

Perception and functionality of space in view of potential and dysfunction of senses

Sense-sensitive Architectural Design

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Abstract: This article is of an illustrative nature. It is intended to juxtapose the possible options of architectural perception and the potential capabilities and dysfunctions of senses. It is, further, aimed at highlighting the co-dependence of the perception of architecture on mental and physical abilities of man (its observer and user).

The way space is perceived is dictated by the perceptual capabilities of our senses. Understanding the physiology and the role of the senses can sensitise the designers to the fact that the users' responses to his/her works might diverge from the perceptual processes in the brain of the creator him/herself. More importantly, architecture itself can generate sensory feedback and exert a therapeutic effect in view of sensory dysfunctions.

Key words: senses, perception, dysfunctions, architecture, universal design

Role of the senses in the perception of space

Many years ago, Le Corbusier, a pioneer of modern architecture, suggested that architectural forms physically affected our senses. Our know-how on the psychology of perception and the impact of sensory experience on the health, well-being and behaviour of the user (environmental psychology), if aptly used, can help us to work up high quality human-centered architectural designs. Perception of architectural space is an individual and multifaceted experience. Only human-centred designs that account for the physiology of senses, multi-levelled perception and any potential dysfunctions shall enable the designer to fully meet the postulates of universal designing.

Architectural space exerts impact on man, underlies his mental and physical condition and, thus, can be deemed an important factor in the process of human therapy. The term 'therapeutic architecture' has evolved into a recognised concept in response to senseless space, among others of the health care facilities, and in response to the absence of any human factor accounted for in the process of their designing. This concept is far from suggesting that architecture alone has any healing properties, it is, though, meant to suggest that

proper arrangement of space may foster certain natural factors like the daylight, colour perception, sound propagation, appearance or smell.

It is important to take these polysensory aspects into account in the architectural designs. Owing to the sensitivity of designs that include the integrated perception aspects, architecture can affect the well-being of man not only with the physical parameters of its form but also with the emotions evoked with its composition. Thus, conscious designing of space that transmits multi-sensory stimuli received via the synergy of all the senses can facilitate architecture and urban planning that promote social welfare and foster cognitive and emotional responses of the users.¹

Sight

“Vision reveals what the touch already knows (...) Our eyes stroke distant sur-faces, contours and edges, and the unconscious tactile sensation deter-mines the agreeableness or unpleasantness of the experience.”²

For centuries senses have been perceived to be under the hegemony of vision. In his principal work on metaphysics, Aristotle stressed the dominating role of sight in comparison to other senses.³ This approach has always prevailed. Even if roles of the other senses were eventually recognised, sight has maintained its prime ranking position. Today, this hegemony of sight is becoming more and more often criticised.

We can observe attempts to engage and activate other senses, embodied in many aspects of designing, and to sensitise the users to their stimuli. Sight is without any doubt a dominant sense, nevertheless, its role should be re-analysed in view of how its interrelation with other senses can be appropriately harnessed to our advantage.

Ancient Greek architecture was designed to be pleasing for the eye. The system of optical corrections, the golden ratio principle and contrasting colours underlay its visual perception. The privileged position of sight has not, however, suppressed the responses of other senses. We are still sensitive to the pureness of materials, weight, texture, rhythm and haptic interaction. As Pallasmaa wrote – “*the eye invites and stimulates muscular and tactile sensations*”.⁴

Sight can reinforce the sensations felt via other senses. Touching various items and surfaces, we feel their texture, yet, only if observing the process itself are we able to better feel its true nature and materiality. We can better focus on the articulated words if we are looking at our interlocutor. The visual representation of appetising foodstuffs makes our mouths water and intensifies our gustatory sensations. Guided with sight, we are not only able to tell apart shapes, colours and distances but also to identify the features of items such as softness, hardness, plasticity, roughness (haptic perception). The visual appearance of such natural materials as brick, concrete, stone and wood facilitates the recognition of their texture and assures the human brain of their authenticity. By sight, we are able to identify the age of the materials, often their origin, and to recreate the history of their useful lives. We can, thus, feel stronger bonds with the space that surrounds us, we can identify with such space or emotionally respond to it.

