

# *The coming age of calm architecture*

Alexander Ćetković

5 March 2015

published at "Mediacity 5 Conference" in Plymouth, UK, 2015

copyright ©2015 by the author

ABSTRACT: Interactive architecture is architecture that adjusts and adapts to the demands of personal, social, and environmental changes. The term is used for architecture that changes in both structural (walls, shades, surfaces, etc.) and atmospheric (temperature, lighting, sound, etc.) senses. In such responsive environments, the changes are often so omnipresent and explicit that the interactors' attention is captured by these changes. For interactive architecture to become a part of our everyday life in the future, it is necessary for it to become more discreet. Even today, combinations of interactive technologies, including interactive architecture, do not lead to the expected "bells and whistles" effect of new technology but to a dissonance and overload of signals and events - a scenario in which the user is led to ignore this technology altogether. The challenge for interactive architecture, as for interactive technology in general, is how to communicate with users without demanding too much of their attention. Marc Weiser, who coined the term ubiquitous computing, has made it clear that omnipresent technology will only be accepted if it is perceived as a calm technology<sup>1</sup>. And Malcolm McCullough states that 'the problem for all design disciplines is: the foreground [of user attention] is full' (<sup>2</sup>). As a possible answer to the problem of omnipresent technology, Weiser and Brown<sup>3</sup> build their vision of the Internet of Things based on the idea of periphery. Periphery is defined as something in the 'background that is outside the focal attention, but which can quickly be given attention when necessary' (<sup>4</sup>). In this scenario, the users perceive the interactive

<sup>1</sup> Weiser and Brown, 1997.

<sup>2</sup> McCullough, 2004, p. 49.

<sup>3</sup> Weiser and Brown, 1997.

<sup>4</sup> Ibid., p. 79.

elements when they need them, just as computer users turn their attention to printers only when they need them. The notion of technology in the periphery is built upon the theory of affordances, as defined by James Gibson<sup>5</sup>. This can be seen as a relationship between an object in the world and the intentions, perceptions, and capabilities of a person. One approach by which responsive architecture may become a part of our lives, as static architecture has, is to adapt it in such a way that only our peripheral awareness is stimulated. Current communication in interactive architecture is based on visual perception, since it has developed from modern architecture. Yet the other sensory systems also make a contribution; Gibson describes them as the auditory, taste-smell, basic-orienting, and tactile systems, and they all add up to the sensations of a place that we register. The most interesting point is that the non-visual senses tend to address us unconsciously.

In this article, I suggest that, for interactive architecture to become part of the periphery and still communicate with the user, it has to leave the focus of design around visual perception and include more of the subtle changes that are perceived through other senses, a method that is already propagated in the theory of "atmospheres" of spaces<sup>6</sup>. Looking at different strategies used in static architecture to stimulate peripheral perception, the praxis of an interactive architecture is an approach that does not compete for attention, that is tranquil, and that is not focused solely on the visual.

<sup>5</sup> Gibson, 1977.

<sup>6</sup> Böhme, 2006; Zumthor, 2006.

KEYWORDS: affect, affordance, communication, determinism, interactive architecture, periphery, user perception, unconscious

## *Introduction*

Interactive architecture is architecture that adjusts and adapts to the demands of personal, social, and environmental changes. The changes can occur in structural (walls, shades, surfaces, etc.) and atmospheric (temperature, lighting, sound, etc) senses. For certain authors<sup>7</sup>, responsive architecture is a subcategory of interactive architecture that uses automated systems built into buildings to react to changes in nature, such as sunshine, (automated shades that regulate the temperature) winds (such as changing the structural elasticity or rigidness of towers in reaction to side winds), structural changes (such as reaction to resting of foundations) or in extreme cases such complex and unpredictable forces as earthquakes. This paper will focus instead on the reaction of intelligent architectural environments to user actions. There is also a differentiation in the grade of sophistication of such systems, as in Usman Haque's description of interactive architecture<sup>8</sup>. For him, the term interactive architecture narrows to signify systems that use circular interaction or multi-loop interaction (systems with adaptable programs, such as heating that adjusts to users' working hours and weekend leisure habits), in contrast to merely reactive systems (lights switching on when a person appears in a dark room or shades coming down when the sun comes out). The difference lies not in merely reacting to certain events, but also in taking users' reactions to these changes into account.

<sup>7</sup> Fox and Kemp, 2009.

<sup>8</sup> Haque, 2006.

