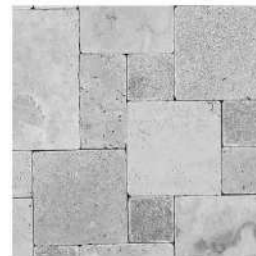
concrete



cardboard



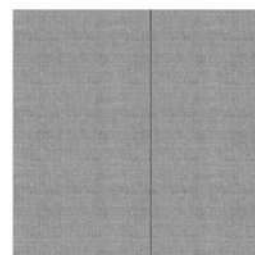
plaster



natural stone



fiberglass



fabric

## 02. landmarks

- object position
- character and physical attributes
- relation to other objects

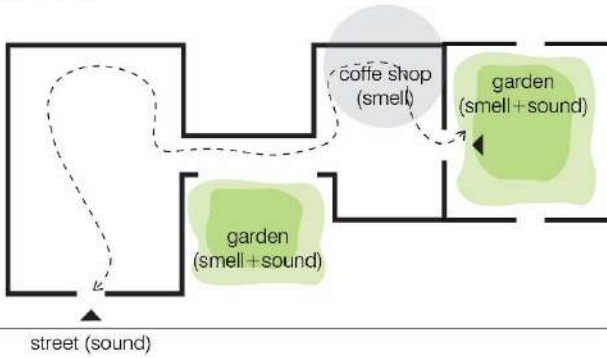
### possible scenarios



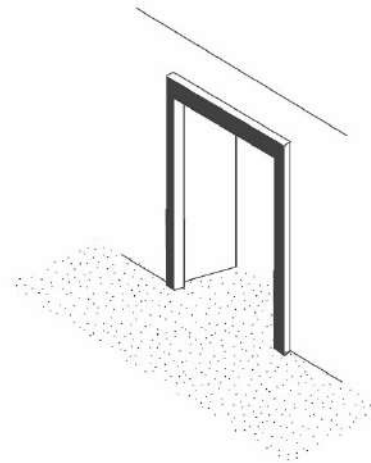
- door
- transitory space (separation + connection)
- contact with outside world
- meeting space
- entrance of light
- ventilation

A

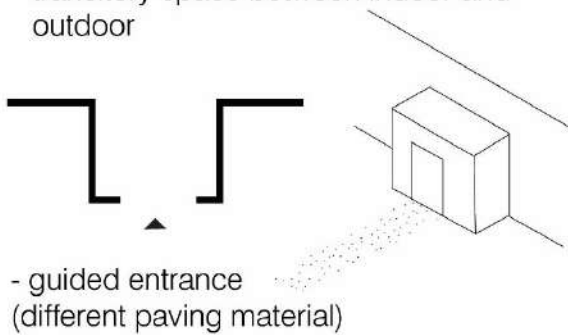
- positioning sensorial landmarks close to the entrances or exits (to be easily identified)



- doors must be easily found and accessed
- revolving and swing doors are not appropriate
- identifiable frames
- colour and material of the door frame changing from floor material



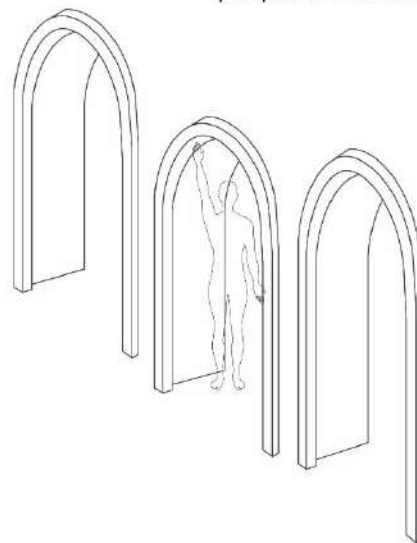
- emphasized entrance that serves as a transitory space between indoor and outdoor



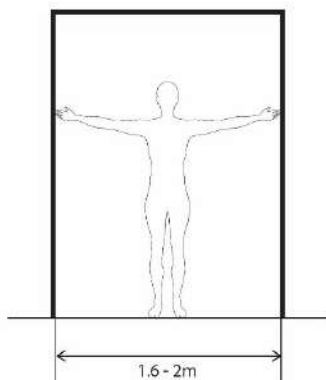
- guided entrance (different paving material)

D

using different heights for doors on purpose to identify spaces



- B size of the door preferably the size of opened arms



## 02. landmarks

- object position
- character and physical attributes
- relation to other objects

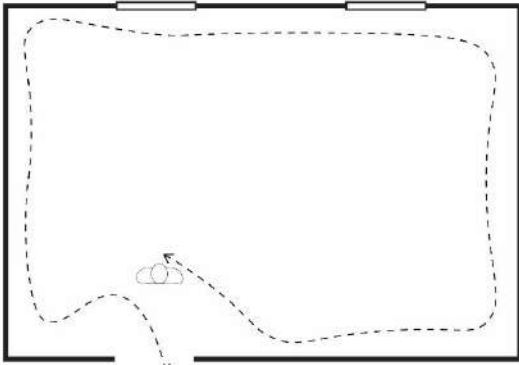
inappropriate scenarios



- wall
- territorial delineator
  - vertical surface
  - limit between self and others
  - dividing space
  - structure/support
  - defines circulation

inappropriate scenarios

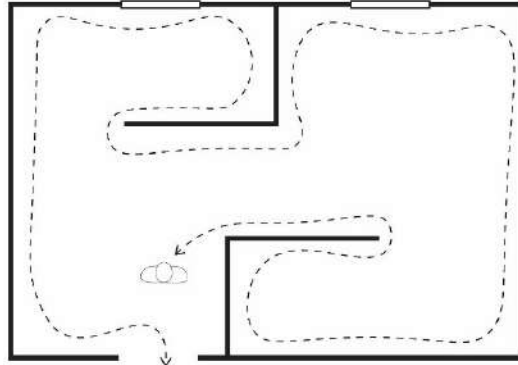
A



- opened spaces are disorienting:
- difficult echolocation
  - very few surfaces for support and circulation