Our sense of sight enables the human brain to receive visual stimuli in a defined electromagnetic spectrum – the visible light – thus, transmitting to the brain the majority of data about the environment. Images projected onto the retina are focused only on a narrow area (in the centre of the field of vision). The remaining part of the space someone sees falls into the scope of peripheral vision. An eyeball is constantly moving, immobile vision does not exist,⁵ for that reason we hardly notice the focused vision effect as it affects a very narrow vision range.

1 Spence C., *Senses of place: architectural design for multisensory mind*, Cogn. Research 5, 46 (2020). <https://doi.org/10.1186/s41235-020-00243-4> [dostęp 28.10.2020].

2 Pallasmaa A., [The Eyes of the Skin] *Oczy skóry. Architektura i zmysły [Architecture and senses]*, Instytut Architektury [the Institute of Architecture], Kraków 2012, p. 53.

3 Aristotle, *Metafizyka [Metaphysics]*, Translated by K. Leśniak, Warsaw 1983, p. 3.

4 Aristotle, *Metafizyka [Metaphysics]*, Translated by K. Leśniak, Warsaw 1983, p. 3.

5 Koestler A., *The Act of Creation*, Hutchinson & Co Ltd, Londyn 1964, p. 158.

(...) richly moulded architectural space, provide ample stimuli for peripheral vision, and these settings centre us in the very space. The preconscious perceptual realm, which is experienced outside the sphere of focused vision, seems to be just as important existentially as the focused image."⁶

To a large extent, it is the peripheral vision that underlies the quality of perception of the matter inherent in the architectural forms. It, moreover, integrates the user with space and shapes his/her assessment of the surrounding space. We feel the atmosphere of a given place even before we intentionally look at its details.

"The preconscious peripheral vision transforms into focused vision and fragmentary images projected onto the retina into some vague, spatial, embodied and sensory experiences that constitute full, existential and dynamically changing experience and the sense of continuum. Ours is a changing and continuous world because we are born with a dynamic system of perception, consciousness and memory, which on on-going basis pieces fragments together into some coherent whole. Peripheral vision makes us feel integrated with the space, whereas focused vision turns us into mere passive observers.' [translator's own translation]⁷

Neurological research confirms the dynamic nature of visual perception. It has been proven that the time of transmission of such stimuli as the object's colour, form and its movement varies. Colour is perceived first, followed by shape and movement, whereas the time difference between the reception of the first and last stimulus ranges from 60 to 80 milliseconds. This means that respective systems of perception are separately developed for the performance of individual functions, pursuing this line of reasoning even further, we can separate colour from form in our perception.⁸

All the above specified features of visual perception ensure the continuous transmission and reception of full data about the surrounding space. We are capable of instantly feeling the place and its atmosphere as we are part of the surroundings. We live in the world that surrounds us and constantly interacts with us – its reality is not just limited to images projected on the retina of our eyes. The visual image of the world can be compared to a flexible structure that continuously interacts with our memories and experiences. This identifies the visual stimuli embedded in the memory and compares them with the stimuli received from the sensed reality.

Touch

Haptic interaction can be defined as the most intimate sensation of the surrounding world. The sensitivity of human skin to touching differs depending on the part of the body. Particularly sensitive areas are called the 'tactile points'. Finger tips, palms and the tongue have shown the highest tactile sensitivity,⁹ That is why, palms and fingers are used to identify the surface quality of the touched objects and enable the blind to master the ability to read the tactile writing system (Braille system).

The fact that skin is provided with tactile receptors does not preclude the ability to create the tactile impression without the involvement of the actual touching process. Stimuli other than touch can also activate the tactile receptors. Additionally, it has been observed that mobile stimuli tend to strongly interact with the tactile receptors than the immobile ones. The sense of touch responds to many various stimuli that are difficult to be unambiguously classified. The latest research has distinguished between the ability to feel pain and temperature. In general terms, however, many properties of the environment affecting our response thereto is the resultant of all the sensations triggered in several senses at the same time. Humidity is the resultant of

6 Pallasmaa J., op. cit., p. 18.

7 Kusiak J., Świątkowska B. (red.), op. cit., p. 58.

8 Kusiak J., Świątkowska B. (red.), op. cit., p. 48.

9 Wyburn G. M., Pickford R. W., *Zmysły i odbiór wrażeń przez człowieka [Senses and reception of sensual stimuli by man]*, Państwowe Wydawnictwo Naukowe, Warsaw 1970, p. 3.