If we consider the number of user-oriented interactive architecture projects, we may be inclined to imagine that the world of intelligent and interactive architecture is imminent. One characteristic that

many of these projects have in common, regardless of the actions they undertake, is that they chiefly communicate visually or acoustically. Above all, these systems demand the attention of the user, either to inform or to require user feedback to deliver what the user wants. This is based on the premise that, to communicate with a user, such a system needs the user's attention, or, to be more specific - all the users' attention. To obtain users' awareness, many such systems go to great lengths in using every trick available in visual and acoustic signals, from applying blinking signs or repetitive sounds to addressing users directly by name. This might be fine and interesting if you have one system that needs attention from time to time, as research projects usually do. But combining a number of intelligent systems could lead to a cacophony of signals and events that might overwhelm any user. The user of such an environment would either become totally unresponsive to such signals or, in the worst case, would be scared away completely. Malcolm McCullough warns that 'the problem for all design disciplines is: the foreground [of user attention] is full' (9). The challenge for such an interactive architecture scenario is how to communicate with users without demanding too much of their attention.

Marc Weiser, who coined the term ubiquitous computing, was aware that omnipresent technology will only be accepted if it is perceived as a calm technology. In their essay "The coming age of calm technology", Weiser and Brown<sup>10</sup> base their vision of the Internet of Things on the idea of periphery. Periphery is defined as something 'in the background that is outside the focal attention, but which can

<sup>9</sup> McCullough, 2004, p. 49.

<sup>10</sup> Weiser and Brown, 1997.

quickly be given attention when necessary' (¹¹). In this scenario, the users perceive the interactive elements when they need them, just as computer users turn their attention to printers only when they need them. The notion of technology in the periphery is built upon the theory of affordances, as defined by James Gibson<sup>¹²</sup>. This can be seen as a relationship between an object in the world and the intentions, perceptions, and capabilities of a person. On the other hand Weiser and Brown find 'the idea of affordance, powerful as it is, tends to describe the surface of a design. For us the term 'affordance' does not reach far enough into the periphery where a design must be attuned to but not attended to.' (¹³)

<sup>¹¹</sup> Ibid.

<sup>¹²</sup> Gibson, 1977.

<sup>¹³</sup> Weiser and Brown, 1997, p. 10.

As mentioned above, current communication in interactive architecture demands users' attention to be able to communicate, mostly on visual and acoustic basis. In industrial design as in architecture, the approach to design has been above all visual. In the wake of ubiquitous computing and Weiser and Brown's article, the design industry has become aware of the problem and is looking for ways to communicate beyond the visual approach<sup>¹⁴</sup>. But how is it in architecture? Since the Renaissance and Alberti's perspective construction, the language of architecture has been largely visual<sup>¹⁵</sup>. One would think that architecture, having its origins in visual design methods, has no other way of being perceived. Yet users have other sensory systems that also add to our perception of the environment around us; Gibson describes them as auditory, taste-smell, basic-orienting, and tactile systems. Beside the five Aristotelian senses, Pallasmaa counts orientation, gravity, balance, stability, motion, duration, con-

<sup>¹⁴</sup> Kuniavsky, 2010, p. 31.

<sup>¹⁵</sup> Evans, 1986.

tinuity, scale, and illumination<sup>16</sup>. The interesting part is that the non-visual sensing does not necessarily draw our scope of attention, as these inputs are usually handled unconsciously.

<sup>16</sup> Pallasmaa, 2014, p.231.

### *Atmospheres*

For interactive architecture to become part of the periphery and still communicate with the user, it has to broaden the focus of design from visual perception and rely to a greater extent on the subtle changes that are perceived through other senses, a method that is already propagated in the theory of "atmospheres" of spaces<sup>17</sup>.

But what do we understand by atmosphere? In everyday speech, it is interchangeably used with mood, feeling, ambience, and tone - terms that Ben Anderson describes as collective affects<sup>18</sup>.

Atmospheres are for Gernot Böhme 'something three-dimensional that one immerses into to experience a change of mood' (19) or 'the distinction between the empirical qualities of a space and how we feel about them' (20).

Ben Anderson argues that many definitions of atmosphere are ambiguous. This is so deliberately. He cites different interpretations of atmosphere as a concept: impersonal or trans-personal intensity (McCormack), environment or the transmission of the other's feeling (Brennan), qualified aura (Böhme), tone in literature (Ngai), a sense of place (Rodaway), or emotions poured out and formed into spaces (Schmitz). Consequently, there is always a sense of vagueness in the description of atmospheres. Atmospheres correlate with anthropologically influential terms of mood, emotion, and affect. 'We find the

<sup>17</sup> Anderson, 2009; Böhme, 2006; Zumthor, 2006.

