THE COMPATIBLE HOUSE: HYBRID ARCHITECTURE

by

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AUTHOR'S DECLARATION

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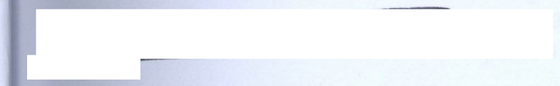

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ABSTRACT

As a speculative vision of the future, the Compatible House was designed to promote critical thinking in architecture by questioning the validity of hybrid space design. The house, once a private space now pierced with public network signals, proved to be an ideal typology to demonstrate the influence of digital space on our physical space. Research and case studies concluded that current technology can be misused within architectural design with serious repercussions. The research also concluded that achieving successful hybrid architecture is to understand the role of the user within the context of the Information Age and enable that user to manipulate the properties of their physical space. As a means to embrace the obsessive trend of digital immersion without disregarding the importance of architectural space, the Compatible House makes use of specific design techniques and emerging forms of technology that demonstrate a productive, evolutionary vision of a possible way of life in the future.

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DEDICATION

I dedicate this work to my parents, Mario and Maria, and to my sisters Lisa, Tina and Erica.

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CHAPTER 1 - INTRODUCTION AND LITERATURE REVIEW

Introduction

The relationships between space, place and time in architecture have always been seen in relation to the progressive needs of a society. As we have recently witnessed an unprecedented evolution of technology, the influence of this evolution on architecture has transformed these relationships, creating threads of discourse that question fundamental aspects of design practice, including user experience and contextual perception. The information age has brought about new communication systems that can radically transform space and time, creating instances of alienation from social, cultural, historical and geographical meaning. These communication networks such as the Internet that we are constantly projecting ourselves into, however, contain dormant forces that can significantly influence our physical environment and the interaction that takes place within it.

Digital space is real, but not tangible and can become hybridized with physical space to create a new spatial form both technologically and culturally. We are living in a time of cultural and technological convergence – a shift in our perception and comprehension of space, materiality and time. This shift is exemplified in our pervasive computing, which has created a reciprocal action between the architecture/user relationship and the static and liquid properties of space relationship – meaning that architecture is beginning to demonstrate the ability to change its form or skin and the people using the space are rendered increasingly static by using their digital devices. These fundamental changes regarding human usage of both public and private spaces are occurring on local and global, macro and micro scales alike.

Although these trends have trailing connections to the implications of globalization and capitalism, the transgression of information communication networks into daily life has created new physical characteristics that have previously only been imagined. Though still within its primitive and unexplored stages, the concept of Hybrid Space poses a new architecture that supersedes the current media screen skin with a more vigorous implementation of digital space as a positive supplementation to the characteristics of physical space. Due to the given nature of digital space as a democratizing agent of communication, there is a debate over the cultural and social impacts of imposing a globalized medium of space into specific local contexts. The challenge then is to learn from failed attempts at using technology as a design driver and exploit the attractiveness of digital space – being its different set of governing rules, that has allowed the continuous pervasive computing of our society to take place. We may then chimerically establish a new dynamic of the properties of space to support the new hybridity of our physical environment. This new dynamic will have the ability to cater to the individual user and to prevent digital interaction from overcoming the importance of physical space.

Learning from history: The Importance of Accurate Speculation into the Future

Historically, technological advancements have significantly affected architectural design; examples include the use of concrete by the Romans or the mass-fabrication methods of the war effort in the early twentieth century. Technology has consistently provided new and exciting modes of expression and broadened the potentials for the production of physical spaces. Although technology is a very powerful tool in design, architects must carefully prevent of technology from completely driving the form of physical spaces. An example can be seen in the early years of modern design. With a heavy emphasis on mass-production, modularity and mechanical mimicry, modern buildings and urban planning strategies supported technological advancements rather than the people using them. Though breakthroughs in design occurred during the modern era, such as the open plan and curtain wall system, many flawed experiments in design were carried out due to unsuccessful speculation of living in the future.

As an example of excessive technological influence, one may look to the works of Lucio Costa and his Brazilian capital city plan of Brasilia. The design posed a new social and physical construct for the country's population. Typically, the pre-industrial cities of Brasil possess the reciprocal nature of figure/ground and solid/void relationships (Holston, 1989). In a typical street, the buildings (solids) become the ground and the street (void) becomes the figure, creating

Figure 1.1 Brasilia (left) vs. Ouro Preto. Credit: Google Earth.

public interaction and communicative environments (see Figure 1.1). When a open square occurs, such as a piazza, the void of the square becomes the ground and the building becomes the figure, creating an instant association of importance to the architectural inventory of that space. This reversible nature is almost non-existent in Brasilia. The design of the city promotes vehicular travel, establishing large highways and interchanges. The strong symmetry of the plan dictates segregated spaces of residential, commercial, institutional and green spaces that are very difficult to traverse. The main problem with Brasilia, which is also shared by its users, is the

lack of a street presence. There are no street corners in Brasilia. Each building is removed from the street and converted into a figure, with large open public spaces around its form. The design of the city posed a significant change for the way of living as a Brasilian citizen. Influenced by the current technology of the airplane and its mechanical organization of parts, the design of segregated functions and symbolism as a revolutionary, up-to-date way of life ultimately failed as a city in the eyes of Brazilians (Holston, 1989). Today, this modern city is occupied by the wealthy and used in ways that do not reflect the excitement and interaction that most Brazilian cities and their occupants expect. We must learn from history the implications of applying a new way of living and new spatial systems, demonstrated by the living machine city designs during the modern era, such as Brasila. Speculation into the future within design must be carried out responsibly and gradually to establish a sense of familiarity during the change. In the case of Brasila, the change of lifestyle was abrupt, imposing, and secondary to the importance of showing the world how advanced their society was.

Learning from history: The Implications of Architecture as Background

In the book *Blue Monday* by Robert Sumrell, the relationship between music and architecture is discussed and portrayed as the first medium used for globalization. Music, historically, was supported by communal activity. Songs commented on the work process, everyday life, or religious themes. As stated by Sumrell (2007), this commentary established a shared bond between co-workers and provided a means to share experiences. Prior to the industrial revolution, all sounds were unique, even if produced repetitively. Sounds adapted to the circumstances of the moment. Sumrell (2007) states that as the machine age arose, the mechanized sounds of factories and automobiles, replaced the natural aesthetic of human comfort in sounds, and caused a shift in power to capital: "As the phonograph evolved from its original 1877 model and became a presence in the household, the experience of listening to music became environmental with the listener perceiving music in a distracted state, rather than through active contemplation" (p. 104). The dispersion of music therefore no longer reflected communal musical appreciation and became one of the first models of temporal reduction and an uprooted sense of place and cultural context. Sumrell (2007) makes a persuasive argument that the incorporation of Muzak into the home and work environment made music even more autonomous, as its intentions were to eliminate sensory distractions and increase productivity. Within modern archtiecture, Musak evolved into what has been called the *Stimulus Progression*, which is quantitatively categorizing Musak based on the physical environment of users. In other words, the media of Musak was directly associated with the image of a new cultural reform through modern architecture. Sumrell (2007) states that Musak became the palpable representation of architecture through sound, thus part of a psychological association deemed as proper and justified. As architecture expanded into more collaborative open environments, Musak developed into *Atmospherics*, which looked into the spatial organizations of

environments, the non-linear implementations of musical moods, and self contained intentions. Sumrell (2007) argues that atmospherics acted as a form generator of corporate culture that supported group hegemony and shared cultural references. The result is the individual as a human chameleon, constantly looking outward for social cues, seeking an appropriate background condition to settle upon and lose distinction from the world. This apocalyptic perspective holds merit within the debate on the social conditions of architecture. Using Musak as an example of a medium for change, architects must become weary of the de-materializing psychological affect of applying a sensory stimulus that is identically shared globally. Media-scape design in architecture is one such example.

