HAPTIC ARCHITECTURE
BECOMES ARCHITECTURAL HAP

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Universal Design is a recent design paradigm which aims at handicap elimination in the physical environment and strives for a more humanized architecture. After pointing out the value of Universal Design, the paper advances human centred design as a possible methodology to make this paradigm operational. Key to this methodology is the explicit attention for cognitive human factors in experiencing space and—the focus of this paper—for the role played by the sense of touch therein. With this account this paper hopes to point out Universal Design's potential contribution to a more beneficent built environment.

Universal Design, Architecture, Haptic perception

1 Introduction

Architects—and designers in general—are used to create, design, dream and think in a visual manner (Cross 1982). They draw on a paper napkin, sketchbook, laptop or drawing board their mental image of a future physical environment. The language spoken during the design process is visual in the first place. As the architect and theorist Bernard Tschumi (1975) noticed before: there is a gap between the mental world in which architects design and the physical world in which they build. Our cultural history has increased this gap and has contributed to this emphasis on visualization: on the one hand because an architect was believed to be a master builder; on the other hand because Western Society is visually marked (Classen 1998). In short, this visual predilection is inherent to our human brain and nourished by our Western cultural framework. As a result, we will point out further on, we are in fact 'architecturally disabled' (Goldsmith 1997). Disability used to be considered as resulting from the physical and/or mental characteristics of the individual. Increasingly, however, it is recognized that disability may as well arise in situations where the individual confronts an unadapted social physical and/or mental environment. This paper proposes a way to prevent handicap situations created by the built environment itself. To this end, the paper is structured as follows: first we briefly introduce human centred design as a methodology which fits the paradigm of Universal Design. Subsequently, we zoom in on the missing parts needed for applying this methodology: knowledge on cognitive human factors in the design process, and in particular on the potentialities of the sense of touch.

2 Designing for all (senses)

If architects create visual environments without bearing in mind their user-friendliness, multi-sensoriality and functionality, this results in places that lack physical or mental accessibility: ‘distorted spaces’ (Brosnan 2003). For example a photogenic building can look very beautiful, but be an acoustic disaster for somebody with an ear-impairment. Hence, designers, producers and constructors are responsible for “handicap elimination” in the built environment (Froyen 2002). We do not have to adapt ourselves to the environment. It is the environment which has to be adapted to us.

At this point it becomes clear that Western architects need a new design approach. If we want to overcome the aesthetic dictatorship in architecture, a major shift in mentality is needed. This viewpoint is supported by Patrick Whitney. He says: "*I think that if architects limit the core of their discipline to the aesthetic form of buildings, architecture will be marginalized as a field. However, if architects take a broader view that deals with the social, the economic and the political issues in society, then they will develop deeper specialities. Architecture will be healthy if it has lots of ‘hooks’; at the periphery of the field, which can cause it to add value to users and clients”* (Whitney 2003).

This view perfectly chimes with the objective of a recent design paradigm Universal Design (UD)—also called Design for all or inclusive design—which aims at usability and comfort for as many people as possible regardless of age, ability or circumstance. Although UD emerged from "barrier-free-design", "assistive technology” or "accessible design", it embraces more than design for special needs. Universal Design enlarges the sphere of activity. It strives for user-friendly and elegant solutions and attempts to improve the environment for as many people as possible. Humanization of architecture is indispensable for the realization of Universal Design.

2.1 Human centred design: a methodology for Universal Design

Universal Design confronts architects with a new challenge. If they want to design environments for more people, they have to expand their patterns of thought and adopt a different design process in which humanisation is the objective. By doing so, they will contribute to the realization of Universal Design and avoid handicap creation in the built environment.

Whitney (2003) proposes a “human centred design process”, which involves three main conditions and which we could call in to achieve Universal Design.

First of all, it is architects’ task to change their attitude. They have to give primary attention to the human needs. These needs are not only functional in nature; aesthetics are essential as well in avoiding stigmatization in design.