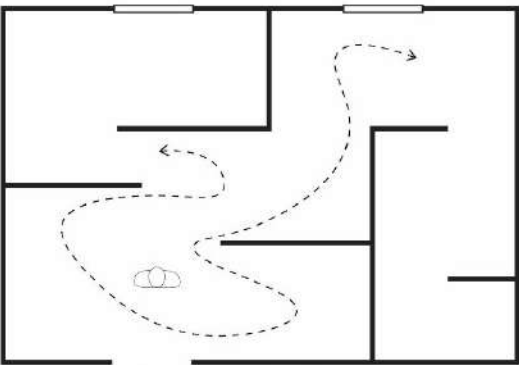
possible scenarios

A



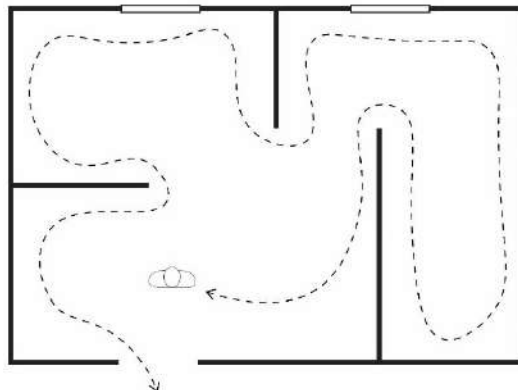
- walls as guiding elements for circulation
- higher possibility to explore all spaces

B



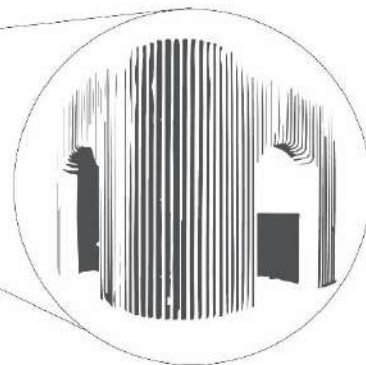
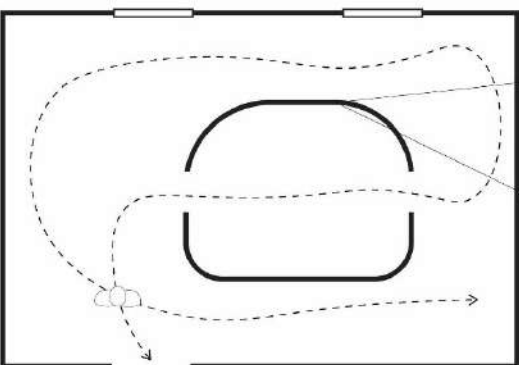
- a large number of vertical surfaces are disorienting

B



possible scenarios

C



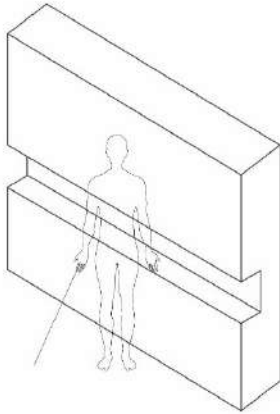


## 02. landmarks

- object position
- character and physical attributes
- relation to other objects

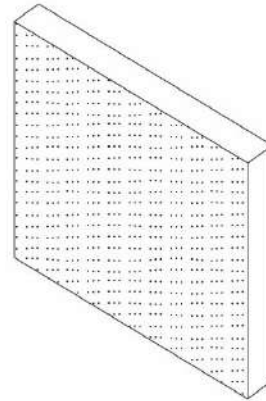
### possible scenarios

D

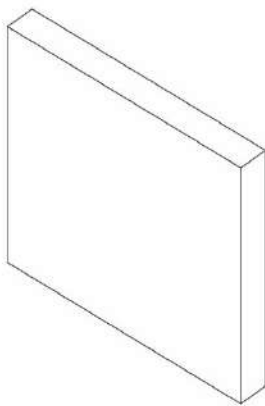


F

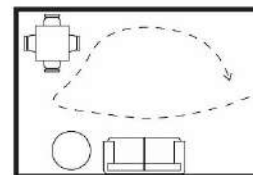
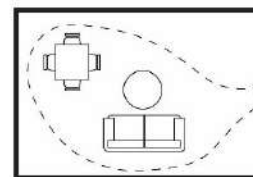
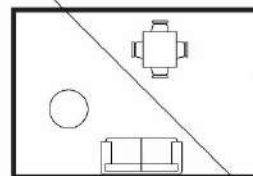
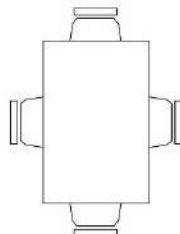
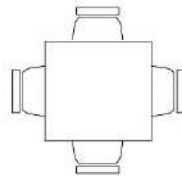
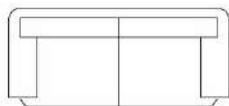
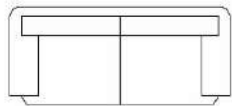
tactile wall  
-wall people to interact with through the use of technology or materials that allow interaction: plastic, sponge, etc.