Understanding Progression: The Marvel of Information Technology

We presently exist within the confines of the information age: an age of seamless temporality of space. There is a tendency for information technology to affect society and culture on both the local and global scales. The information age contains a society of instantaneity, sharing information through electronic networks and systems at an alarming rate for completing daily tasks. Inevitably, digital space and computational devices have increasingly become more complex, rational and representational of their original design inspiration – the human mind. Information technology has always been a means of understanding how the human mind works, and of achieving systems that could become comparable to the mind's degree of complexity. At

Figure 1.2 Artificial Living Skin. Credit: Marcosandmarjan.

earlier stages, technological mimicry of the mind occurred using complex systems of electrical signals in an attempt to replicate the logical operations of human thought (Verb, 2004). These developments lead to mechanical intelligence and the use of experience as part of a feedback loop systems, demonstrating adaptability. This feedback system would contribute to other fields such as the medical profession – leading to the development of neural network and self-reorganization studies of the human body (Verb, 2004). It is then no surprise that the first version of organized complexity was introduced – the computer, as a programmable entity that could perform tasks similar to the thought process of the human brain using features such as memory.

The study of cybernetics – the interdisciplinary study of communication and control processes in mechanical and biological systems was then introduced to academia as a by-product of the work of Buckminster Fuller and his research on energetic geometric systems (Verb, 2004). This new interdisciplinary world of collaboration would give birth to many new areas of study, including artificial intelligence, distributed networks, intelligent building skins and materials, embedded interactive environments, the internet, and nanotechnology (Verb, 2004). The trend of technological developments continuously relay, to a certain degree, some form of representation of the human body and its inherent complexities. We have the 'bottomless pit' of research into the human body to thank for the inspiration and curiosity that has provoked new ideas and techniques into architectural design and materials. The main difference between the information age and the machine age is the understanding of the thought process and particularly the processes of decision-making and control. Though not fully developed, there continues to be a race to the inauguration of completely self-aware systems in all aspects of society, including architecture. Although the use of technology has enabled the production of new forms and methods that mimic human nature and biological processes, how do they affect human usage of space? Using modernism as a reference, it is evident that an obsessive design approach to technology can have several implications associated with the use of the tangible product. An investigation is therefore necessary into methods of design that use technology responsibly.

Classifying Hybrid Space

Hybrid space refers to the influence of digital space on the way humans use the physical realm. This relatively recent area of research aims to understand the phenomena of digital space and its profound affects on society. As stated by Zellner (1999), hybrid space defines an architecture that is produced by combining ideas or concepts of contrast - the strong and the weak, the formed and the formless, the real and the virtual. Zellner (1999) argues that hybrid spaces use architecture as an organizational tool by arranging the spaces between things rather than perpetuating the myth of ideal form. The applications of hybrid space occur in public and private environments, social and cultural systems, and digital and physical realms. Though there are

many moments and situations where hybridity exists, the following is a condensed classification of such instances:

1. control
2. interaction
3. communication
4. autonomous behavior

Control refers to the ability of digital systems to organize the usage of space. This entails situations that concern access to spaces and circulation patterns, such as using an access card or retinal scanner to enter a room or elevator. *Interaction* refers to the physical interfaces created by the use of digital systems. This form of hybrid space encompasses the sensual factors of the perception of space and the role of digital techniques to manipulate, amplify, diminish or redefine the sensual experiences of space. Examples of interactive hybrid spaces would be projections on surfaces or responsive building systems to both tangible (eg. sunlight, rain) and intangible properties of space (emotions). *Communication* refers to the social effects

Figure 1.3 Critical Mass Bike Ride. Credit: Hybrid Space.

of digital communication networks. Contrary to the physicality of interactive hybrid spaces, hybrid communication addresses the potential of digital space, as a single entity, to evolve design methodology simply by considering its presence and influence on society during the design. As a phenomenological approach, this form of hybridity can be seen in the occurrence of flash mobs and the mobilization of public spaces through communication technologies. This mobilization of public space has been recognized by Marion Hamm (2006), who describes this communicative hybridity of digital and real as socially constructed spaces. Using a Critical Mass Bike Ride in London as an example, Hamm has analyzed the affect of cyberspace overlapping the public sphere of physical space and how these forms of technology can be productive and evolve in terms of their use and interpretation (see Figure 1.3). Critcal Mass Bike Ride is about resistance, showing that digital space can communicate, support, and evolve with the 'geographies of protest' aided by online and offline practices (Hamm, 2006). This means that an essential local and global relationship must be present. *Autonomous Behavior* (AB) includes design practice and the role of the computer as a design lead through algorithmic decision-making. AB hybridity engages with an environment without prior knowledge of that environment or its users. The system can therefore perform a decision making process based on environmental input that is processed and executed in a manner that is considered rational and proper without any external influences.

The four main classifications of hybrid space can and often do intersect one another to form more robust effects. Segregating these systems however, helps to understand the vast applications of hybrid space, and the degrees in which further interventions into the productive nature of this form of space could be pursued.

Glocal : A Perspective on Globalization and Context

The information age has brought about new, easier and more efficient communications. New information communication technologies (ICT) have not been unanimously embraced globally, and their impacts have been debated as either beneficial or degrading. The positive factors of globalization through ICT's are the democratizing agents of change associated within network communities. This new force of networking acts to decentralize and redistribute power rather than reinforcing and consolidating it (Tschumi, 2003). ICTs have also produced new avenues of networking that are quite beneficial. Within architecture, an example would be the firm OCEAN, and their intercontinental nodes of practice as a research and development firm. The removal of the temporal sense of space by ICT's enables collaborative environments, on which firms such as OCEAN thrive (ODRN). Embracing the effects of information networks involves the understanding that networks do more than just organize activities and share information; they also support the newly emerging social transformations in addition to emerging technology. Manuel Castells (2007) states that networks can even be perceived as producing and distributing cultural codes, also considered as the introduction of space flows (Bell, 2007). With

the seamless geography associated with the timeless time of information networking, the space flows represent people, money, technology, ideologies and media (Bell, 2007). These flows become evident in physical space when they touch the surface of the earth, forming nodes (Bell, 2007). The strongest nodes, which are seen as global cities, are controlled by the selective nature of globalization – otherwise known as indigenization (Tschumi, 2003). This process is sought to prevent the global community from becoming a mono-culture by understanding the value of the scapes of information (technology, ethnicity, media, financial, ideological) as seen by the users of that specific cultural community.

The benefits of enforcing indigenization on a well established society are very evident in some contemporary architectural interventions. Examples include the Guggenheim Museum Bilbao by Frank Gehry in Bilbao Spain or The Murinsel (Mur Island) by Acconci Studio in Graz, Austria (see Figure 1.4) (Acconci, 2003). The visual and spatial qualities of these interventions juxtapose the existing urban fabric significantly. Being controversial with respect to cultural

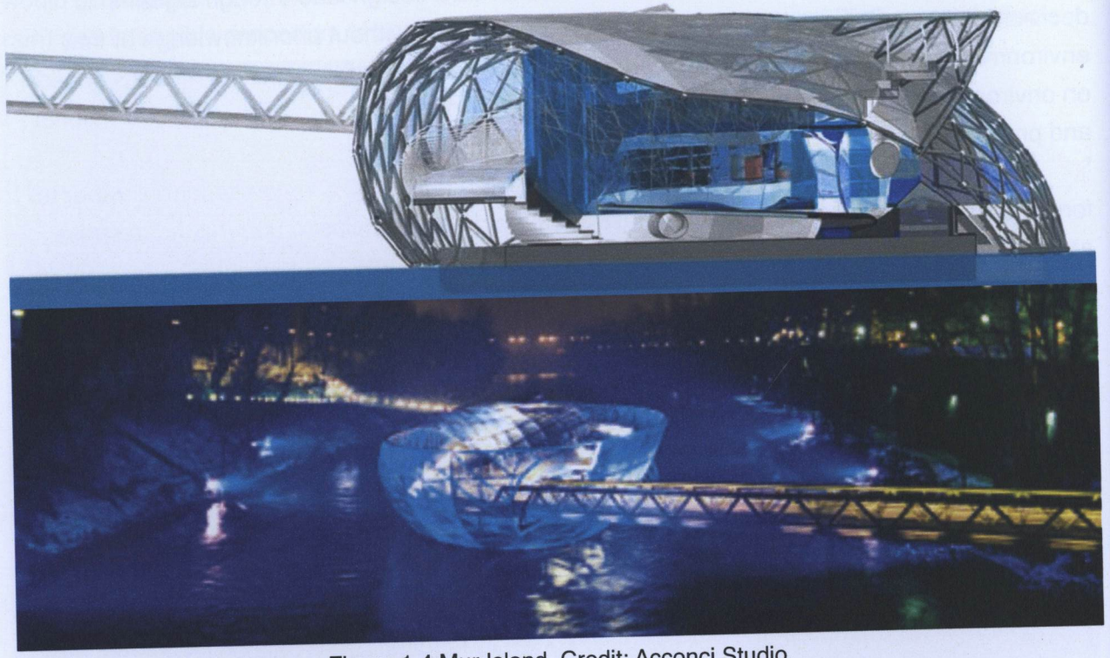


Figure 1.4 Mur Island. Credit: Acconci Studio.

responsibility and contextual adaptation, both projects were responses to communities in turmoil or neglect. The production of these fantastic forms breathed life into their financial and technological scapes, which were readily accepted as a 'good' thing by the immediate community. Therefore, the best way to produce an intervention based on a new form of technology is to understand, and make understood, the abilities and desires of a community to accept designs that are results of global/foreign techniques/technology (Blundell, 2005). Essentially, a participatory model of design or one which caters to the micro scale of each individual would be the most appropriate approach.