<sup>18</sup> Anderson, 2009.

<sup>19</sup> Böhme, 2006, p.16.

<sup>20</sup> Ibid., p.16.

same multiplicity when thinking about emotion, affect or any other term that might become part of a vocabulary proper to the logics of affect and emotion' (<sup>21</sup>).

<sup>21</sup> Anderson, 2009, p.78.

Anderson also opines that the lack of specificity in the language used for describing atmospheres is also due to the unsteady and fluctuating nature of atmospheres.

'Atmospheres are perpetually forming and deforming, appearing and disappearing, as bodies enter into relation with one another. They are never finished, static or at rest' (<sup>22</sup>).

<sup>22</sup> Ibid., p.78.

What makes this statement about atmospheres so appealing is that it implies a view of architecture that is not static but something in constant change. Furthermore, this perfectly matches the nature of interactive architecture. Interactive architecture understood as atmosphere is not based on the static views of plans and drawings but on a flow in an environment of ever-changing situations that occur as bodies appear and disappear and enter in relation with each other.

For Böhme, an important aspect of atmosphere is "leiblicher Raum," the space of flesh, meaning space as it is experienced. Flesh is used by Böhme to signify personal experience, rather than experience conceived through an anatomist, doctor, or architect<sup>23</sup>. This conceived experience, rather than felt experience, is what he calls experience of the body. We can observe the distinction in the discrepancy between a felt fever and the temperature of the body objectively measured below 37°C that is conceived not to be a fever. In architecture, people can find a huge space intimidating, and it makes them

<sup>23</sup> Böhme, 2006, p.14.

feel small. Alternatively, it can make them feel elevated and grand, depending on the atmosphere of the space. Böhme cites Sennet<sup>24</sup>, who condemns “diminishing of the senses, that seems to follow modern architecture like a curse”. The distinction between body and flesh is significant; Böhme believes Sennet’s problem with modern architecture is not its relation to the body but that it has lost its sense for flesh. In respect to this distinction between body and flesh, Böhme refers to the contrast between the concepts of Aristotelian space, *topos*, and that of Descartes, *spatium*. Cartesian space is the space defined by coordinates and measured through absolute distances. *Topos*, on the other hand, is defined through relations, vicinity, and location and is expressed in relative distances. A *topos* is the space where one is situated or resides. Cartesian space is space as it is conceived. The reason I remark on Böhme’s juxtaposition is because the distinction between the space of physical presence and space as medium of representation is crucial for the architect when designing space. The “space as a medium of representation” is a space conceived through typical design methods and is concerned with proportions, volumes and distances. These spaces are drawn, verified in models, and finally recorded as a photo. The “space of physical presence” is like *topos* in that the vicinity relates to the body. It is centralised on the position of ourselves and has directions related to our body (front, left, right, back, above, and below). There are also orientation points - elements that we relate to, that we gravitate to and are attracted to or repelled from. As such, a space is not an imagined space but a space of physical awareness in which we experience

<sup>24</sup> Sennett, 1994.

rience such sensations as narrow/wide, far/near, gravity (slope), the sensation of being attracted or repelled by objects, light, or haze. For Böhme, the link between experienced physicality and architectural forms is a combination of affects for motion or, as he calls them, motion hints (*Bewegungssuggestionen*). Moreover, a space of physical presence has an atmosphere<sup>25</sup>.

<sup>25</sup> Böhme, 2006, p.16.

Although the definitions of atmosphere are vague or ambiguous, Böhme indicates that architects can actually design atmospheres. Besides using such typical methods as geometry, proportion, form design, and measurement, this also means also taking into account light, colour, and sound. Further, signs and symbols should also be taken into consideration. Beside their signifying character, they contribute to certain atmospheres on the basis of their cultural connotations. One renowned architect who has explained how he tries to create atmospheres is Peter Zumthor.

