

Technology and the Senses: Multi-sensory Design in the Digital Age

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ABSTRACT

As society progresses into the future, the impact of technology on different aspects of our lives will continue to increase. The challenge for architects lies in determining how to combine technological advancements with fundamental sensual qualities. For architecture in the Digital Age, technological implementation too often overshadows multi-sensory design. However, when done carefully, technology and digital media can be used to help stimulate the senses and enhance the perception of a place. Through the venues of light, sound, and touch, this paper investigates how technology and the senses can work together to impact the experience of a place.

INTRODUCTION

Through academics, architects are taught to address various design aspects of building performance such as context, environment (sun, temperature, wind), cultural aspects, user behavior, occupancy, and function. These considerations are combined and manipulated into a formal aesthetic expression of the architect's imagination. However, it can be argued that emphasis on formal design principles and media-generated architecture is coming at the expense of sensory necessity. In an increasingly technological-based society, it is understandable that architectural principles would be influenced by both digital and technological developments. However, architects must not neglect the role that sensory stimulation plays in

both the design process and the experience of architecture. With the direction that architecture is heading, the thinking process of the technological approach needs to be reconsidered in order to balance the sensory one. Thus, the theoretical arguments in regards to the significance of multi-sensory design will be studied in this paper, along with case studies of how technology and the senses can work in conjunction with each other.

THE PERCEPTION OF SPACE

The dynamic nature of perception means that it is "continuously changing by various extents" (Kreji, 2008). Not only do people perceive things differently in the same situation or environment, they also apply different meanings to what they perceive. It is this variability that makes it very challenging for architects to produce spaces that are equally beneficial and meaningful to their occupants. Because an architect cannot predict an individual's reaction to a space, they must allow their instincts to guide them. But to what extent should architects rely on their instincts to produce emotional attachment to a building? The way that design arrangements impact emotional responses and what those responses mean to the building's users are important considerations. This idea is a fundamental aspect of multi-sensory design. By creating a "feast for the senses" one has more ability to connect with multiple users on different levels of experience (Lehman, 2010). Thus, the more diverse the built environment is the

more sophisticated the occupants' perceptions will be.

THE COMPONENTS OF MULTI-SENSORY DESIGN

Multi-sensory design is traditionally assumed to be design that impacts the five senses: sight, hearing, taste, touch, and smell. However, this notion encompasses only the most basic concept of multi-sensory design. In fact, there are three other systematic concepts related to perception that are incorporated within multi-sensory design: hapticity, kinesthesia, and syneasthesia. In essence, these systems take the five senses and reformulate them into an active, inclusive system that directly impacts the experience of architecture (Kreji, 2008).

Up until now the perception of “space” has been stressed, but it is important to note a differentiation between space and place. Place is established from space as it becomes better known and is endowed with the value that one gives it; this value is created is through our senses. Therefore, perception of place is essentially “processed” sensation (Malnar, 2004). Although perception technically only requires gathering information about the environment by at least one of the senses, the more senses that are engaged within a space, the easier it will be to establish the perception of place. This is why an argument can be made in favor of the necessity for multi-sensory design within the built environment. As the senses are used to establish a place, an experience of that place through hapticity, kinesthesia, and syneasthesia will be formed.



Picture 1.1 The creation of place

In psychology, the word haptic refers to “the ability to experience the environment through active exploration, typically with our hands” (Towards, 2010). This means that hapticity is similar to the act of touching. However, the main difference between touch and hapticity is that touch is often characterized as two-dimensional, and a haptic experience is three-dimensional (Towards, 2010). The sense of touch is essentially extended to include temperature, pain, pressure, and kinesthesia (Malnar, 2004). Thus, the third dimension makes movement an important factor in the experience of a place.