The Dualism of Globalization

The problems associated with globalization reflect its dualistic nature. Global cities and environments tend to have bits of other cities and environments within them, which reduces the originality and nostalgic qualities of that environment (Tschumi, 2003). The result is the ubiquity that arises within the scapes as previously discussed. As we become more pervasive with computers and technology, the world we live in has been considered as becoming all space and no place (McCullough, 2004). In the book *Digital Ground* Malcolm McCullough, space and place can be identified within the following:

SPACE	PLACE
1. Movement	1. Rest
2. Anxiety of global indifference	2. Comfort of local malleability
3. Alienation	3. Identification
4. Ordering of understanding	4. Ordering of experience
5. Social production	5. Personal reading
6. Basic divisions of surroundings	6. History and adaptation to them
7. Scene of being	7. Human modes of being well provided for (p. 176)

ICTs have created instances in which space has become disseminated, place has become uprooted, and time has become almost non-existent. In other words, time and space are warped by the network society. McCullough (2004) states that space is accelerated, randomized and de-sequenced, leading to timeless time and temporal perturbations that upset the former rhythms of life (see Figure 1.5). The term tourist has even been used to describe the spatial experience of contemporary architecture (Tschumi, 2003). In an essay by Balkrishna Doshi entitled Cultural Continuum and Regional Identity in Architecture, there is an emphasis on the need to look into past heritage and architectural practices and understand the evolution of adaptation within the cultural undercurrents that nourish society (as discussed in Canizaro, 2007).

Figure 1.5 T-Mobile Headquarters, Germany. Credit: Media Facades.

Architectural moments of apparent disregard for cultural and social context are best portrayed on the exterior surfaces of buildings. The surface of a building is the mediator between the architectural spaces within and the social constructs that exist on the exterior. The surface engages with the public in two main ways: communicate function and establish identity. Information networks have created a trend towards the agglomeration of these surfaces into the general media fabric. An example is the inventory of Las Vegas and the work of Venturi and his 'decorated shed', which clearly demonstrates a detactchment from local context (Tschumi, 2003). The more contemporary model of this surface application addresses the scapes referred to in earlier discussions, such as social, technological and programmatic influences. The envelope of a building becomes de-territorialized as the surface begins to struggle with the ability to be distinct and adaptive to a given context (see Figure 1.6).

Figure 1.6 International Media Avenue, Beijing. Credit: Media Facades.

One standard debate on the media façades and media architecture is between advancing the potential of skins and the implementation of television monitors (Edler, 2008). In the latter, Tim Edler (2008) states that architecture attempts to generate a feeling of some futuristic endeavor regardless of its rather conventional methods of production, becoming unauthentic in the process. The aesthetic appearance therefore becomes nothing more than a distraction. The media surface weakens disciplinary autonomy and this new envelope is now a de-differentiation of form, technique and experience, becoming no longer a distinctive entity but

merely a part of a large system (Tschumi, 2003). Socially, the media façade can be beneficial in terms of identification, especially amongst societies in turmoil or with minimal contemporary interventions. Sumrell (2007) states that the problem however is that social realms become less distinct and more a part of a new flow of mass subjectivities held by many people all at once. Users must then become, as mentioned earlier, human chameleons; individuality is expressed without a sense of home. This type of architecture is seen to carry the negative qualities of the information network society. The potentials of surfaces to act as hybridizing agents of architectural design is a significant factor in developing new, culturally respective interventions that avoid the traditional media 'skin' draped over architecture.

Perhaps the most realistic perspective on globalization is by Joan Ockman and her theory of globalization within a post-critical age. Ockman argues that globalization has given a pervasive sense of cultural disconnection so that there is no longer a privileged position to be critical (as discussed in Tschumi, 2003). The market has contaminated every sphere of life and globalization and criticism are now incompatible. Everything local is permeated by the global while the local ultimately changes the form of the global (Tschumi, 2003). Ockman states that the political realm becomes both formal and informal, the cultural tendencies become homogenously consumer oriented with regards to lifestyle and mentality, and communication and networking technologies are criticized for the suppression of difference, eradication of local traditions and heritages, environmental deprivation, and economic privatization and de-regulation (Tschumi, 2003). It is obvious that the affects of globalization and culture pose significant disagreements amongst researchers in an attempt to pursue a movement that can be uniformly agreed upon. The fact remains that culture is mediated through modes of communication; therefore any transformations in modes of communication, including communication technologies, have profound implications for culture. Since ICT's are in constant flux, and culture is mediated through these ICT's, the role of media on physical space induces critical thinking into ways mass media can become heterogeneous and customizable. The nature of the internet and narrowcasting of mass media can enable multimedia culture to have the glocal condition expressed earlier (Critical Mass). Combined with the idea of indigenization as a progressive sub-conscious cultural throughway, the solution can therefore be to reintegrate virtual flows as core to our reality and to our experience of physical space.

The Biomimetic State of Digital Space

The popular use of computational devices leaves one questioning their pervasiveness as well as the qualities of digital space that users find to be so attractive. The agglomeration of computers and phones into our daily routines, sometimes unwillingly, seems to be a growing trend in contemporary society (see Appendix A). Typically, digital space provides extensions of ourselves into spaces and environments that have the ability to satisfy our curiosities and desires. Digital space offers a different dynamic of what we consider the properties of physical

space. Examples of these properties include rules of physics, morality, and federal law. In digital space, these properties become redefined, and the users find themselves behaving in ways that are otherwise impossible or even immoral in physical spaces.

The popularity of video gaming is an example. An intriguing aspect of video gaming is its use of real space as a platform for its game play. Jones (2006) states that the act of mimicking a process or form addresses aesthetics, not function. If games exist in an environment that has a modified set of rules for how interaction may take place, why is there a constant return to a humanistic environment that becomes manipulated after the fact? Digital space has the potential to redefine function, yet its biomimetic platform is a compromise between the non-natural ability of the space, and the boundaries that must be established and framed to induce some sort of familiarity while using it. The reason behind mimicking nature is to establish a humane relationship to a space that is otherwise incomparable to anything physical; this can be seen as either a positive or negative approach.