the tactile and temperature (cold) sensations. Hardness or softness encompass the pressure element – certain effort must be made to identify the features of a given object. However, vibrations will be felt as a type of non-continuous pressure transmitted via the skin to extensive areas of tactile receptors. We can also note that the touch and pressure will continue to be felt even if the vibrations aren't.¹⁰

The feeling of firmness plays a significant role in any touch related therapy. It is the feature felt as a result of many different types of tactile sensations. Moreover, it is the only sensory quality that involves the integration of tactile and kinaesthetic data and the data concerning the deformation and plasticity of the material under pressure.¹¹

The ability to sense firmness and the different sensitivities to firmness of the individual space users are used in many therapies, with the account for the users' personal features, the environmental conditions or degree to which an individual can develop the sense of firmness. This testifies to its theoretical and practical significance in a variety of therapies.

The sense of touch is distinguished from any other sense due to its continuous activity, on-going reception and transmission of stimuli. The human brain is able to process the sensations it receives only selectively, thus, we can talk about seeing without recognising the visual images, or hearing without understanding the meaning of the sounds heard.¹² However, the tactile receptors in our skin are unable to ignore certain stimuli. Our bodies are constantly sensitive to them. The sense of touch is an important part of the early stages of child development, predetermining proper functioning of a human body later. It plays a significant role in sensory integration therapy, autism therapy and in the treatment of other sensory disorders. Many medical research results have confirmed the positive effect of the sense of touch. Patients who feel the positive touch of nursing personnel are better able to adapt to the specific conditions in hospital, more positively view the treatment procedures they have to undergo and recover quicker. A friendly touch positively fosters the course of therapy – it can reduce the patient's fear, promote a nice atmosphere and make the cognitive disorders of dementia patients less acute.¹³ What's more, the patients become more open and relaxed, feel safe and are willing to get into social interactions during their hospitalisation period.

The sense of touch may apparently seem to be inferior to sight in the process of sensing the architecture. Yet, it is the sense of touch that transmits to the human brain a lot of information about the surrounding space, which would not be received if we only relied on visual sensations. Rasmussen observes the importance of the sense of touch in the development of a child, who, at the early stages, learns about the world through the tactile sensations – learning to identify the textures of various materials, to understand the difference between tension and relaxation and to differentiate between the weight of objects. Learning about the material objects and their spatial relations, a child engages into such activities as e.g. throwing a ball against the wall. This way the child comprehends the plasticity of the wall, weight and texture without directly touching it.¹⁴

As the most intimate of human senses, touch helps man to feel architecture and space in the most natural way, fosters the integration of man with space and promotes an in-depth analysis of spatial properties. Haptic architecture, unlike the visually dominated architecture, engages the users into the interaction with space, creating bonds between them, turning them into active participants from otherwise passive onlookers. The sense of touch is something more than a cognitive method to learn about the environment, it is also a database of previous memories and emotions.

10 Wyburn G. M., Pickford R. W., *Zmysły i odbiór wrażeń przez człowieka [Senses and reception of sensual stimuli by man]*, Państwowe Wydawnictwo Naukowe, Warsaw 1970, p. 32.

11 *Ibidem* p. 131.

12 Wyburn G. M., Pickford R. W., *op. cit.*, p. 32.

13 *Ibidem* p. 66.

14 Rasmussen S. E., *Odczuwanie architektury [Feeling architecture]*, Wydawnictwo Murator, Warszawa 1999, s. 15.

The sense of hearing

Hearing structures and articulates the experience and understanding of space. We are not normally aware of the significance of hearing in spatial experience, although sound often provides the temporal continuum in which visual impressions are embedded. When the soundtrack is removed from a film, for instance, the scene loses its plasticity and sense of continuity and life. Silent film, indeed, had to compensate for the lack of sound by a demonstrative manner of overacting.¹⁵

Human life is, to a large extent, dominated by the visual sensations. We often feel oblivious to the surrounding cacophony of sounds. We are able to ignore the auditory stimuli, e.g. when we must focus on something else or if the sound continues for an extended period. The auditory stimuli usually go together with some elements of dynamics. Sounds can strongly interfere with our mental comfort. The hurricane hail, the sound of thunder or a car horn will be felt by the human brain more acutely than any other visual sensations.¹⁶ Hearing is a useful space orientation tool. Being in the building or in the street we can hear our own steps, the noise of the surroundings, the rustle of the objects, the chirping of birds, conversations, echoes. Once we register all these stimuli emitted from the environment we are able to identify, sometimes unconsciously, the scale of space we are in, the distance to the subsequent elements or buildings or the nature of space at a distance, even if it is still invisible to our eyes. Pallasmaa observes that *“music of shopping malls and public spaces eliminates the possibility of grasping the acoustic volume of space. Our ears have been blinded.”*¹⁷