### *Zumthor's creation of Atmospheres*

In his talk at the Renaissance palace of Wendlinghausen in 2003 entitled "Atmospheres. Architectural Environments - Surrounding Objects" Zumthor reflects on architectural qualities, how a building arouses feelings, and above all how a building can be designed to do so. For Zumthor, atmosphere is 'this singular density and mood, this feeling of presence, well-being, harmony, beauty...under whose spell I experience what I otherwise would not experience in precisely this way' (26). The atmosphere of a building is instantaneous; without our reflecting why we are attracted or repulsed by it, it addresses

<sup>26</sup> Zumthor, 2006.

the instinctive emotions. The atmosphere of a building, for Zumthor, cannot be attributed to specific elements but rather emerges from all its parts. For Zumthor, it is the magic of the mutual reaction between physical things and people - the physical reality that can move us. Zumthor uses nine points to describe how he approaches the design of a building to create an atmosphere:

*Body of Architecture* is the material presence of architecture. The combination of different materials and structures creates something we call architectural space.

*Material Compatibility* is the combination of different materials. Each of the materials has certain effects. Yet the contradictions or harmonies of different materials combine in the right proportion create an effect that could not be possible with a single material alone. 'Materials react with one another and have their radiance, so that the material composition gives rise to something unique. Material is endless.'<sup>(27)</sup> For Zumthor, there is a critical tension between materials that depends on their materiality and their mass.

<sup>27</sup> Zumthor, 2006, p.25.

*Sound of a space* Each space has its own tone with which it resonates. 'Interiors are like large instruments, collecting sound, amplifying it, transmitting it elsewhere. That has to do with the shape peculiar to each room and with the surface of materials they contain, and the way those materials have been applied.'<sup>(28)</sup> Even when there are no noises, a space has its own tone when it is silent.

<sup>28</sup> Ibid., p.29.

*Temperature of a space* Each space has its own temperature, influenced by the materials used. There are materials that give warmth and other materials that drain warmth from the users.

*Surrounding Objects* People gather objects around them to create their own atmosphere. Architecture is then a repository for such things that build up a “sense of home”. A mental image of such objects helps an architect design spaces to contain them.

*Between Composure and Seduction* Architecture is also an art of time control (*Zeitkunst*). Narratives of movements through spaces are at the root of most designs. Moods can be used to attract towards a space or to follow a path. There are also elements that can be used to slow users down or even woo them to stay. Such elements result in drifting, seduction, or letting go.

*Tension between Interior and Exterior* Every building has an inside and an outside with thresholds, passages, crossings, and openings. A contrast occurs between the concentration and intensity of the inside and the openness and detachment of the outside, between privacy and intimacy as opposed to public anonymity. Architecture likes to play between these feelings.

*Levels of Intimacy* The definition of the scale in relation to the body can decide the feeling of closeness or distance. The choice of elements used can influence whether a huge space can be intimidating and make one feel small or can make one feel elevated and grand.

*Light on Things* There is a tension between shadows and objects in light. One can imagine a building as a mass of shadows where light is let in, guided to cut through the shadows and form spaces. The materials and surfaces are exposed to light to create a play of

reflections and shadows. Sunlight is always preferred to artificial light.

Thus, architecture for Zumthor is a built environment for people to live in and socialise. If it is obvious how to use it, and its usage comes in a natural way, then the architecture is well accomplished. One would notice that all its elements are coherent, so one could not remove something without breaking the whole.

Looking at Zumthor's description, one is very much aware that visual perception, although very important, is not the only kind that matters in his architecture. His attention to peripheral sensory perception, here sound, touch, and warmth, and the feelings that are produced through contradiction (suspense of inside/outside), relations to the body (grades of intimacy), and to movement (in-between relaxation and seduction), is just as important. He is aware of the users' need to appropriate spaces, in that they may introduce their intimate things around them to create a sense of home. The built architecture becomes a repository for such things.

### *Strategies in architecture to stimulate peripheral perception*

Zumthor's ingredients for architectural atmosphere shows us that peripheral perception is an important part of experiencing architecture, but his presentation, except for the examples to explain what he means, does not deliver much detail about what elements are used and how they are designed to stimulate peripheral perception. What are these elements, and how could peripheral perception be used for interactive architecture? I would like to point out some strategies

used in architecture that are not based on gaining visual attention.

For the sake of systematic explanation, I categorise the strategies by sensory systems. I do not discuss peripheral vision, which is also an important part of unconscious perception, as this would go beyond the scope of this paper. Having said that, I want to suggest that these elements are not to be used independently but rather in combination with one another and as a part of the architectural ensemble. Hence, I start with the example of Sala di Giganti in Palazzo del Te, Mantua, which, although it has often been praised for certain of its elements, needs a multi-sensory experience to be properly understood.