Unlike hapticity, kinesthesia is not a direct interpretation of one’s surroundings and, therefore, does not create an emotion within the body (Kreji, 2008). It does, however, have an important effect on the senses and is thus entwined with the experience of a place. People understand kinesthesia in a subconscious way, but it is rarely recognized because it is constantly experienced. In the simplest terms, kinesthesia is the examination of our environment through movement (Towards, 2010). No matter what type of movement occurs, whether it is walking, or even a head or eye-movement, the physical and reactive quality of kinesthesia is extremely relevant to the formation of one’s perceptions (Kreji, 2008). Thus, kinesthesia affects an experience through its connection with touch, movement, and hapticity. A

contemporary example of this philosophy is parkour, which is a physical practice of experiencing a place by traversing elements in an urban setting.

Syneesthesia is an involuntary phenomenon that collects sensory information from one sense and transfers it to another (Towards, 2010). This implies that there is no choice but to make connections between the senses when one is experiencing a space. Because of past experiences with certain sensory properties, a person's memory influences how his or her mind relates to seeing these properties again in the future. Thus, syneesthesia unites previous sensory information into one coherent representation of an experience without the need for actual sensation. A simple example of syneesthesia is to consider how people relate the color red to "hot" or blue to "cold" (Towards, 2010). In this way, syneesthesia has the power to alter perception by causing objects or spaces that one perceives to essentially enter our physical realm.

System	Anatomy of the Organ	Activity of the Organ	Stimuli Available
Sight	Ocular Mechanism (eyes)	Looking, fixation	Variables of structures in ambient light
Taste	Oral Cavity (Mouth)	Savoring	Composition of ingested objects
Smell	Nasal Cavity (Nose)	Sniffing	Composition of the medium
Touch	Skin, hands	Touching, feeling	Texture, weight, etc
Hear	Cochlear organs (Ear)	Orienting to sounds	Vibration in the air

Haptic System	Skin, joints, and muscles	Exploration (through touch)	Varying configurations of touch
Kinesthesia	Muscles, joints	Exploration (through movement)	Varying positions and movement of body parts
Syneesthesia	Neurological	Sensory Connection and transferrence	Memories

Table 1.1 Expanded summarization of the sensory systems (Malnar, 2004)

VISUAL PREVALENCE

The challenge with creating multi-sensory design is that architecture traditionally supports ocularcentrism, or the importance of visual qualities over the other senses. This should not be surprising, however, given that formal design principles used in academics today are verifiable elements of architecture and sensory elements are not. This means that to an architectural community grounded in aspects that can be substantiated and observed, the other four senses seem unreliable as design parameters (Malnar, 2004). This is creating an increased interest in the visual sense and a decreased interest in the other sensual qualities of the built environment.

In addition, architecture is also being influenced more and more by mass media, fashions, and various digital medias (i.e. internet, advertising, and television). Whereas in the past architecture was judged 'in situ', images of buildings can now be uploaded onto the computer for everyone, regardless of location, to see (Towards, 2010). In

response, architecture has already begun to adapt to our dominance towards the visual sense and virtual image. Many buildings no longer create a spatial experience grounded in expression (Towards, 2010). Before they are even experienced, they are judged by their digital representation - a representation that is extending beyond the aesthetical aspects of architecture and into the environmental aspects as well.

CASE STUDIES

Multi-sensory architecture should not only act as a visual journey but also as a physical experience in a place. Based on the different theories involving multi-sensory design, I have investigated three elements that I that believe help stimulate a sensory environment: Light, sound, and touch. Although the importance of these elements has long been established, in our contemporary culture, technology is quickly becoming an inherent part of architecture. Thus, it is necessary to merge past methodologies with present capabilities. By exploring different relationships between light, sound, touch, and technology we will be able to create ambiances that act as mediating devices between the two extremes. Along with an analysis of each element, a corresponding example of work has been included that portrays sensual elements through the use of technological means.