E



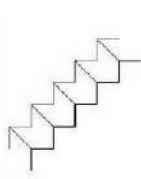
-no decorative patterns  
-using not similar colours to contrast different surfaces or elements  
-small details/elements should be in a different colour from the background  
-yellow is the colour easily identified in visual impairments  
-suggested colour combinations:  
red - yellow, black - yellow, black - white, blue - yellow, or other combinations.



## 02. landmarks

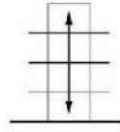
- object position
- character and physical attributes
- relation to other objects

### possible scenarios



#### stairs

- vertical spine of the buildings
- defy gravity
- modulator of time through rythm
- awareness of body capacities (movement/memory/body schema)

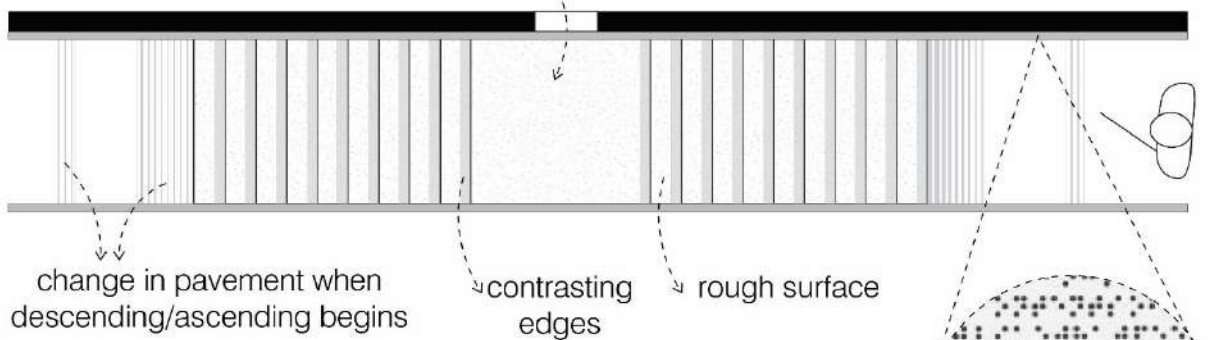


#### elevator

- limited circulation to horizontal plane
- numerical

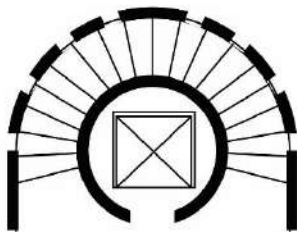
A

pausing zone associated with openings in wall for passive touch and echo location



- rough materials and non slippery surfaces should be used un stairs
- constant hight and width of stair steps
- hand rails in both sides
- hand rail should provide information in braille before starting to ascend/descend

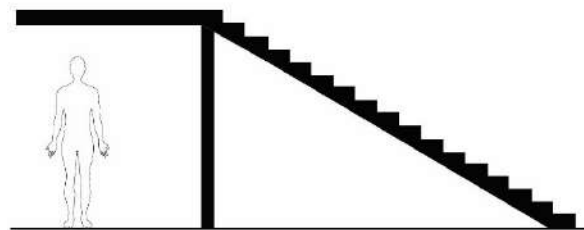
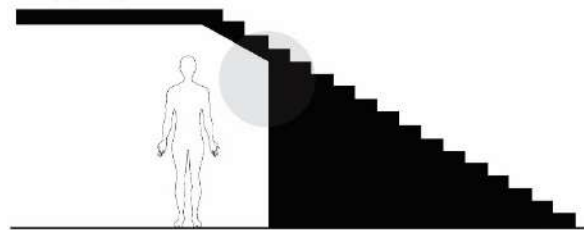
B



circular stairs

- rough material for stairs' surface
- hand rail or wall should give information about the direction (clockwise or not)
- the relation to light or openings with the outside provides sensorial information for better orientation.

C inappropriate scenario



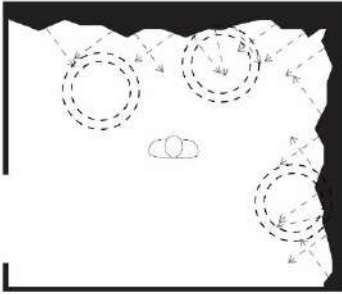
closure of spaces underneath stairs

03. Soundscape  
 -echolocation  
 -volume  
 -reflection, absorption, diffusion

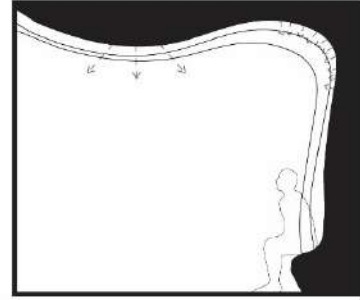
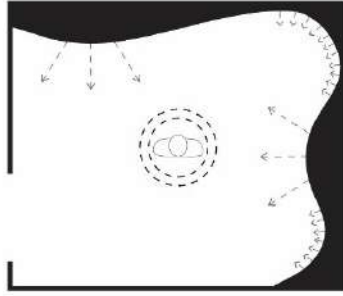
inappropriate scenarios