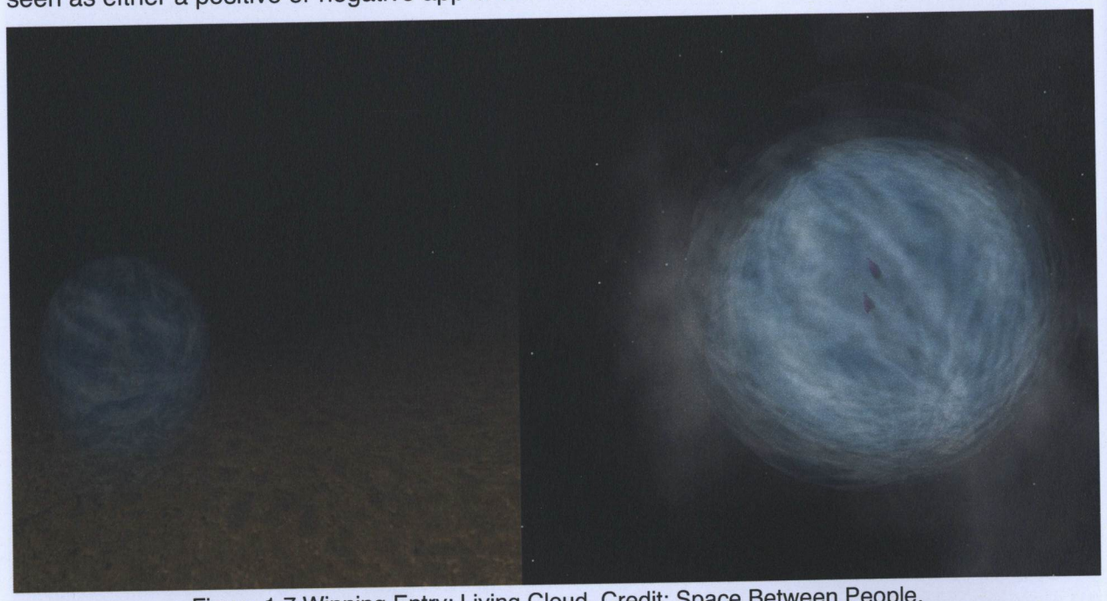


Figure 1.7 Winning Entry: Living Cloud. Credit: Space Between People.

In an architectural competition for a popular online video game Second Life, the brief of the competition left options open to designers for what they deemed appropriate in a digital gaming environment (Doesinger, 2008). The brief of the project described by Doesinger (2008) states that the project was based on the idea of the virtual dimension of buildings as a new extension of the body and to discover what buildings the younger generation of architects dream about. The result of the competition was that the various categories such as private homes, commercial and high-rise became irrelevant since there is no point to them in digital architecture. The winning entries understood this condition in digital space and its dynamic of rules (see Figure 1.7). Even public and private spaces are not conceivable.

In digital space, one can perform physical acts such as high-speed travel, flight, speech and various sensual experiences of spaces because such acts are true to the nature of digital environments. They are accepted and allowed because the digital space is designed in that fashion. The more physical space allows that dynamic to take effect on its actual environment, the more responsible one becomes to the technological culture that persists in almost all aspects of life. The key to understanding hybrid spaces is the chimerical combination of the properties of digital and physical spaces to form an environment that can become more productive.

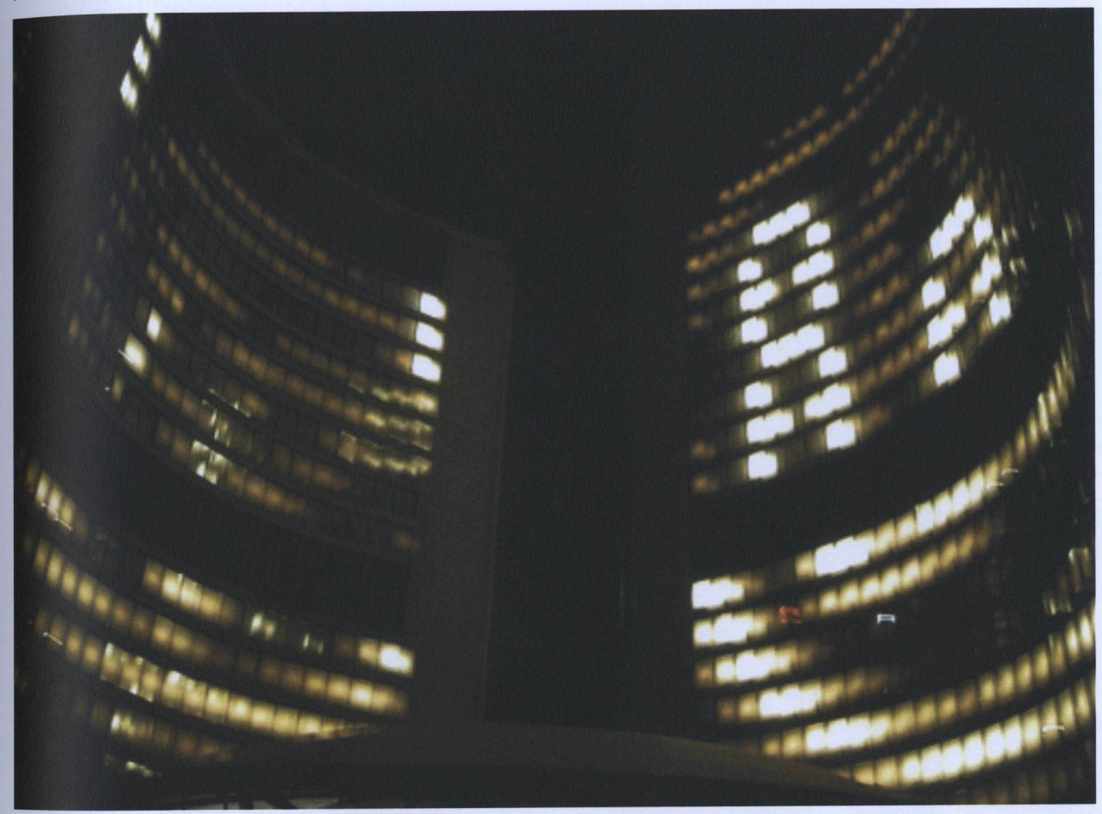


Figure 1.8 Stereoscope. Credit: Nuit Blanche.

A Contemporary Model of Space: Public and Private Reversals

The Internet is an online user environment that allows individuals to speak and communicate with one another even though they do not share the same physical environment. The internet can even be considered as ideal space of communication, evoking a sense of safety and comfort and promoting interaction amongst many other people. It is evident that public and private physical spaces have acquired a reversible quality caused by the use of such digital spaces as the Internet. The popularity of communication networks can arguably dwarf the popularity of physical public spaces in terms of the time spent within each. As the cyber

culture theorist Manuel Castells would mention, the space of flows is becoming more occupied than the space of places (Bell, 2007). The nature of digital communication networks such as the Internet has brought public space into the private realm. The temporal disassembly by technology has made incredible possibilities to interact and engage with public spaces and forums from your own home. Similarly, public space has now assumed a more complex role in society with the advent of digital networks and signals since people can access their personal information and assume their virtual routines via their wireless handsets or computers. This condition in public space creates an environment where both the virtual and the actual are

Figure 1.9 Amodal Suspension. Credit: Nanoculture.

real. Hayles (2004) states that the difference is not reality or unreality, but rather their temporal positions. The actualization of this hybrid space occurs when it becomes unnecessary for one to remove themselves from physical space to expose the potential energies of virtual space, as seen by such interventions as Amodal Suspension by Rafael Lozano-Hemmer in Japan or the Stereoscope by D.A. Therrien as part of the Nuit Blanche Festival in Toronto (see Figure 1.9) (Hayles, 2004). As a model for public hybrid spaces, three main characteristics arise:

1. The merging of borders between physical and virtual spheres.
2. The use of nomadic and pervasive technologies as interfaces.
3. Mobility and communication in public spaces (Hayles, p. 39).

With new communication technologies, the emergence of possible and distant realities within actual public spaces becomes an expanding possibility. As Hayles (2004) describes them, these nomadic technologies, getting smaller and smaller daily, become more and more embedded into our physical spaces to the point where they are no longer visible – giving virtual space almost a dictated authority over the use of that physical space. The reality which the digital represents can be understood if it is conceived not as opposed to physical but as potentially already present in the physical.

There are many attempts to re-instill physical communication within this 'network' age. Sometimes these interventions are represented as media installations, as seen in such exhibitions as the Nuit Blanche Festival in Toronto (Nuit Blanche). During this festival, members of the artistic community share their talents, research, and initiatives to create a city wide installation of various mediums including film, sculpture, light, digital displays and auditory stations (see Figure 1.8). Successfully, planned events such as Nuit Blanche are not frequent however and could not be a continuous event since the production disturbs the natural function of the city. Their hybrid effects however, can definitely be used on a more consistent basis, and may be just as simple as adding a digital address to a physical one, a tangible IP so to speak.