Secondly it is important to take the usability into account, by drawing up the requirements, checking the design and refining it, all with the help from user/experts. Each design process starts by asking the client/users for their needs and desires. Practising a human centered design involves a number of cyclical processes which are repeatedly passed through during one realization. Unlike in designer centered design, the process does not end with the inauguration of the building, but continues even when the building is already inhabited. Feedback of users/experts on a new building can yield useful knowledge for future design processes. By consequence, Universal Design is a process which will never stop. Steinfeld and Tauke (2001) therefore speak of Universal design*ing*.

Finally, the human centred design process incorporates four human factors: the physical, social, cultural and cognitive factors. The physical, social and cultural factors have already been studied at large and are being addressed by many architecture programs, but the cognitive human factors ask for more scientific and interdisciplinary research.

2.2 Cognitive key to multi-sensoriality

In contrast to the physical and socio-cultural factors in architecture, cognitive reactions to the environment have only recently attracted the attention of scientific research. In the 1980s Changeux (1985) made the first link between brain-mind activity and environmental design. John Zeisel, chairman of the Academy of Neuroscience for architecture (ANFA), smelled the uncultivated sphere of action which was discovered by Changeux and started a pioneering research track combining neurology with architecture. Zeisel proposes a research approach based on observation and cooperation between architects and people with dementia. He believes that the more you know about how people experience their environment and what they know about it, the better you will understand their behaviour, emotions and cognitive reactions (Zeisel 2006). In this way, architects keep their finger on the pulse and are more attentive to cognitive aspects of our spatial experience. After all we experience the built environment with all our senses. For many people it is an evidence that architecture largely assumes visual experiences but architecture is more than just a visual experience. Architecture is multi-sensorial. In his book 'Experiencing Architecture', Steen Eiler Rasmussen (1963) describes the multi-sensorial way of perceiving architecture: *"Architecture is not produced simply by adding plans and sections to elevations. It is something else and something more. It is impossible to explain precisely what it is –its limits are by no means well-defined. On the whole, art should not be explained; it must be experienced."* All our senses contribute to our environmental perception: *"Every touching experience of architecture is multi-sensory; qualities of space, matter and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton and muscle"* (Pallasmaa 2005).

3 None so blind as those who won't see the multi-sensorial opportunity

The lack of attention for multi-sensoriality in most of the present design processes, could be solved by adopting a human centered design process. According to Zeisel (2001), blind people are experts in screening multi-sensorial qualities: *"Who can better clarify for us what the non-visual perceptible multi-sensory qualities and shortcomings of a city space or of a building are than a blind person?"* Thus, if we intend to make architecture more multi-sensorial, we can learn from the behaviours and experiences of blind people on environmental perception. To Morton Heller (2000), the idea that perception in the total absence of sight can afford important insights into the relation between the sense modalities and cognition, goes back at least to the famous letter by Molyneux to John Locke. In this letter Molyneux asks Locke if it could be possible for a man, born blind but having regained vision later, to recognize by sight alone the shapes that he had previously known only through touch.

For our research we decided to concentrate on the sense of touch. The most important reason for this is the suggestion by Bloomer and Moore (1977) that we know and feel the most from our physical environment thanks to our haptic and basic orienting system. This suggestion was substantiated by Pallasmaa's (2005) statement that "*all the senses, including vision, can be regarded as extensions of the sense of touch –as specialisations 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."* The major goal of our research is to identify haptic parameters, which allow to incorporate cognitive human factors during the design process. The research set-up covers different phases, two of which are reported on in the following sections. First of all, we have started by reviewing related research on the sense of touch as well as the spatial perception of people who are congenitally blind (Section 3.1). At the same time, we are conducting in-depth interviews with respondents who are congenitally blind (Section 3.2). In a next phase, the insights from literature and the interviews should allow to detect multi-sensorial misfits in the built environment, and translate these into design parameters that incorporate cognitive human factors in the design process. Finally, these design parameters and their appropriateness will be evaluated in a real-world human centred design.