possible scenarios

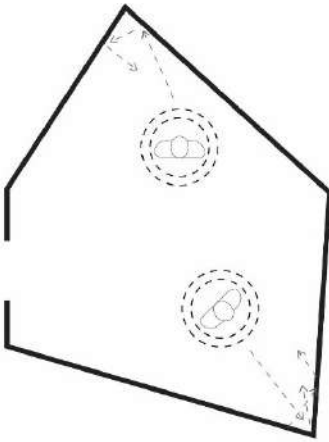
A diffusion



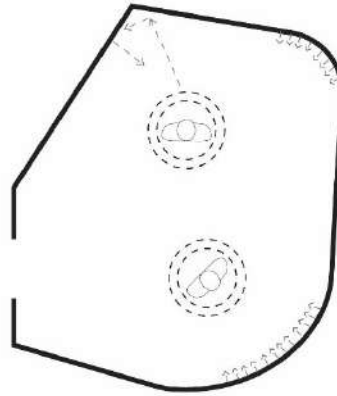
A



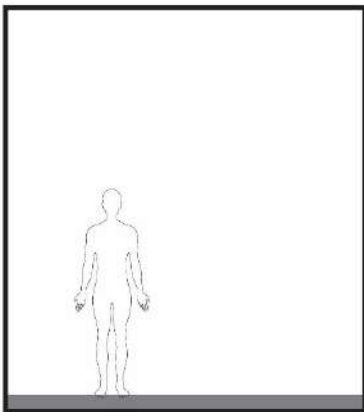
B



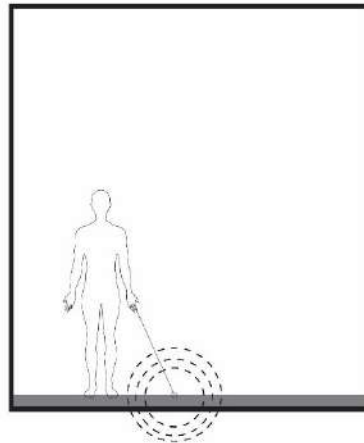
B



C



C



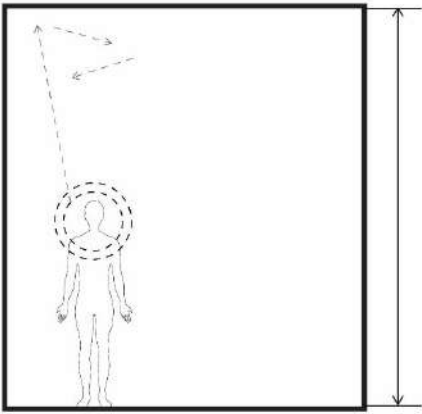
vibration from floors

03. Soundscape  
-echolocation  
-volume  
-reflection, absorption, diffusion

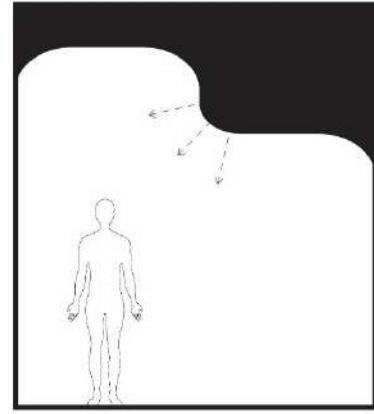
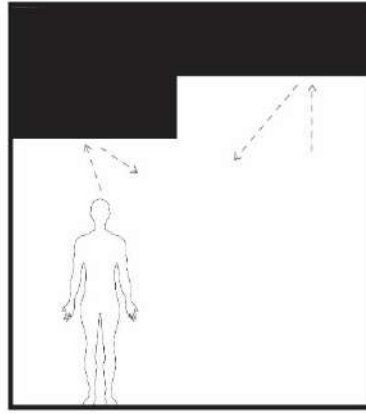
inappropriate scenarios