The Potentials of Nanotechnology in Architecture

It is unquestionable that the emergence of nanotechnology has rumored and spread its great potentials in all disciplines. It almost seems utopian, that once this technology is perfected, all of the world's troubles will cease to exist. In 1999, a report rocketed out of the works of IBM claiming the possession of Nano-Bots that could cure cancer (Hosey). The reason why these claims were so widely accepted, although they are not true, is due to the concept of nanotechnology. Simply, the study of nanotechnology is based on the study of information networks at the molecular level. This involves chemical transmission and intelligent material organizations that can substantially change the way we interact with and perceive spaces (Verb, 2004). Is nanotechnology going to bring to the architectural table what has been sought after by designers for centuries – the moving building? Can nanotechnology bring a new space

that is completely sustainable and fully responsive and adaptable down to the make up of its structure? The answer, at this point in time, is obviously, no. However, the nature of the subject being so new and fertile draws the attention of many as the new plane of imagination. As stated by Hayles (2004), cyberspace has acted as the mediating interface for achieving the imaginary spaces of the digital realm in the physical world. The digital space provided a means to achieve hybridity within physical space because the inherent immateriality of the digital and the new dynamic of digital spatial rules freed the digital world from the constraints of the physical world and made new places and identities possible, as we have seen. However, what form of mediation will occur to see the production of nanotechnology in architecture?

Since its inauguration in 1985, nanotechnology has gained respect by simply making existing materials and process better, as opposed to redefining them. An example is the use of nanotechnology in solar panels, which enables energy to be derived from the full spectrum of light, making these panels far more efficient than present PV cells (see Figure 1.10). Another

Figure 1.10 Full spectrum solar power. Credit: www.nanoarchitecture.net

example is improving the effects of peizo electric systems or carbon microtubes as the superior counterpart to carbon fiber structures (see Figure 1.11)(Nanoarchitecture). Improving materials at the atomic level is a very exciting area of study; however, the applications of this study in architecture are underdeveloped at this point in time. Hayles (2004) suggests one solution is that connecting nanotechnology to imagination does not imply that the science itself is imaginary; rather it is related to how people project their imaginaries onto a potential and unexplored part of the real. Perhaps the mediating device for this new form of imaginary

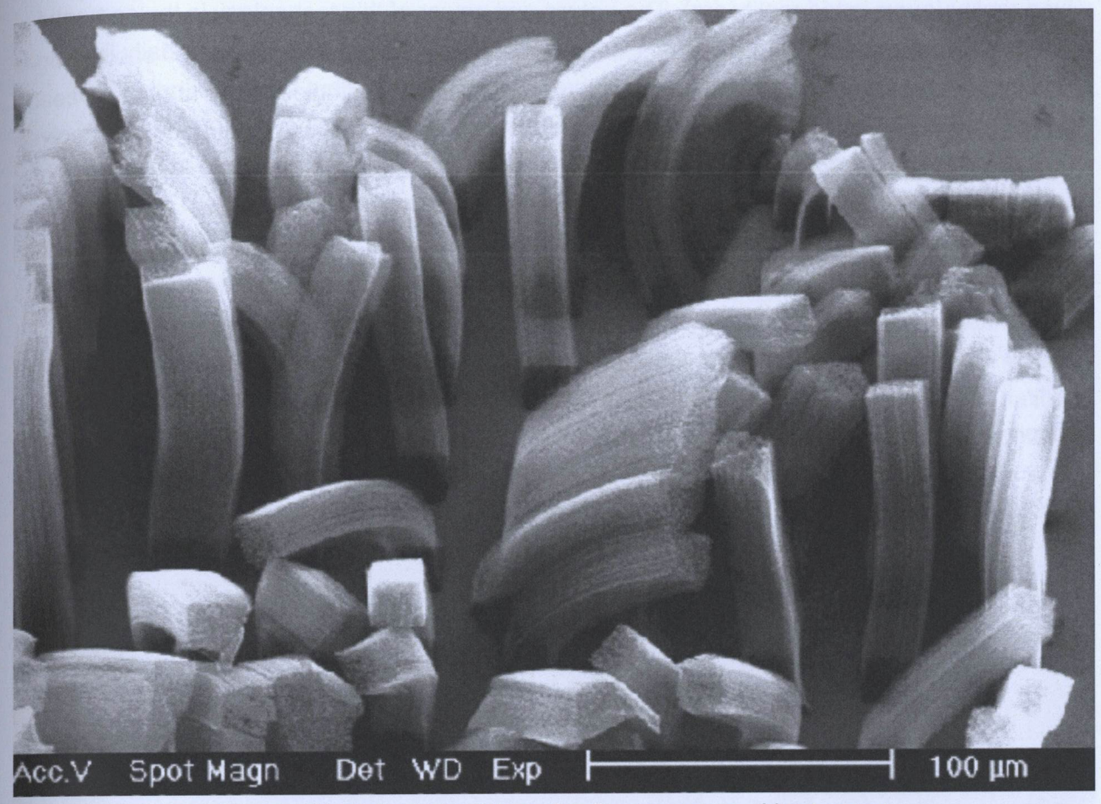


Figure 1.11 Carbon microtubes. Credit: www.nanoarchitecture.net

exploration is the induction of hybrid spaces in our societies and cultures. Hybrid space can serve as the throughway that will make the inauguration of nanotechnology in architecture easier to accept. One example is the possibility of Claytronics, physical avatars (which we are presently seen explorations into, though still carried out through primitive means), E-Ink surface applications, or cloaking options in architecture (Nanoarchitecture). There are technologies available now that can provide these hybrid affects, such as Augmented Reality. More importantly however, is the ability of nanotechnology to fuel speculation into the potentials of architecture and social interaction in the future. This speculation induces critical thinking in architecture and makes the present design process and resulting interventions more productive.

Bending the Properties of Space: The Potential of Augmented Reality

Augmented reality (AR) is the epitome of hybrid space in the sense that its premise is based on the successful integration of virtual fields of view layered on our existing physical environment. Naturally, augmented reality is a worthy technology for usage in a space designed for hybridity to take place. To clarify, augmented reality is a real time view of a physical environment whose elements are merged with, or augmented by virtual computer-generated imagery, creating a

mixed reality (augmented reality.org). The nature and power of this technology is the semantic relationship it has to physical context, making the transition of integration into our daily lives much easier and more natural. The result is that the information about the surrounding real world of the user becomes interactive and digitally usable (Lyon, 2005).

Simplified, augmented reality works by having a computer communicate to a viewing apparatus what to see over surfaces that have been tracked. Currently, one must have some form of sensorial extension, such as a Head Mounted Display for augmented vision in order to experience the effects. HMD's are becoming smaller and more unobtrusive, so speculation into the future of AR can be that the devices used to experience the effects will be so integrated into one's own senses, that its presence will be unnoticed and its effects indistinguishable from reality. In the case of visual immersion, the computer will tell the HMD what to see over the trackers placed in the physical environment (see Figure 1.12). Trackers typically have two parts: one worn by the tracked person or object and the other built into the surrounding environment, usually within the same room (Feiner, 2002). Augmented reality however should not be