Light

Light and architecture have long been interdependent concepts. Light allows users to define the surroundings of a place and, therefore, forming a relationship between the two is inevitable. According to Pallasmaa the

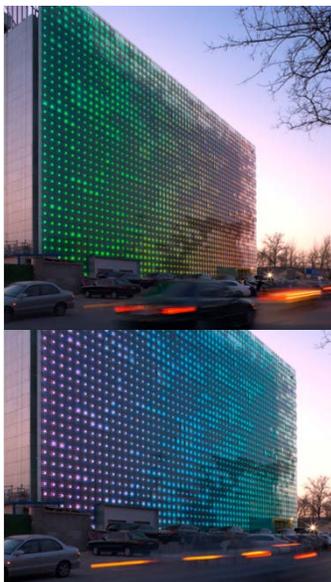
window should “act as a mediator between the inside and outside worlds” (Pallasmaa, 1996). Whether light is natural or artificial, however, is irrelevant to its importance in multi-sensory design; it is the manner in which it expresses a space that determines its relevancy. Light is also important because of the shadows it imparts on spaces. Shadow and light are connected in a way that few things are; light creates shadow, and shadow emphasizes light (Chapter, 2010). Shadow also expresses depth and texture of materials, but both light and shadow are needed to affect the atmosphere of a place (Chapter, 2010).

A-Asterisk Architects created a bold, modern design for an office building in Shanghai (Picture 1.2). Their inspiration came from images of shadows and trees, which they perforated onto GRG panels. Behind the panels, white glass helps enhance the experience by contrasting with the texture of the panels so that a building occupant truly feels like he is walking underneath trees (Leafy, 2008). The use of light and shadow creates a mystical experience that is uncommon to most office building lobbies.



Picture 1.2 Light – Leafy Shade, A-Asterisk Architects, (Leafy, 2008) retrieved from www.a-asterisk.com, 2 Nov. 2010

The advancement of technology has broadened the potential of lighting to manipulate the perception of a place. Architects are no longer required to rely on the sun to create lighting possibilities; the architect can now control light rather than simply respond to it. This has greatly affected the transfiguration and communication possibilities of architecture. Color can add another dimension to the output as well. Many architects have recently been exploring how colored light can become more dynamic within a space. An example of this can be seen in Beijing's Xicui Entertainment Complex. The building's curtain wall integrates the largest display of colored LED's in the world and is also combined with a photovoltaic system (Giostra, 2010). Thus, multiple types of technology have been utilized to create a lively display of lights. As the sequence in Picture 1.4 shows, each changing light combination creates a different experience of the surrounding environment depending on whether the colors are warm or cold and what arrangement they occur.



Picture 1.4 Light – Xicui Entertainment Center, Beijing, China, (Giostra, 2008) retrieved from

<http://gliving.com/category/lifestyle/videos/page/3/>, 3 Nov. 2010

Sound

Human beings are active creators of sound and place, and each are reinforced by the other. Architects' concerns with the acoustical quality of their buildings is certainly not a new concept; however, our ability to control and manipulate the sound within a building is becoming more sophisticated (Chapter, 2010). New digital technologies now allow sound to influence architectural space and be a design tool, rather than a second thought. The omnipresence of sound in the built environment makes it important for architects to understand the effect and meaning associated with spatial sound.

The relationship between sound and architecture can even be taken a step further than acoustical considerations and sound generation in a building. With new digital and sound technologies it may be possible to manipulate musical sound properties into a physical architectural space. No longer will sound only be capable of affecting the atmosphere of a building, but it can now affect the physical environment as well. Current research being performed by Jesper Bonde deals with the relationship between music, body, and architecture in order to develop a tool based on the qualitative and

quantitative parameters of sound. By digitizing the process of producing music and architecture the two can be linked to form a dynamic architectural experience (Bonde, 2010). Picture 1.5 illustrates possible building outcomes generated from musical digitalization and the different experiences that they could create. In my opinion, the first image creates a perception of mystery, while the second one creates a perception of energy and chaos. Whether or not this technique ever comes to fruition, it is interesting to consider how sound can be used as a manipulator of space.



Picture 1.5 Sound – Sound generated Space, Jesper Bonde, (Bonde, 2010) retrieved from www.jesperbonde.com, 2 Nov. 2010

Touch

The tactile sense is important because it connects us with the materiality of buildings. Architectural facades or skins can express multiple characteristics such as texture, density, temperature, and weight (Chapter, 2010). This allows for a creative environment and sensory experience. Improving digital media

allows architects to use, or even design, an endless assortment of textured materials and technological advancements mean that material selection is continually evolving. London designer Giles Miller used materials in an inventive way to create a tactile experience. He created a wall mural, entitled “Miranda”, consisting of a silicon base layer with over 65,000 polypropylene ‘hairs’ attached to it (Picture 1.6). The hairs can be brushed in different directions to create images or patterns on the wall (Miller, 2010).