possible scenarios

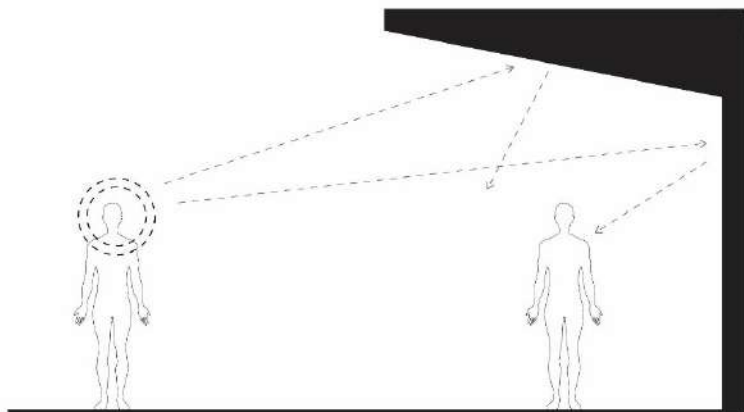
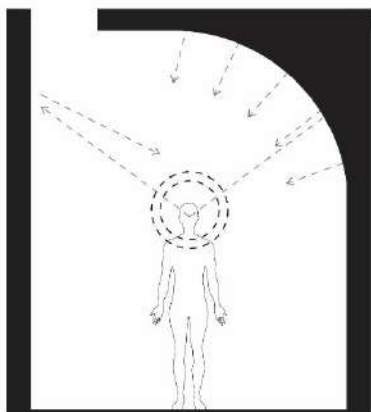
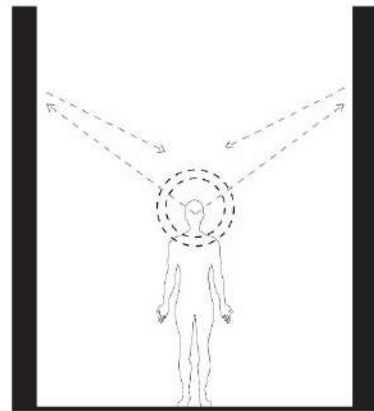
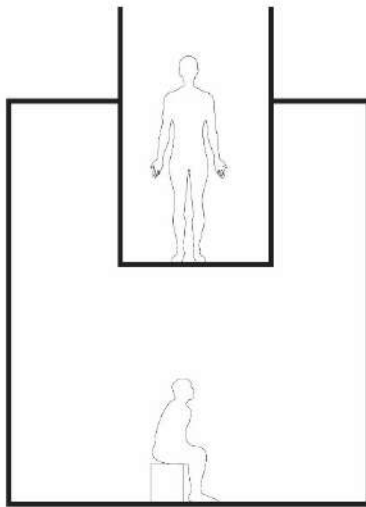
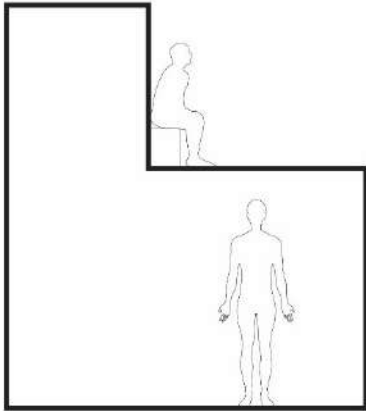
D



D



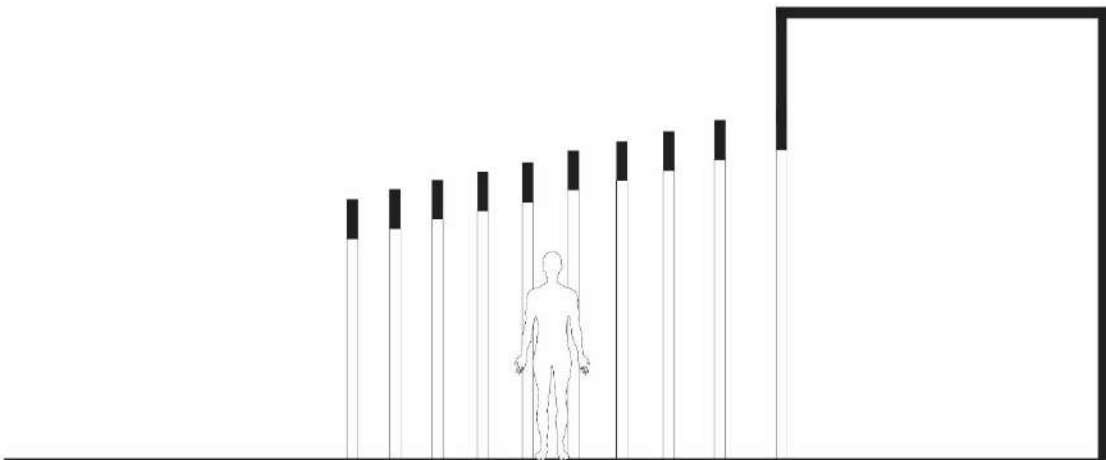
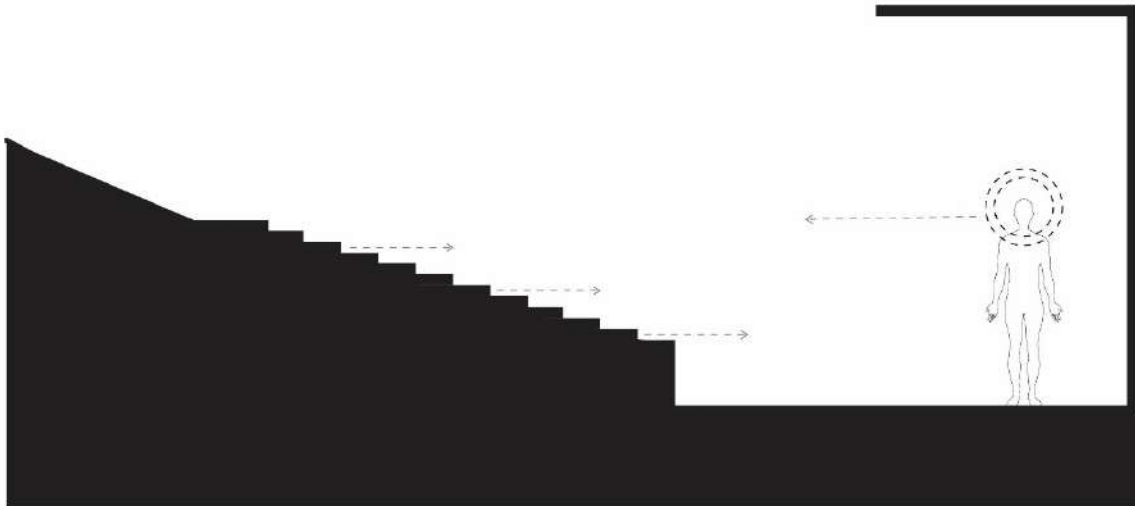
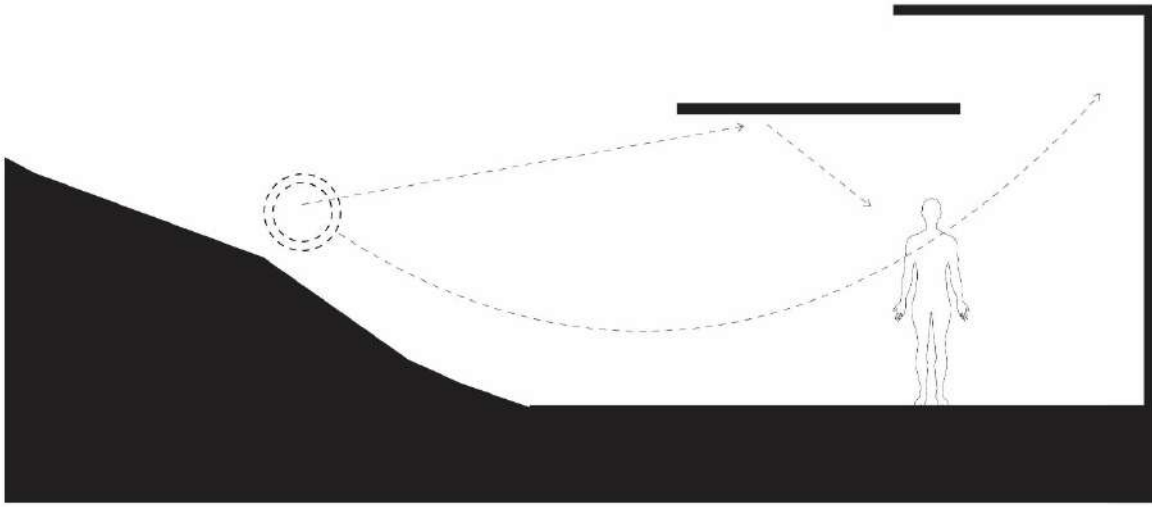
D