The auditory experiences created by architecture enrich the range of our sensory perception. Proper acoustics of space affects our mood and activity. Rooms that assure intimacy and tranquillity seem to attract the users, contrary to the rooms where sounds are echoed or reverberated. Proper acoustic comfort is an important parameter in the assessment of health care facilities. It not only affects the well-being of patients and the work comfort of medical staff but, furthermore, facilitates social interactions in common areas. Sound therapy is an important part of sensory integration therapy, used not only in the treatment of patients with hearing disorders, but also the autistic or hyperexcitable patients or those suffering from depression. A common form is music therapy, when the patients calm down and relax. Auditory experiences may differ depending on their variable properties. Pitch and intensity evoke respectively different sensations of tone volume and loudness – low sounds seem to level over longer time periods than high sounds. Additionally, respectively adjusting the frequency and intensity, we may influence individual audio experiences – the feelings of hard or plusive sounds.¹⁸

Smell and taste

The chemical senses, i.e. the senses of smell (olfaction) and taste (gustation) can be analysed as functionally interrelated. Their role in the sensation of architecture may be suppressed by the senses discussed above, yet complementing the dominant senses they underlie completeness of the sensory experience of space.

We distinguish between four basic tastes: sweet, bitter, sour and salty. The human tongue is mapped into four areas that correspond to the aforementioned tastes. Similarly to basic colours that, in combinations, create secondary colours, combinations of the basic tastes form tastes which are inherent in our foods. Without any doubt, taste goes together with smell. Any gustatory experience is reinforced with the sense of smell and smell can change the human sensation of the taste.

Pallasmaa highlights the interrelation between taste and other senses. Tactile sensations related to food structure and consistency and visual impressions of appearance and colour make the meals more palatable.¹⁹ In the further part of *“The Eyes of the Skin”*, the author states that architecture can evoke gustatory sensations:

15 Pallasmaa J., op. cit., p. 18.

16 Wyburn G. M., Pickford R. W., op. cit., p. 80.

17 Pallasmaa J., op. cit., p. 18.

18 Wyburn G. M., Pickford R. W., op. cit., p. 75.

19 Pallasmaa J., op. cit., p. 71.

“A delicately coloured polished stone sur-face is subliminally sensed by the tongue. Our sensory experience of the world originates in the interior sensation of the mouth, and the world tends to return to its oral origins. The most archaic origin of architectural space is in the cavity of the mouth.”²⁰

In the context of architecture, smell seems to have a bigger role to play than taste. Smell is largely dependent on our volition – if we want to feel the smell, we must take a deeper breath and focus on the received stimuli. Volatile odorants dispersed in the air reach our olfactory receptors in the nose. The more volatile the substance is, the more intensive the smell it gives off.²¹ On the other hand, intensive smells reach our body simply during the normal breathing process, with no special effort made.

Another attribute of the sense of smell is its ability to get used to long-term and persistent odorants, then our body starts ignoring the olfactory stimuli if they fail to change on the on-going basis. Despite this, repetitive stimulation of the olfactory receptors with one and the same flavour may result in the nostrils identifying it differently.²²

Olfactory, similarly to auditory, sensations influence the emotional perception of architecture and the feeling of well-being of its users. Smell is also an important spatial orientation tool for the blind or the visually impaired. Smell is most strongly remembered. Certain places or people are immediately associated with familiar olfactory stimuli and we are able to distinguish between spaces on the basis of their different smells. Olfactory impressions and sensations may be pretty individual, however, there are certain aromas, e.g. natural flavours that positively affect the well-being of all of us.