### *Sala di Giganti*

Palazzo del Te in Mantua was built as a summer residence for the Count of Mantua by Giulio Romano and is of notable importance in architecture history as a prime example of rustication<sup>29</sup> and of early Mannerism. The most famous fresco in the palace is in the Sala di Giganti; it depicts the ancient Greek myth of the fall of the giants who dared to rebel against the gods at the moment they are defeated by Zeus. The room is atypical of rooms in the palace as it uses many special effects to create an atmosphere. An observer is immersed in the ambience by two means, the narrative of the fresco and the architecture of the room. Contemplating the drama on the walls, one gradually follows the action from the walls to the ceiling. There is no caesura in this observation, as the corners fade away and the distinct spiral created by the clouds supporting the gods on the ceiling guides the user's gaze. Following the narrative of the fresco,

<sup>29</sup> Summerson, 1995, p.46.

one starts turning around. The architecture of the room morphs from four walls into a dome, gradually losing any hold as corners and edges disappear. The original floor, as described by Vasari<sup>30</sup>, had round stones (*ciottole*), possibly with water running between them. Being uneven, the original floor encouraged a feeling of unease while observing the narrative. The room echoes eerily as it functions as a whispering gallery. All this, combined with the illumination of torches, summons a dizzying perceptual experience. The theme of the frescoes reminds the observer that one should not provoke the gods. Romano underlines this theme by putting the observer in the middle of the drama, on the level of the giants, and emphasises the lesson through the unease evoked by the atmosphere, not least by upsetting the balance of the observer through the spiral movement of the fresco narrative and the uneven floor.

<sup>30</sup> Vasari, 1568, p. 160.

### *Embodiment*

As Böhme remarks, physical perception of space and above all embodiment is an important aspect of how we experience space. Movement through a space is an important element in how the body experiences the dimensions and the qualities of that space (material of the floor, equilibrium, and sensations of narrow/wide and near/far).



Figure 1: The Fall of the Giants

GRAVITY as a force to move users has not generally attracted much attention from modern architects until recently, with the notable exception of a few, such as Claude Parent or Arakawa+Gins. In the Renaissance, it was sometimes used as an urban design element using concave and convex forms on squares and piazzas to drive people towards either the perimeter or the center, often using the topography, as in Sienna or the design of Campidoglio in Rome by Michelangelo. In the 1960s, Claude Parent and Paul Virilio worked

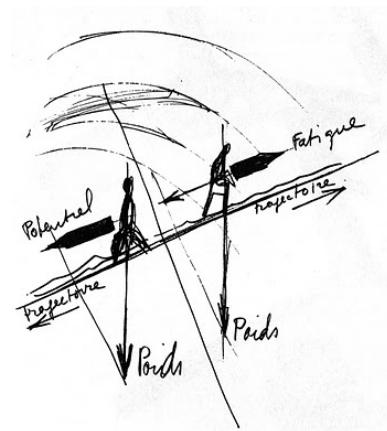


Figure 2: Architecture principe

together on the idea of “oblique architecture”, in which Parent’s ideas of slope met with Virilio’s ideas of heaviness<sup>31</sup>. Beside employing the theory on the church of Sainte Bernadette du Banlay in Nevers, Parent built several houses with slopes. The general public was exposed to his ideas in the French Pavillion in Venice in 1970. In his projects, he emphasises the “architecture principe” (Figure 2), the decelerating force when climbing and euphoric potential when descending, shapes that displease people who are not accustomed to being off balance<sup>32</sup>. This unpleasantness is comparable to the goal of the projects by Arakawa+Gins that introduced uneven floors in their buildings to create a general state of tentativeness (Figure 3). This is the basis of their reversible-destiny theory that negates comfort. The general idea for them is that as soon as people are seduced by comfort, they drift towards death instead of resisting such forces and opting for life.

A less radical view of the potential of gravity without the intention of creating unpleasantness is the Yokohama Project by FOA. Much like the shapes of some Renaissance squares, the slopes in the project are used to navigate people through the different areas of the building, defining a sequence of spaces for a narrative that people can follow.

**DISEQUILIBRIUM** Similar to gravity, equilibrium uses the bodily perception of our body mass. I distinguish here between disequilibrium and gravity; disequilibrium is the sensation experienced in elevators when they suddenly stop. And also used in Scarpa’s architecture.

In Tomba Brion, the tomb by Carlo Scarpa for the Brion family in

<sup>31</sup> At the conference one the participants argued that he cannot see anything calm in the brutalistic architecture created by Virilio and Parent. I noted that in an interview with Koolhaas (Koolhaas and Boom, 2014) Parent explained that Virilio was obsessed with the bunker architecture, wheras he was more interested in the concept of the ramp.