03. Soundscape  
-echolocation  
-volume  
-reflection, absorption, diffusion

possible scenarios

E



inappropriate scenarios

A  
"dead" materials (no scent preserved)

glass + metal



possible scenarios

A  
odourous materials (raw/natural materials)

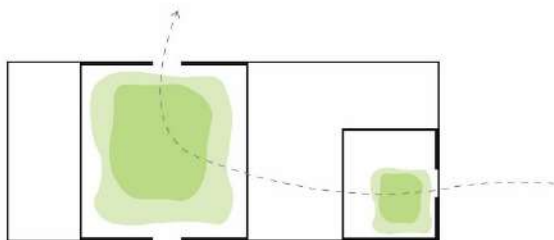
scent of material depended by factors:  
climate, location, storage condition,  
season changes, moisture, drought.

other: recycled wood, onyx panel, plaster, paint,  
leather, timber, concrete, lime, fibers, tar, mat.



possible scenarios

B



presence of patios/gardens as a  
wayfinding system  
+  
seasonal plants  
+  
scents of gardens to circulate inside  
the building

C

depended by:

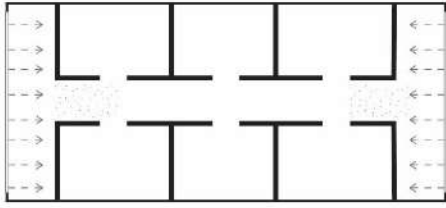
- human activity;
- diffusion of air volume/air movement;
- odour as a spatial temporal mark for people in a repetitive way;
- diverse odour source especially in focalpoints (entrances or transitory spaces);
- presence of water: mineral content of water changes the apparence and odour of materials.

05. light  
 -glare  
 -reflection

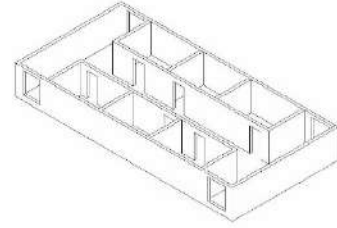
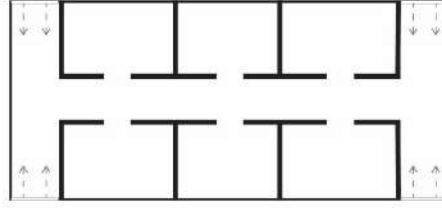
inappropriate scenarios