Sensory compensation

Some people may be born with certain sensory disorders or be born with a total lack of certain sensory abilities and some may become impaired as a result of a disease or injury. Human senses seem to show compensatory properties. Should any get impaired or lost, the remaining ones are able to increase their efficiencies. The loss of vision will not translate immediately into different or better functioning of the other senses, but the senses will learn to better analyse the data received and interpret it correctly.²³

The sense of touch is the basic cognitive tool compensating for the loss of vision. Unfortunately, the operation of the two senses largely differs – sight can receive visual stimuli that are located at a distance from the observer, whereas the sense of touch requires direct physical contact. This is vital in the sensation of architectural space because most of its components remain outside of the field of perception of a blind person. Another important aspect of vision is the fact that the human brain is able to receive many different stimuli at the same time, which underlies the ability to understand the features of the objects seen and the relations between them. However, the sense of touch enables us to discover ‘layers’ of an object.²⁴

Visual perception records data involuntarily, in a sense – automatically – contrary to the sense of touch, which requires undertaking specific acts, attention focus and refraining from simultaneous engagement in any other activities. Tactile sensations, however, provide much more data about the features of an object than vision. Another sense compensating for the vision disorders is the sense of hearing. It is particularly useful in spatial orientation and moving around space. Reflexive analysis of the tone, pitch or intensity of sounds enables us to locate the position of objects in space and their interrelations. The sense of hearing largely affects the perception of the vast spatial expanse, going beyond the perceptual abilities of the sense of touch.²⁵

²⁰ Ibidem p. 71.

²¹ Wyburn G. M., Pickford R. W., op. cit., p. 142.

²² Ibidem p. 148.

²³ Kusiak J., Świątkowska B. (red.), op. cit., p. 79.

²⁴ Ibidem p. 80.

²⁵ Ibidem p. 80.

Also smell can, to a certain extent, compensate for incomplete visual perception of the blind, yet, it will not be of much use in spatial orientation. Smells that reach us from the environment most often complement the overall data set about the surroundings, underlying the feeling of aesthetics.

Talking about the compensatory nature of senses, it shall be underlined that none functions separately. We can observe their changeable hierarchy, depending on the actual process of perception and the type of the analysed object or space, however, we must acknowledge that all our senses work jointly, on the basis of cooperation, transmitting to our brains complementary information.

Sensory dysfunctions and designing space

Sensory dysfunctions are not tantamount with disability, but in combination with social and environmental factors, may lead to it.²⁶ We are talking about a disability, in relation to functioning in a particular way when it poses a barrier preventing the performance of certain functions easily performed by a reference group.²⁷ Proper space design can remove the barriers posed by the dysfunctional senses and, thus minimise the disability. Dysfunctions are not tantamount with disability if they can be overcome. Properly shaped social environment plays a key role in this respect. To better illustrate the issue, Buchanan refers to an example of a person with a hearing dysfunction (as compared to the reference group with no dysfunctions, this person does not hear sounds in certain frequency range). If the frequency range this person does not hear is redundant for his/her functioning in the social environment, such inability is not deemed a disability.²⁸ Subjective opinion of a given person regarding his/her condition underlies the disability definition. Public spaces and buildings adapted to special needs, e.g. of people on wheelchairs, will enable them to use the space on equal terms with other users and will facilitate positive perception of their condition, now not so much diverging from the others.

Because we have certain social norms and standards applicable to the majority, a disabled person that fails to meet the set criteria is often negatively perceived as a misfit. Such perception of people with sensory dysfunctions may also entail aggressive attacks on them.²⁹ We can, thus, understand that a disability is a deprivation of a certain potential or functional inability resulting from certain barriers posed by a sensory dysfunction, spatial or social barriers. These, in turn, are posed as a result of stigmatisation or discrimination of people suffering from sensory disorders.³⁰ The important thing is that the designed space should be sufficiently accommodating (universal) to be able to serve the needs of persons with various perceptual abilities, eliminating the barriers that prevent their unassisted functioning and, thus, narrowing down the physical differences between people.

The fundamental principle to adapt space to sensory dysfunctions, e.g. the dysfunction of vision, is to design its functional and clear layout. The concept of beauty, in reference to architecture, is a much more complex issue. It can go beyond the purely visual zone and be felt through non-visual perception. However, despite the fact that the pleasure man feels experiencing beautiful and aesthetic objects is a universal human need, irrespectively of perceptual abilities of an individual person, when designing public utility architecture, the designers often seem to ignore its aesthetic value. Universal design should stress the importance of aesthetics, emotional code and meaningful language of architecture equally with the functionality. This is often deemed a prerequisite for the fundamental sense of dignity, comfort and safety of the user.³¹

26 Sen A. K., *Development as freedom*, Knopf, New York, 1999.

27 Buchanan A., i in., *From Chance to Choice: Genetics & Justice*, Cambridge University Press, 2000, p. 285–286.

28 *Ibidem* p. 287.