<sup>32</sup> Koolhaas and Boom, 2014, p.63.



Figure 3: Arakawa+Gins

San Vito d'Altivole, there are tilting stones in the pavement between the tomb and the lily pond surrounding a small pavilion. As many elements in Scarpa's architecture are reminiscent of maritime structures, it could be that the tilting pavement was inspired by the pontoons used in Venice to board the vaporetos. When a visitor walks over the stones, they tip under the weight of the body, creating a sequence of sounds. The stones have small holes, which amplify the tones. The whole passage is in a dark hallway, so the combination of disequilibrium and darkness creates a slight sense of unease, an emotion Scarpa uses in his narrative of the passage between the tomb and the pond with its pavilion, which is often compared to oriental gardens signifying paradise.

### *Acoustics*

Peter Zumthor mentioned that every space has a tone, and that part of a space's atmosphere is defined by how the space sounds. Yet rarely do architects consider sound when they design spaces. Indeed, the awareness of sound in spaces has diminished with modern architecture. The minimalistic expression of some public buildings, with bare concrete walls and glass and containing just the odd piece of simple furniture, might be calming to the eye; the acoustics in these spaces, however, stripped of any ornament or fabric, reverberate every little sound. At occasions where a large number of people meet, hardly a word can be understood, up to the point that one is scarcely able to hear oneself think.

In his book *Stadt hören: Klangspaziergänge durch Zürich* (Listening

to the city: sonic walkscapes through Zurich ) Andres Bosshard<sup>33</sup> describes how an acoustic artist perceives a city. In one of the walks through the old town of Zurich he explains how in a medieval environment sound always played a role. The different fountains scattered through the old town, preferably at junctions or places, provide each a specific sonic orientation that offers locals an unconscious indication of their whereabouts, especially in the dark. There are acoustic thoroughfares (Klangschleuse), passages with glass walls and concrete floors and ceilings, where the acoustics seems to rush the people through, and acoustic holes, where sounds that have been omnipresent suddenly disappear. The modern city's acoustics is usually affected by the traffic and other man-made noises. There are places in Zurich, like the square in front of the main railway station, where people seem to be always in a rush, as driven by some unseen force. Even the taxi-drivers waiting for customers prefer to wait in their cars. Bosshard attributes this behaviour to the discomforting acoustics. Other places, such as walkways under bridges or in front of skyscrapers, offer special acoustic settings. In his book, he defines an acoustic code that is used to create a "plan sonore" - an acoustic map of the town that explains how location-specific acoustic atmospheres are created. Understanding the plan sonore creates the potential to redefine or design specific characteristics of the town soundscape so as to match the overall acoustic perception. The shape and the form of the city streets and the places embedded in the hills and open to the lake create the basic elements of this code in combination with the overall hum of the city(Figure 4).

<sup>33</sup> Bosshard, 2009.

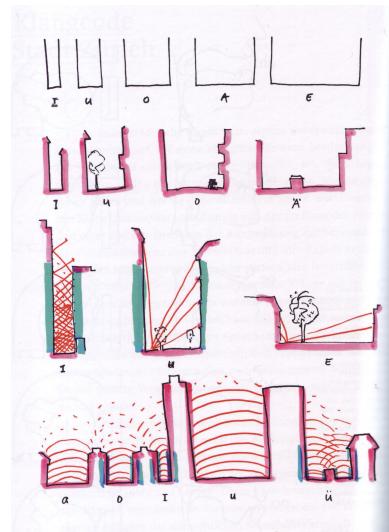


Figure 4: Assignment of vocals to street sections

The manipulation of our moods through sounds is currently a hot topic in the commercial world too. Elevator music that is slow and relaxing has been found to make visitors slow down and browse longer in shops. At the same time, such music distorts our acoustic sense of space, as it inhibits peripheral acoustic perception. The Mosquito, an 'ultra-sonic teenage deterrent system', which is intended to deter teenagers from an area by emitting an unpleasant sound only perceptible to people under about 25 years of age can be seen as a repelling element aimed at a specific community. But the efficiency of such measures is debatable, as research in Holland seems to show that using classical music in such environments has proven to be more efficient in deterring teenagers.