possible scenarios

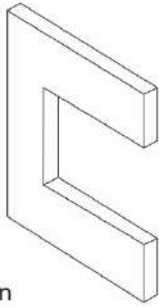
A



A

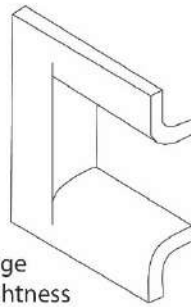


B

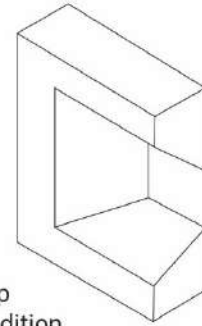


sharp edge  
 produces sharp  
 contrast condition

B

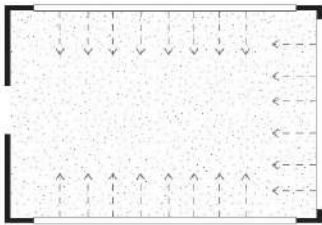


rounded edge  
 softens brightness  
 differences

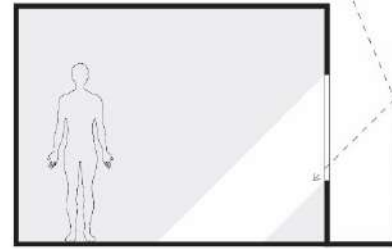
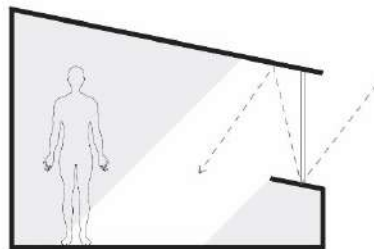
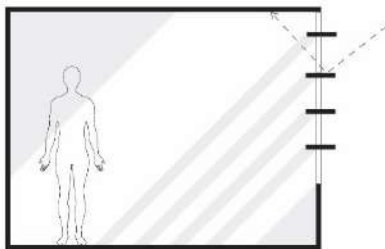
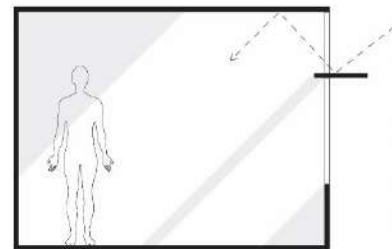


softens sharp  
 contrast condition

C

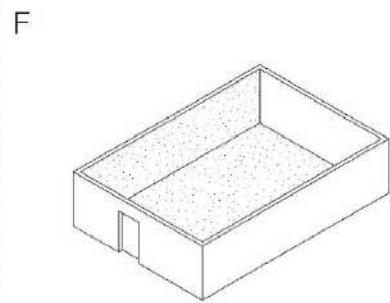
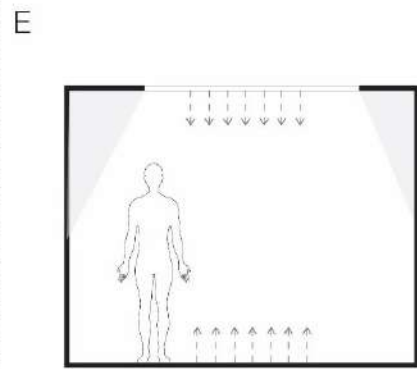
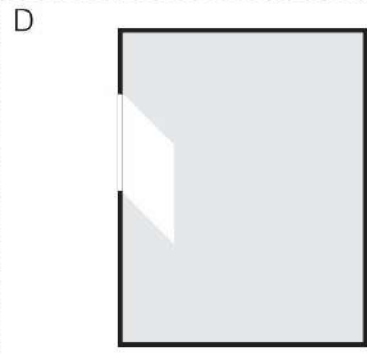


C



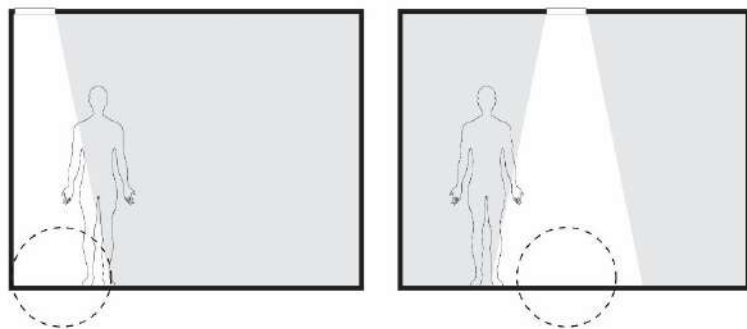
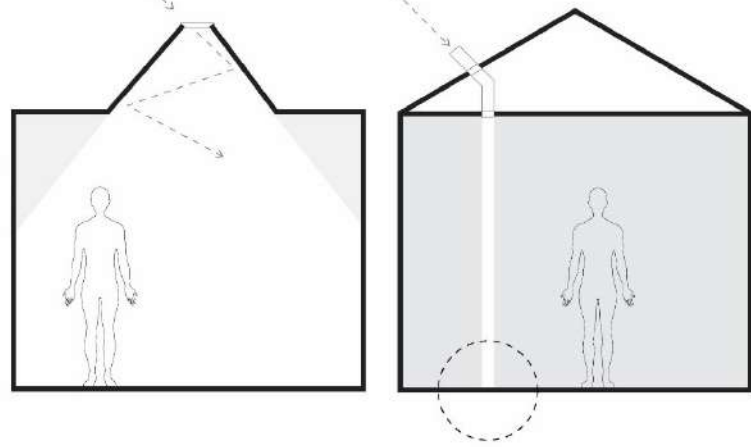
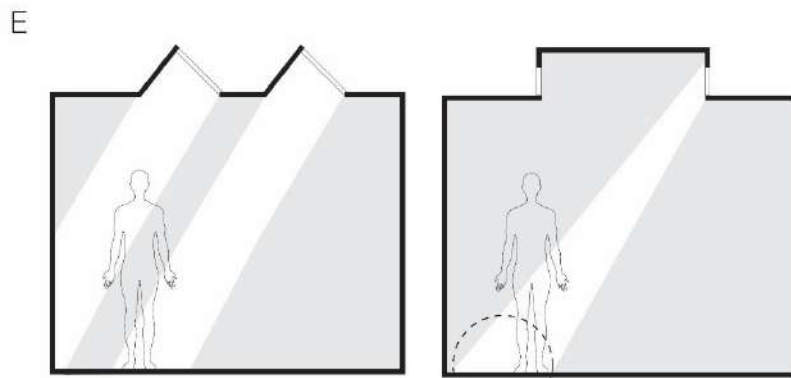
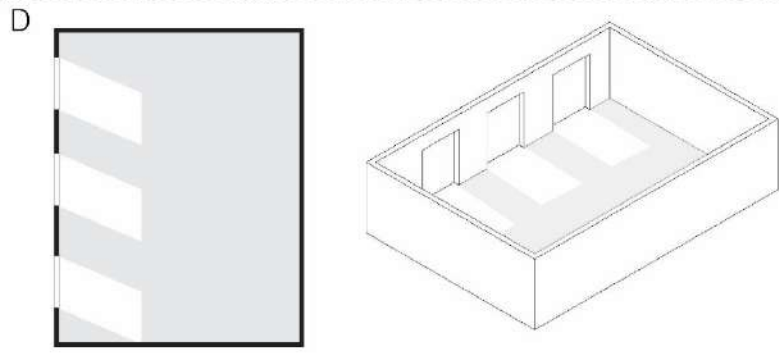
05. light  
 -glare  
 -reflection