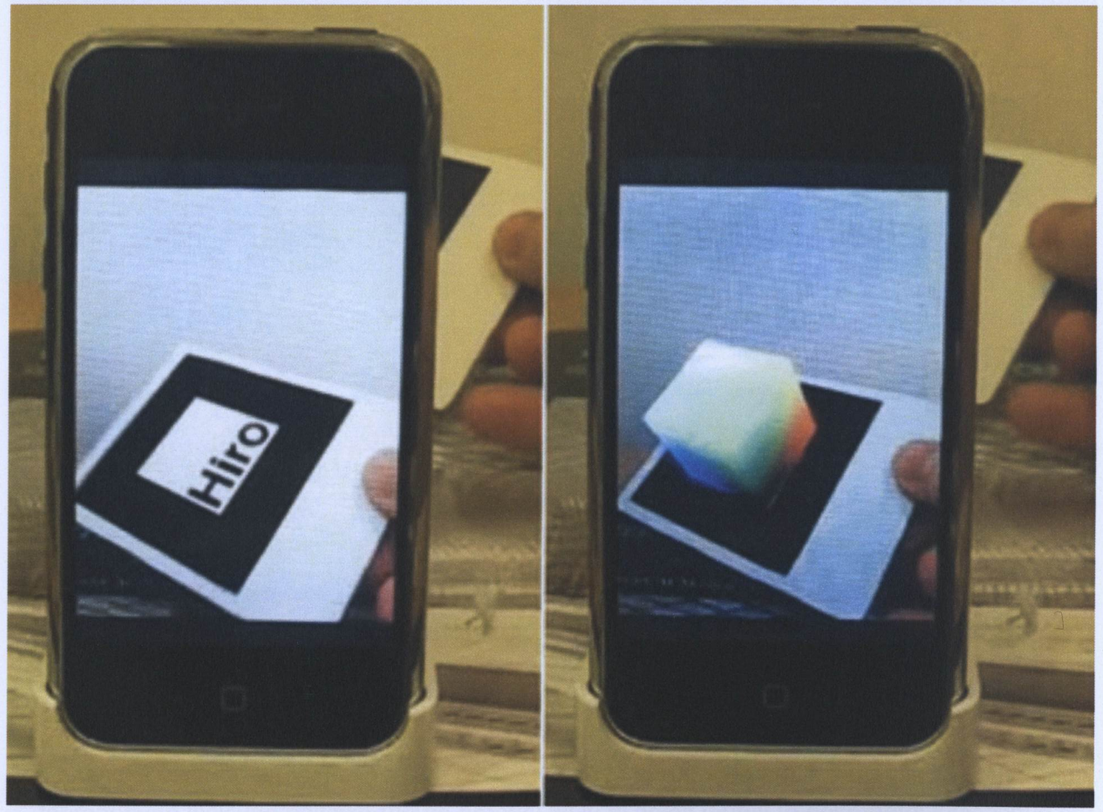


Figure 1.12 Augmented reality tracking. Credit: www.augmented-reality.org

confused with Virtual Reality (VR). Although the same equipment is used in VR as it is in AR, Virtual Reality is designed to replace the real world with its display, where Augmented Reality enhances it (Feiner, 2002).

As discussed earlier, there is a definite pervasiveness in our present computing habits. Digital space occupies all surfaces, yet it is mediated through devices. Architecturally, this poses a problem since a significant amount of social interaction takes place through these devices and not through public spaces. One of the key benefits of AR is that the physical space becomes the interface for digital space (see Figure 1.13). Augmented reaility is designed to supplement the qualities of physical space by layering digitized textures, objects, or images onto any existing condition. Typically, we have seen that media scape design uses physical space to enhance digital space. With AR, digtal space enhances physical space, transcending the attractive qualities of digital space into our physical reality. Although many are skeptical of digital integration and the uprooted sense of place that results, AR can become one of the most exciting and progressive mediums ever. The reasoning behind this claim is that the foundation is both democratic and adaptive, making the potentials of usage particular to each individual.

Figure 1.13 Active augmented reality. Credit: www.augmented-reality.org

This profound prediction of the possible future has been labeled by some as the Houdini Trend, meaning this technology is about finding fresh and unique ways of getting out of the world we are in, and into the endlessly imaginative world of digital space (Lyon, 2005). The example used in the Houdini Trend article specifically refers to gaming, which is always meant to entice joy, interaction and expression of your innermost desires. AR holds an extreme amount of confidence in the future because the desire factor of society is so great that the question of integration into daily life should not be why, but why not.

Hybridity and Nature

The incorporation of natural elements into design is a proven method of improving the quality of that particular space. Using nature in design creates an inherent sense of connection between humans and nature as a movement towards establishing a fundamental sense of being. The incorporation of nature does not necessarily reflect sustainable practice and design, although sustainability is keen to natural processes in nature (Day, 2002). Nature, or what is natural to

humans rather, involves a certain knowledge of the way people engage with their environment using senses – touch, smell, sight, sound, and taste. Technology has helped our understanding of natural processes, even to the point where the essence of such processes has been extracted and re-produced to improve our environment as humans. An example is the study of bio-mimetic and anthropomorphic environments.

A 2008 exhibition at the Museum of Modern Art in New York City entitled Design and the Elastic Mind displayed a series of installations that were intended to act as simplified solutions for a broader understanding of just how far we as humans have pushed the technological envelope. Many of the installations demonstrated natural biological processes and forms as inspiration for new products. Some of the products included the Fly Bot, which was a micro processed mechanical insect the size of a fly that could navigate and relay images and video, the Mercedes Benz Bionic Car which analyzed the aerodynamics of aquatic species and applied them to a vehicle (see Figure 1.14), the Lily Impeller - a propeller that was fabricated based on the natural turbulences generated by vortex water forms, and the Power Assist Suit and Powered Ankle Foot Prosthesis, which are intended to replicate and improve the muscular and tendon structures of our human body (MoMa, 2008). The creation of these new improvements are only made possible by the advances that we have made as a society. We are mimicking biological processes digitally and bringing them into our physical world by means of fabrication. Artificially fabricating nature has proven to be the most difficult of tasks in this contemporary era of design. The tangible properties of nature, perhaps, have been the most comprehensively attempted as the basis for conceptualization.

In architecture, buildings engage with the exterior context (natural elements) as well as interior context, simplified as human circulation and interaction. In some scenarios, a building may choose to use natural elements as a means to generate an active public hybrid space by reversing the relationship between the elements and the building – ie. giving the building control of the elements. One particular example is the Scharnhauser Park Town Hall in Stuttgart where rain has been digitally controlled to produce text messages into the public space (Verb, 2004). The 'rain' effect is controlled by nozzles which are triggered at specific time intervals to create digital displays out of a substance as natural as water. Also, large light lanterns arranged in grid form on site display its light patterns on an online website as a measure of wind conditions in the area (see Figure 1.15). This enables users abroad to understand the conditions of the physical environment from a remote location. One of the first examples of responsive architecture to the elements was Toyo Ito's Tower of Winds in Japan in 1986 as the first attempt to convert the environment into information using digital sensors (Verb, 2008). The result was a tower displaying various color spectrums based on wind intensity (see Figure 1.16). Nature holds the potential to be a powerful tool as a platform for devising hybrid spaces.

Attempts at hybrid design have engaged with both the tangible and intangible qualities of physical space. Interface design is one aspect of this study, which seeks to develop a more natural, organic way of using digital interfaces. One example is of course, the iPhone, which