3.1 Haptic perception in the built environment

As the terminology for touch is very extensive and has different connotations, we first of all define the sense of touch related to architecture. After all, touching involves very different types of information (e.g. regarding pressure, temperature, shape) and uses both the cutaneous (e.g. skin perception) and the kinesthetic receptors (e.g. perception of muscles, tendons, joints) (Gibson 1962; Loomis & Lederman 1986). Some researchers relate these two ways of touch perception to the absence or presence of proprioceptive activity (Loomis and Lederman 1986), respectively called passive and active touch. This distinction was suggested by James J. Gibson who in 1966 categorizes the senses in five systems: the basic-orienting system, the auditory system, the visual system, the taste-smell system and the haptic system. The haptic system refers to touchable experiences and is derived from the Greek word *"hapthai"*, meaning to lay hold of. It was introduced –in relation to the environment- by Piaget and Inhelder (1956). In Gibson's (1966) approach all perceptual systems are active seeking mechanisms. This definition is also supported by Morton Heller (2000). He notifies that some may use the word 'tactile' for passive perception and 'tactual' or 'haptics' for active perception, but he himself uses 'tactile' and 'tactual' both for 'touch' and distinguishes active touch by using 'haptics'. Loomis and Lederman (1986) describe haptic as identical to 'tactilokinesthetic' perception or the cooperation of both cutaneous and kinesthetic perception. O'Neill (2001) related this perception system to architecture and for her the haptic sphere covers even more. It involves the integration of many senses, such as touch, positional awareness, balance, sound, movement and the memory of previous experiences, which finally all combine into one holistic whole. This definition affirms the complexity and size of experiencing architecture. For example, our footsteps can give us an impression of our balance, our positional awareness, the ground's texture and dimension, but the sound which is produced by our shoes can give us tactual architectural information as well. Therefore we suggest to redefine the sense of touch in relation to architecture and call it 'architouch', which involves all information concerning touch related to the built environment.

3.2 Non visual sensory inquiry

For our research, we have chosen to work with people without vision because for them knowledge about the visual reference system is absent. They have to rely entirely on their other senses (Cox & Dykes 2001) and are more attentive to non visual stimuli (Hollins 1989; Warren 1978). More than others, congenitally blind have to turn to their egocentric reference system (Millar 1976) and they experience space sequentially

(Milner & Goodale 1995). Consequently they are the ideal users/experts (Ostroff 1997) for a non visual sensory inquiry. For the interviews we apply open questions. Literature study as well as the first interviews point to the fact that people with congenital blindness ask for more and better acoustics and haptic architecture. During the interviews respondents refer to the ability of ‘facial vision’ (Hollins 1989), a talent to feel space with the help of the displacement of air or sound waves. The latter we call ‘echolocation’ (Kish 1995). Intuitively they prefer to have low ceilings and small rooms. Their preference goes out to orthogonally designed spaces, but they do not like to walk in an unnatural way. After all the most pleasant spaces are those where you can literally ‘feel’ yourself at ease. These spaces give people without vision their freedom back: *“The ability to travel safely, comfortably, gracefully and independently … is a factor of primary importance in the life of a blind individual”* (Foulke 1971).

4 Conclusion

This paper has reported on the preliminary results of ongoing research, which aims at identifying and evaluating haptic design parameters for architecture. Ultimately, these parameters should assist to incorporate cognitive human factors in the design process and, as such, contribute to the realization of Universal Design by humanizing the built environment elegantly.

Awaiting the final results of this research, architects can surely start preparing themselves for a thorough shift in mentality, for as this paper has pointed out, every designer can contribute to the realization of Universal Design provided that he/she takes the values of human centred design into account. Besides the importance of architects’ attitude, it has also highlighted the key role of users/experts and the need for interdisciplinary research between architecture and medical, social, and cultural sciences.

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