inappropriate scenarios



avoiding reflective materials for walls, floors, ceilings

possible scenarios





## 5.5. Recommendations

The case of the blind person, considering their spatial conception, provide knowledge that when speaking about spatial perception, it is not necessarily a set of mental images visual in nature, but it can be provided from any kind of sensorial means. Furthermore, it proves that perceiving spatial components is not fixed, but is fragmented, partial and subjective. This mental image is created in fragments to provide the whole mental map of a space. For a sighted person, or for a visually impaired, vision is the limitation of perception because it is depended by light; while for a blind person those limitations are of a different nature. By knowing these limitations, it provides possibilities for the architect to elaborate tools for an accessible and embodied architecture not only for the blind but for all users. The parameters discussed in the handbook are formulas, which provide a set of spatial configuration when combined. The architects can provide a set of configurations, which can evolve into architectural spaces multi-sensorial in nature and accessible for all users. This research and the proposed parameters can be used as a basis for developing more architectural qualities and various combination possibilities through further research.

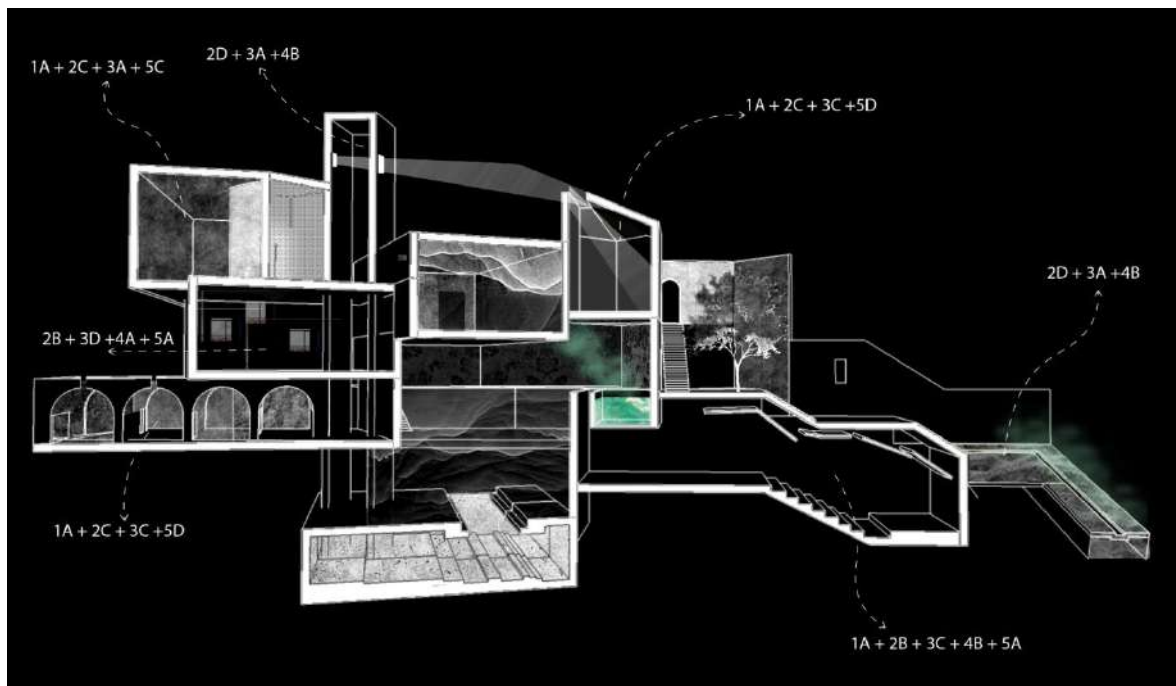


Figure 152 - Example of spaces produced by the combination of the parameters

The limitation of this research is the fact that the proposed architectural parameters are based on interpretations of a phenomenological approach. The research can be elaborated further, and through future research this handbook can be completed with further architectural parameters dedicated to all of those who have any type of sensorial deprivation.

“Every actual body has a limited set of traits, habits, movements, affects, etc. But every actual body also has a virtual dimension: a vast reservoir of potential traits, connections, affects, movements.” (Deleuze & Guattari, 1994)

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