### *Smell*

We do not usually relate sense of smell to architecture, but the knowledge that smell triggers emotions and memories in us has often been used to link a location to a smell. Some of the earliest orientation keys in the lives of humans are linked to the sense of smell, as babies identify people and places using their sense of smell. The fact that babies orient themselves in their surroundings and become calm when they identify their bed through smell and touch is used often by their parents when they travel; they know that taking the bed mattress on a journey calms babies in unknown environments. In many religions, traditional rites have been linked to scents such as frankincense, and with them inevitably locations. Spanish Moors had orange trees in the patios of mosques that would provide scents

that also gave people an orientation in local and urban settings. The cosmetic industry is partly built upon the fact that certain odours evoke emotions in us. Supermarkets have started releasing specific fragrances in the fruit and vegetable areas of grocery stores, as it has been found to make people more likely to buy goods that they unconsciously believe are fresh and healthy.

### *Temperature*

The introduction of HVAC technology, beside artificial lighting and the elevator, has proven crucial in influencing forms of modern architecture, as described by Banham in his "The Architecture of the Well-Tempered Environment".

The artist and architect Philippe Rahm has been using technology to question the effects of artificial atmospheres in architecture. Besides working with air quality, climate, lighting (and other non-visible wavelengths), and scents in many of his projects, he has used temperature as an element of design. In his project entitled "domestic astronomy", he distributes vertically distributed areas in a single space as platforms (sleeping, toilet, bath, sitting) which can be reached by ladders. The platforms are differentiated in their functions, and their heights are defined by the ideal temperatures for the activities that take place there. The temperature dispersal in most spaces is vertical. Similarly, in his project for the Lucy Mackintosh Contemporary Art Gallery, he designed zones in a single space with different heating conditions, depending on the functions: working and sitting at 21°C, touring the show at 19°C or storing artworks at

16°C.

One of the more sophisticated academic examples is the 'adaptive house', which learns automatically from the habits of each separate user so as to predict their actions and desires in advance and act appropriately. The 'adaptive house' is an example in which the system analyses the correlation between household activity and user reactions. The house has a neural network, which learns over time how the user wants it to react to specific conditions. Not only do the user and the system interact with each other; they actually adapt to each other as specific habits emerge over time. So, for instance, the system learns when the occupants are usually out of the house for work or when they go to sleep, turning the heating down in the idle time and turning it up early enough to have an ideal temperature before the house is used, thus contributing to substantial cost reductions.

### *Changing of Roles*

I have described some of the strategies used in architecture to stir peripheral perception, many of which only affect users while they move. The effect, if it takes place, is usually in the change of movements or to touch users' emotions. These strategies cannot always be simply repeated in interactive architecture, as certain affects have to be reinterpreted in an architecture that changes. This can be examined by comparing the changing of roles with architectural elements we have all used - the door and the automatic sliding doors.

The role of a door, especially the front door, is to separate inside from outside and at the same time provide a link between two neigh-

bouring spaces. Doors protect, keep out, keep warm, keep quiet, invite, hide, represent, show that someone is in, and show that someone is waiting outside. Doors are not only barriers or connectors, but as they define the place where people get in or out, they are inevitably the places where people meet. This is often used to advantage; think of the mistletoe hung above the door or the bench put at the entrance door. There are rituals of politeness around the meeting at doors: keeping the door open; a gentleman letting a woman go first; and awaiting guests at the door. People stand at the door talking when welcoming or bidding farewell.

The role of automatic sliding doors seems at first sight to be the same as the classic door, as it separates two spaces and links them at the same time. It even has the obvious advantage that one need not use the doorknob to open or close the door, only stand in front of it to use it, especially helpful when something is being carried. Yet most people do not realise that the role has changed. The automatic sliding door is a moving machine that forces people to pass the doors in the fastest and most direct way. No one stands and has a chat in the doorway of an automatic sliding door. People do not meet; they rush past one another. Automatic sliding doors are installed at places where the efficient flow of people needs to be ensured. It is so effective that people do not realise that the rituals of the door have also disappeared. There is no hierarchy, no gender or race, there is no politeness, no exchange of words, and communication is reduced to a brief glance as all are rushed through from one space to the other.