29 Davis, L. J., *The disability studies reader*. New York: Routledge, 2013.

30 Mitra S., *The Capability Approach and Disability*, "Journal of Disability Policy Studies", 2006, volume 16, no. 4, p. 236–247.

31 Kłopotowska A. *Niewidzialna architektura – status piękna w poza wzrokowej percepcji przestrzeni architektonicznej* [Invisible architecture – status of beauty in non-visual architectural perception], *Czasopismo Techniczne. Architektura*, Wyd. Politechniki Krakowskiej, Kraków, 2007, R. 104, z. 6-A, p. 269–274.

Perception and senses

The terms 'sensory system' and 'perceptual system' are often used interchangeably. The processes within the two systems are mutually complementary and stimulating. They, however, concern different processes. The sensory system shall be understood as the process of reception of the stimuli that reach us through all the senses that we have. Perceptual system is the process of decoding, analysing and responding to the stimuli transmitted to our brains via the sensory system. Thus, we can be facing different types of disorders – our senses might not be sending some of the data (and prevent us from full perception of the environment) or the perception itself might be impaired (which does not have to mean that we have any sensory disorders). Pallasmaa argues that we so easily rely on the work of our senses that we do not fully comprehend the role perception plays in our lives. Perception refers to past memories and emotions to further process them and recognise the meaning of the stimuli sent from the environment at a given moment.³² The role of memories is discussed in the works of Kenya Hara, who points out that memory is vital in the processing of data by the human brain. He explains that memories are evoked through past experiences, that then help us comprehend and interpret a given situation we are facing at present. Therefore, what we can see at a given moment is not just the image projected on the retina, the visual stimuli are reinforced with our previous experiences recorded in the memory.³³ Perception is the resultant of volition and imagination. According to the research done, the perceptual processes occur in those parts of the brain that are responsible for imagination, which proves that they are interrelated.³⁴

The quality of architectural space is, to a large extent, predetermined by the users' feedback. For that reason, it can never be appropriately assessed exclusively based on its visual attributes. Proper assessment of the nature of a given place or an architectural facility is much more complex and shall fully account for all the sensory stimuli. According to Edward T. Hall, the way the users experience the spatial layouts depends on the visual contours of the facilities as well as on the distances maintained between them. Moreover, cultural differences between various groups of users might also involve the differences in the perception of spatial relations. Users dynamically experience space because their perception is correlated with action, thus, they account, not only for what they see, but also, for what they can do in the space.³⁵ The very topic of building relations, undertaking unusual activities with the use of objects and implementing new materials is discussed by Maciej Frąckowiak in his publication "Inne podniety. O miasto otwarte także na doznania" [Other stimuli. City also open to sensations"], where he calls these atypical relations or activities 'other stimuli' that enable the users to open up to new bodily sensations and other, more intensive sensory stimuli transmitted to the brain. He is of the opinion that it is desirable for the urban space to more extensively stimulate the users. The author refers to a very simple example of street furniture, namely armchairs installed on the pavement, along a busy road. Anyone sitting on the armchair can observe the space and other passers-by from the position of an active participant of the traffic, rather than a passive observer only, being able to receive the same stimuli, smells, vibrations and sounds. He/she stands a chance of actively participating in the scene dynamics via a direct interaction (engagement into a discourse, enforcing a route change or letting someone pass).³⁶ Time of the day may be an important motivator thereof because the atmosphere prevailing in space depends on the given moment, lighting conditions or what's temporarily going on in the street. Being in space and experiencing architecture is always of multi-sensory nature, in other words, our simultaneous perception involves the simultaneous work of all the senses together.³⁷

32 Pallasmaa J., *The Contribution of the Five Human Senses towards the Perception of Space*, p. 27.

33 Banasik-Petri K., *Architektura zmysłowa – Nowe tendencje w procesie projektowania na podstawie wybranych przykładów z twórczości Kenya Hary* [New tendencies in designing based on selected examples of Kenya Hara works], KNUV.