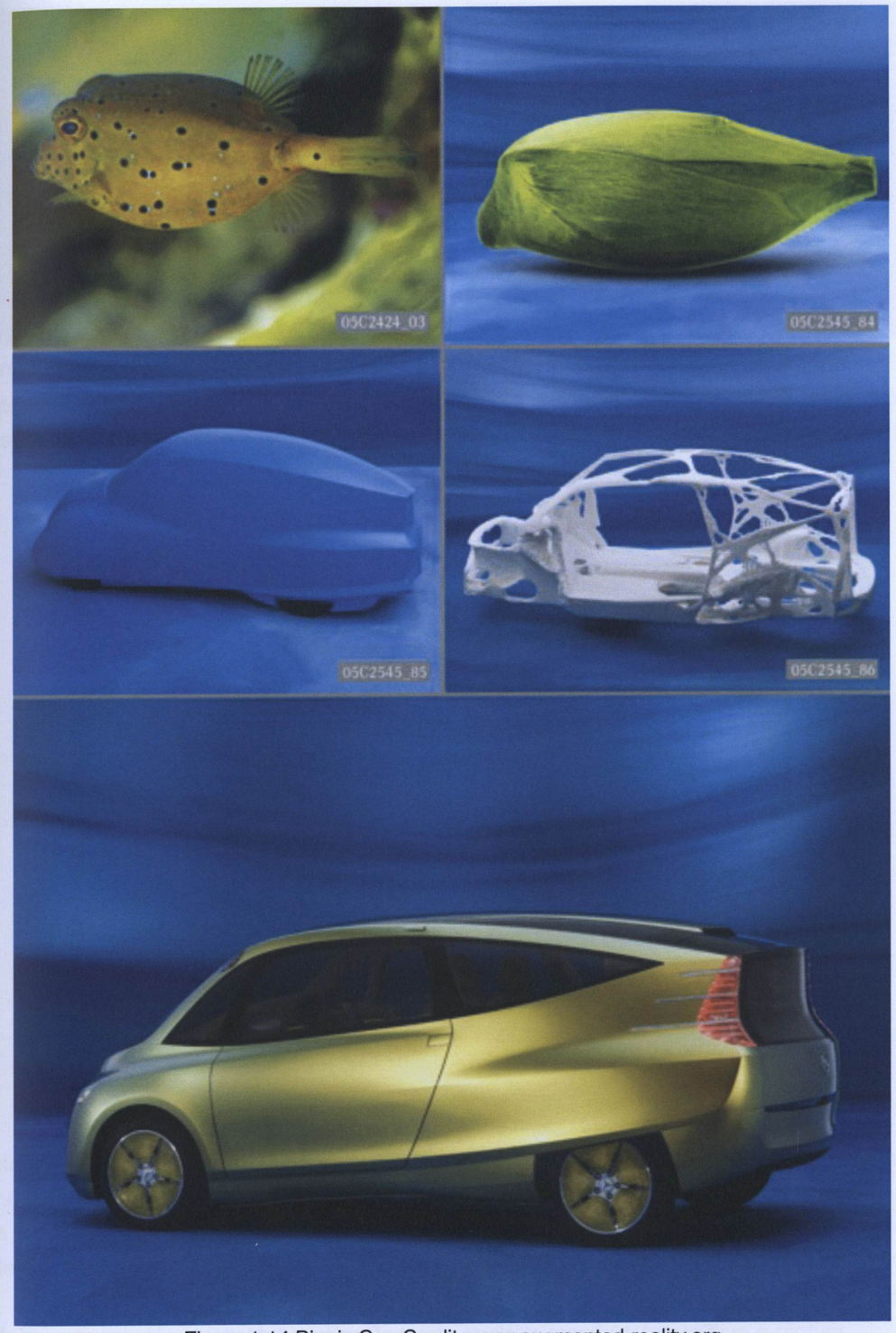


Figure 1.14 Bionic Car. Credit: www.augmented-reality.org

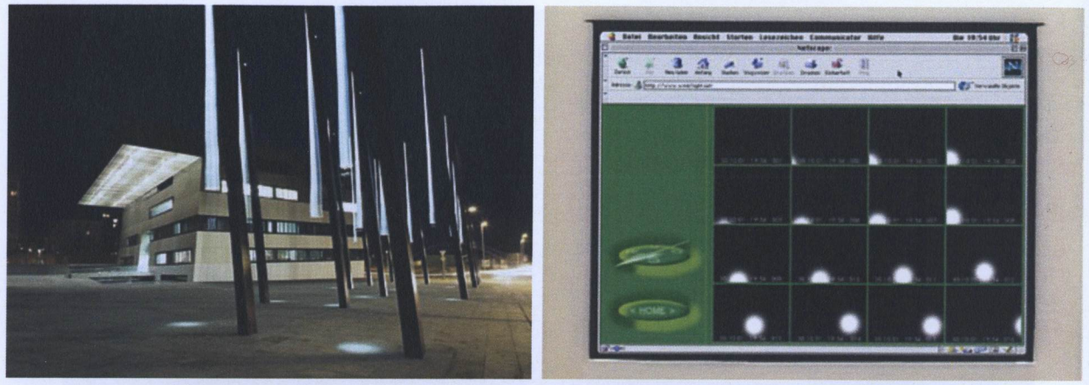


Figure 1.15 Scharnhauser Park Town Hall, Stuttgart. Credit: Verb:Matters.

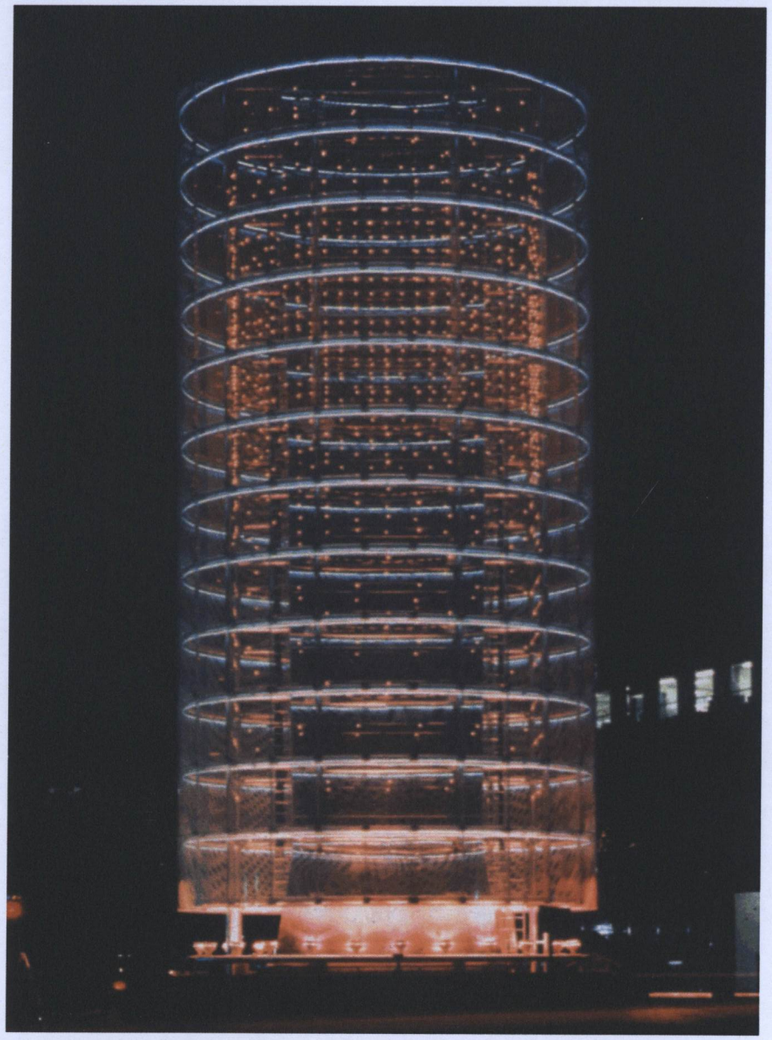


Figure 1.16 Tower of Winds, Japan. Credit: Verb:Matters.

incorporates palpable instincts of exploring digital space. Other examples include the Bump Top and Paper Windows applications, which are based on a more informal, realistic way of cycling through digital spaces (Bump Top; Paper Windows). Applying the laws of physics is also an example of introducing natural processes into interface design, as seen in the Newton Virus (MoMa, 2008). These methods inadvertently create a more participatory way of engaging users, whether within public or private space. Natural features enable the removal of digital, inert interfaces into responsive, relative materials.

Each human sense offers a potential framework for removing digital space and inserting itself into physical space. Haptic devices are perhaps the most powerful in terms of interaction. They are the interfaces that are physically contacted and manipulated. The sense of touch can even be used to fabricate senses, also known as internal imagery. The Mind Chair, another installation at Design and the Elastic Mind, exemplifies this notion (MoMa, 2008). The audible sense is also an important entity to understanding physical space. Sound is understood as the

Figure 1.17 Paper Windows. Credit: Human Media Lab - Queens University.

primary role player for establishing three dimensional spaces. Bottiger (2007) states that sound is the bulk of the 'submerged iceberg' for the importance of sensual emersion in physical space as a means to transcend digital space. Physical feedback from digital space is an revolutionary endeavor that would benefit from the natural inherent instincts of human beings.

Kas Oosterhuis, and his body of knowledge known as *e-motive architecture*, describes such importance. He states that architects today need to construct interactive e-motive

architecture in real time to adapt to the parallel worlds around and the worlds within. This new form of architecture would embrace new technologies, a true *transarchitecture*, since it builds new transaction spaces. It is at the same time e-motive, transactive, interactive and collaborative (Oosterhuis, 2003). One can appreciate Oosterhuis' views of the architect as one who builds these transaction spaces and gives shape to the flow of data. Examples of Oosterhuis' work establishing truth, as discussed earlier, can be seen in his concept of 'body buildings'. These anthropomorphic environments synthesize complex geometries, human action and environmental data. One example is Protospace, a 'hyperbody' architecture at the University of Delft in Netherlands (see Figure 1.18). The Protospace is filled with an array of sensors and tracking devices to establish a fine-grained high-resolution and above all emotional communication between the players (experts) and the design worlds in progress (Oosterhuis, 2003). The goal is to create a collaborative environment and develop buildings that embody behavioral rules that are derived from the integration of form and information, thus becoming

Figure 1.18 Protospace. Credit: Hyperbodies.

productive environments that can develop their own intelligence and rationality. The result is a building that supports and also learns from natural human processes. A learning building becomes a place that can be identified as a living organism and grounded to that specific context and local social condition.