## *Conclusion*

Much of the communication in interactive architecture could be achieved without the screens and noises that need users' attention to interact. Instead, using one of its greatest assets, communication that we are used to in everyday architecture, some of the information needed can be passed using our peripheral perception. The theory of atmospheres in architecture describes how we peripherally perceive the ambience around us. Many of these impressions we perceive habitually, without even being consciously aware of them. Put together, however, many of these impressions, registered through the different senses we have, set us in a mood and influence our actions. We register even the smallest changes without needing to draw our conscious attention to them. These subtle changes can be on the level of gravity, equilibrium, change in sound level, light, temperature, smell, haptic, or even visual, and are often perceived simultaneously. Our subconscious filters the information and effectively decides whether it is meant for us, could be attended to later, or needs our attention. Luckily for us, most of the information perceived unconsciously will not be consciously attended to. Some information needs to be aggregated from several different signals to be apprehended. Interactive systems could collect their feedback from users without people even being aware of it, subliminally, through the position of their body, their presence, a movement of their hand, or simply not reacting to it at all. That would be interactive architecture that we would take for granted as a part of our habitual environment. Instead of annoying us and robbing us of our time, we would then notice it only if we

missed it, if it were broken or absent.

### *References*

- Anderson, Ben (2009). 'Affective atmospheres'. In: *Emotion, Space and Society* 2.2, pp. 77–81. ISSN: 1755-4586. DOI: 10.1016/j.emospa.2009.08.005. URL: <http://www.sciencedirect.com/science/article/pii/S1755458609000589> (visited on 03/19/2015).
- Böhme, Gernot (2006). *Architektur und Atmosphäre*. ger. München: Fink. ISBN: 3770543432.
- Bosshard, Andres (2009). *Stadt hören : Klangspaziergänge durch Zürich*. ger. Zürich: Verlag Neue Zürcher Zeitung. ISBN: 9783038235491.
- Evans, Robin (1986). 'Translations from Drawing to Building'. In: *Translations from Drawing to Building and Other Essays*. Architectural Association Publications, pp. 153–193. ISBN: 1-870890-68-X.
- Fox, Michael and Miles Kemp (2009). *Interactive Architecture*. 1st ed. New York, NY, USA: Princeton Architectural Press. ISBN: 1568988362.
- Gibson, James Jerome (1977). 'The Theory of Affordances'. In: *Perceiving, Acting, and Knowing: Toward an Ecological Psychology*. Ed. by Robert Shaw and John Bransford. 1st ed. New Jersey, USA: Lawrence Erlbaum, pp. 127–136. ISBN: 0-470-99014-7.
- Haque, Usman (2006). 'Architecture, interaction, systems'. In: *Arquitectura & Urbanismo* 149. Brazil: Pini. URL: <http://www.haque.co.uk/papers/ArchInterSys.pdf> (visited on 04/03/2011).
- Koolhaas, Rem and Irma Boom (2014). *Ramp*. eng. Elements of architecture. Venice: Marsilio. ISBN: 9788891013088.

Kuniavsky, Mike (2010). *Smart Things: Ubiquitous Computing User Experience Design*. 1 edition. Amsterdam ; Boston: Morgan Kaufmann. ISBN: 9780123748997.

McCullough, Malcolm (2004). *Digital Ground : architecture, pervasive computing, and environmental knowing*. Cambridge, Massachusetts: The MIT Press. ISBN: 0-262-13435-7.

Pallasmaa, Juhani (2014). 'Space, place and atmosphere. Emotion and peripherical perception in architectural experience'. In: *Lebenswelt. Aesthetics and philosophy of experience*. 4, pp. 230–245. ISSN: 2240-9599. DOI: 10.13130/2240-9599/4202. (Visited on 03/24/2015).

Sennett, Richard (1994). *Flesh and Stone: The Body and the City in Western Civilization*. English. New e. edition. New York: W. W. Norton & Co. ISBN: 9780393036848.

Summerson, John (1995). *The Classical Language of Architecture*. Reprinted. World of Art. London: Thames & Hudson. ISBN: 0500201773.

Vasari, Giorgio (1568). *Lives of the most Eminent Painters Sculptors and Architects*. Trans. by Gaston du C. De Vere. Vol. 6 (of 10). [EBook # 28422, Release Date: March 27, 2009]. URL: <http://www.gutenberg.org/files/28422/28422-h/28422-h.htm> (visited on 02/26/2015).

Weiser, Mark and John Seely Brown (1997). 'The Coming Age of Calm Technology'. In: *Beyond calculation: the next fifty years of computing*. New York, NY, USA: Copernicus, pp. 75–85. ISBN: 0-38794932-1. URL: <http://dl.acm.org/citation.cfm?id=504928.504934> (visited on 07/13/2012).

Zumthor, Peter (2006). *Atmospheres: Architectural Environments - Surrounding Objects*. 5th Printing. Basel, Switzerland: Birkhäuser Architecture. ISBN: 3764374950.