34 Kusiak J., Świątkowska B. (red.), *op. cit.*, p. 23.

35 Hall E. T., *Hidden Dimension*, 1996.

36 Kusiak J., Świątkowska B. (red.), *op. cit.*, p. 163

37 Kusiak J., Świątkowska B. (red.), *op. cit.*, p. 14.

Sensing space

Generally speaking, some places encourage leisure activities and social contacts and some tend to be avoided. Halls with glazed side doors offering nice views foster social relations, whereas e.g. lifts seem to discourage them. The same has been observed about the impact of shapes on human behaviour – round tables encourage the social integration, contrary to the narrow and long spaces that discourage it.³⁸ Owing to his/her peripheral perception, the space user can interpret the atmosphere of the place he/she is in, just in an instant. This multi-dimensional and peripheral vision makes the observer part of the space observed. This phenomenon has been used in impressionist, cubist and abstract expressionist paintings to recreate the 3-D reality around the observer.³⁹

Spatial perception is largely dependent on mental factors. Mental approach, emotions, associations or response to the experienced architecture correspond to the models prior created in the observer's psyche. If the experienced space contains unknown or complex elements, the observer attempts to find similarities by analogy with previous experiences, consciously developing his/her manner of perception.⁴⁰

The observer responds with uncertainty to unknown objects, forms or materials. This at the same time increases his/her attention focus and curiosity and in the end, enriches and extends the experience range. Another important aspect of perception is finding similarities between the properties of architecture and music and interdependencies between their visual and acoustic features. The two disciplines share such elements as rhythm, proportions and harmony, which often serve similar functions. As early as in the Ancient times, the scholars found a correlation between mathematical proportions used in building facilities and harmony in music. Ancient Greek classical architecture, designed with the use of the golden ratio, may well support the statement.

Palladio's works were also based on spatial dimensions and measurements. The most frequently used by Palladio proportions were: 3:4, 4:4 and 4:6 – the same as time signatures in music.⁴¹ The factual impact of such proportions on the perception of space has already been confirmed. If these proportions are observed, we feel that the building composition is harmonious, magnificent and well-integrated. This translates into our well-being therein. Feeling the rhythm of architecture fundamentally underlies the components of spatial perception. Comparison with music automatically comes into mind. We can similarly look at people dancing or listening to a concert and feel the rhythm of music as if it were originating from the inside of our own bodies, even if we are just passive observers and do not engage into any physical activity. Rasmussen notes that we similarly feel architecture if we visually sense the elements repeated at the same intervals.⁴² The rhythm of architectural forms makes us better understand and remember a place. It also eliminates any feeling of spatial chaos and disharmony. Another vital factor underlying the atmosphere of a given place and the well-being of the users is the interior design. In this respect we can well refer to the works of Peter Zumthor that may serve as the examples of conscious sensitivity to designing and almost 'poetic' use of materials. The skill of combining textures, colours and weight with the play of light makes his architecture appeal to all the senses and evokes an emotional response of the user. A specific relationship of form and sensuality of materials represents an outstanding value, enabling the users to sense the uniqueness of the creation made of familiar components.

Conclusions

Perception is a complex process that involves tools of sensory cognition and personal experience. Adherence of the user to a given cultural group might further condition his/her manner of perception. A wide range of factors affecting the perception of space by its users poses a true challenge for the designers. Architecture may appeal to man in terms of bodily, material and spiritual attraction. An architectural work, blended within the landscape, transmits unique stimuli received with all the senses. The ability of a designer to create innovative relations

38 Day C., *Places of the Soul. Architecture and Environmental Design as a Healing Art*, Routledge, London 2004, p. 21

39 Ibidem.

40 Wyburn G.M., Pickford R. W., *op. cit.*, p. 207.

41 Rasmussen S.E., *op. cit.*, p. 111.

42 Ibidem p. 134–135.

with space and its other users can positively foster the users' sensitisation via new and more intensive bodily and sensory experiences. The understanding of the processes of spatial perception, based on the knowledge of the physiology of senses, enables the designer to fully comprehend the needs of the users and to design works in compliance with the principles of the universal design. Properly designed space can enable people, suffering from sensory dysfunctions, to enjoy the widest scope of unassisted living. At the same time, it can hide their limitations from the public eye and compensate their deficiencies with multi-sensory aesthetic feelings.

Conscious designing in future shall harness the multi-sensory potential of human nature to respectively create the intended spatial relations with the users, having a wide range of special needs.

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