Picture 1.6 Touch – Miranda Wall, Giles Miller, (Miller, 2010) retrieved from www.yankodesign.com/2009/08/17/brush-patterns/, 1 Nov. 2010

Another current trend involves smart materials, or materials that use functional properties to perform in response to a change in their environment. One example of this is thermochromic material, which changes color in response to temperature change. Thermochromic qualities can be used within a variety of materials including tiles, fabric, paint, and jewelry. Perhaps the interesting aspect of thermochromic materials, however, is that they take heat, which is inherently invisible, and make it visible. When used in architecture, thermochromic materials can effect the perception of a place

depending on how the colors change and the interaction of the users.



Picture 1.7 Touch – Thermochromic Paint, (Touch, 2010) retrieved from www.designboom.com/contemporary/wallpaper2.html, 13 Nov. 2010

CONCLUSION

Technology has many beneficial aspects to architecture, such as increasing production efficiency and energy efficiency, reducing costs, and enhancing digital representation to communicate design ideas. However, there still needs to be a balance between technology and the senses. Due to the enhancement of

technology, implementation of traditional architecture practices is not a feasible solution to this challenge, yet the solution needs to build off of those practices to establish the essence of the place. In many cases this means re-examining our design process to incorporate concepts that stimulate the senses, especially through the use of light, sound, and touch. The application of multi sensory design in an architectural project is definitely not an easy task. No two humans have the same perception of a space just as no two sites have the same surroundings. This challenge is further oppressed by the technology-centered state that characterizes contemporary society. However, although we may find ourselves deeply entrenched in the “digital age”, multi-sensory design is not time sensitive. Coming to terms with the challenges that multi-sensory design entails is the first step in achieving design that creates a true experience of place.

Bibliography

Bonde, Jesper. Sound Generated Space, 2010, Jesper Bonde, Denmark. Accessed 2 Nov. 2010. <<http://www.jesperbonde.com/>>.

Chapter 2. University of Pretoria. 19 Feb. 2010. Accessed 31 Oct. 2010. <<http://upetd.up.ac.za/thesis/available/etd-01192010-161423/unrestricted/02chapter2.pdf>>.

Giostra, Simone. Xicui Entertainment Center, 2008, E-Architect, Beijing. Accessed 3 Nov. 2010. <<http://gliving.com/category/lifestyle/videos/page/3/>>.

Kreij, Kamiel Van. Sensory Intensification in Architecture. Technical University Delft, 2008. Accessed 29 Oct. 2010. <www.scribd.com/doc/9025050/Sensory-Intensification-in-Architecture-by-Kamiel-Van-Kreij>.

Leafy Shade. 2008, A-Asterisk Architects, Shanghi. Accessed 2 Nov. 2010. <www.a-asterisk.com>.

Lehman, Lorena. Sensing Architecture. Studio Press, 2008-10. Accessed on 28 Oct. 2010. <<http://sensingarchitecture.com>>.

Malnar, Joy Monice and Frank Vodvarka. Sensory Design, Minnesota: University of Minnesota Press, 2004.

Miller, Giles. Miranda Wall, 2010, Yanko Design, London. Accessed 1 Nov. 2010. <www.yankodesign.com/2009/08/17/brush-patterns/>.

Pallasmaa, Juhani. The Eyes of the Skin: Architecture and the Senses. London: Academy Group Ltd, 1996.

Touch Me. Designboom, 2010. Accessed on 13 Nov. 2010. <www.designboom.com/contemporary/wallpaper2.html>.

Towards a Multi-Sensory Perception in Architecture. Design Your Own Mind, 2010. Accessed on 26 Oct. 2010. <<http://www.designyourownmind.net/?p=6>>.