Architectural Practice: An Ethical Perspective

Architectural practice as a whole has seen several shifts in terms of its management and execution of projects. It is the responsibility of architects to express ideas through drawing and physical representation. As Mitchell (2008) would describe, drawing an image was a performance, a trace of improvised motion in time which circumstantially could not be repeated. As time evolved and tools were used to draw these Euclidian forms, the process of drawing became more of an algorithm, a step by step process using tools to produce forms. Although still manually drafted, these drawing methods enabled mass production and standardization of building design (Mitchell, 2008). Since the use of computers in the 1960's, digital spaces have carried out these algorithms – removing any possibility of the idiosyncrasies of the artist's hand (Mitchell, 2008).

More recently, Generative Algorithmic computer software programming has enabled the incredible production of magnificent and exciting forms with exceptional accuracy and

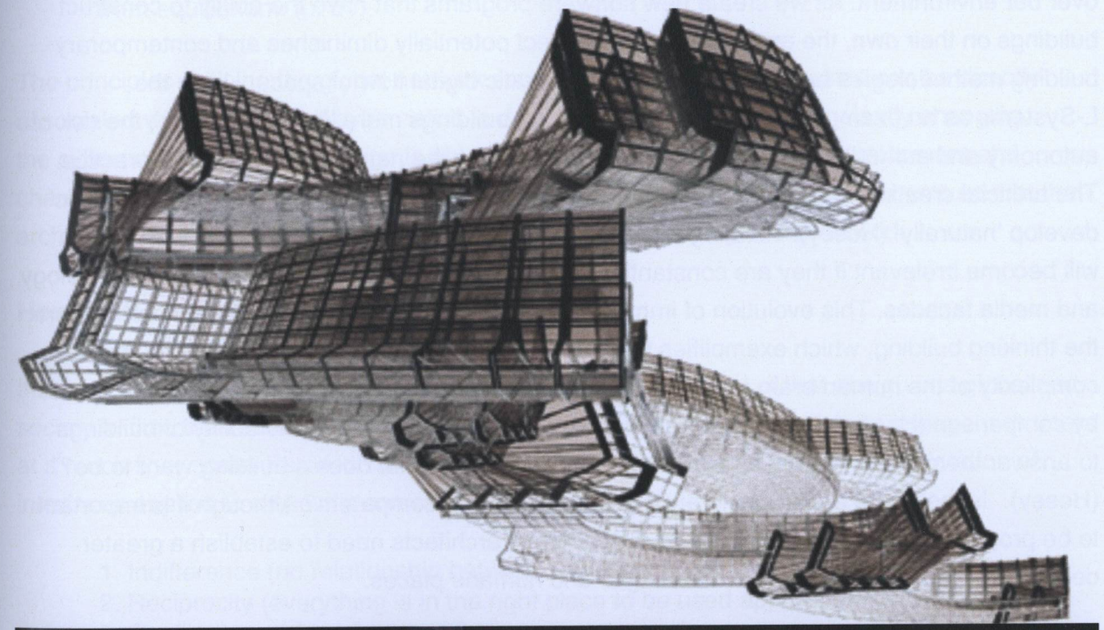


Figure 1.19 L-System. Credit: Algorithms in Architecture.

feasibility. One example is the Lindenmayer-System method (L-System), developed by Michael Hansmeyer (see Figure 1.19)(Algorithms in Architecture). The L-Systems use biological growth algorithms in plants to structure the form and expansion possibilities of actual buildings in digital space, making organic architecture and 'building the way nature builds' idea of Frank Lloyd Wright all too real (Algorithms in Architecture). The computer has proven to be a very powerful tool for architects. Computers allow spatial and natural simulations to take place, structural capability studies, and many other forms of analysis that may accurately depict the success of a building with regard to integrity and the embodiment of its users. A new era for architects has emerged in which the tools an architect must understand are rapidly de-materializing into computer codes. The architect must become software in order to understand the nature of producing these forms and shapes that can perform better and are in demand.

The main concern behind computing is our tendency to slip deeper into the dependence on them, especially in architectural design. As in the case of nanotechnology, the smaller the computation devices become, the more unaware we become of their presence and control over our environment. As we create new software programs that have the ability to construct buildings on their own, the expertise of the architect potentially diminishes and contemporary building methodologies become part of the democratic digital flow of space. Using the L-Systems as an example, as we move into making buildings more literally 'organic', the risk of autonomy and authoritative control over design threatens the nature of architectural practice. The artificial creation of buildings will become pointless when all things organic and synthetic develop 'naturally' (Hosey). Relating back to Christopher Day, the nature of truth in materials will become irrelevant if they are constantly in flux, as seen in the predictions of nanotechnology and media facades. This evolution of immateriality leads to the concept of sentient architecture, the thinking building, which exemplifies the inevitable future of computers surpassing the complexity of the human brain and developing consciousness that becomes indistinguishable by comparison (Hosey). Some see the future of architecture as having the ability of buildings to answer themselves the question posed by Louis Kahn, "What does a building want to be?" (Hosey). Is the future architect merely a choreographer of computers? Although it is important to be progressive and provide new and exotic forms, architects need to establish a greater degree of vigor in pursuing more meaningful and humane places.

The Importance of Cybernetics

Although computers have the negative qualities of obsessive use and inhumane influences in design, the computer has enabled extensive multi-disciplinary environments that allow the practice to grow and flourish into new and interesting directions. Hybrid space is the actualization of digital spaces, which offers a large array of artists, scientists, engineers, and theorists to exercise their ideas in physical spaces with architects. Mark C. Taylor and his

concept of *co-evolutionary disequilibrium* looks to the principles of the global network economy resulting from the information age (Tschumi, 2003). He identifies seven principles:

> (1) they are comprised of many different parts which are connected in multiple ways, (2) diverse components interact both serially and in parallel to generate sequential as well as simultaneous effects and events, (3) complex systems display spontaneous self-organization; order emerges without being planned or programmed, (4) the structures emerging from spontaneous self organization are not necessarily reducible to the aggregate of the components or elements of the systems, (5) though generated by local interactions, emergent properties tend to be local, (6) inasmuch as self organizing structures emerge spontaneously, complex systems are neither fixed nor static but develop or evolve; such evolution presupposes that complex systems are both open and adaptive - guided by both positive and negative feedback, development is not always incremental or continuous but can be episodic or continuous, and (7) emergence occurs in a narrow space lying between conditions that are too ordered and too disordered. This boundary or margin is the 'edge of chaos', which is always far from equilibrium. (p. 81)

The principles defining the global network society which we presently reside can be directly associated with the study of cybernetics in design. In a society that is constantly changing, the cybernetic approach to design is able to cope with the continuum of development and change. It becomes essential for architects to create multidisciplinary environments so that the architectural response is comprehensively suited for an evolving social network.

How To Design for Tomorrow

If the concept of a design project is hybrid space, and the context of that design is a globalized society in flux, then surfaces used to define boundaries must out of necessity engage with users at a much finer scale. Bernard Tschumi states three possibilities for design consideration of interfaces applied to a specific context and concept:

1. Indifference (no relationship between the envelope and what happens inside).
2. Reciprocity (everything is in the right place to be used appropriately).
3. Conflict (everything is strategically in the wrong place)

(Tschumi, p. 25)

In terms of design, it is unethical to produce exotic forms with advanced skins that communicate ideas and perhaps act as public fora because the skin becomes one of indifference (Tschumi, 2003). Sumrell (2007) states that many of the leading practitioners in architecture are fatally enthralled by the possibility of form as a generator of affect, of being able to appeal to a broader public by the ingestion and regurgitation of hip consumerism. To maintain the profession of architect, one must avoid the typical ambiguities brought on by the information flows and

establish a reciprocity of new public spaces, regardless if it may cause initial feelings of indifference or conflict. In other words, one must design for meaning and purpose, not for aesthetics.

Conclusion from Research

Historically, our society has embraced new technologies. We have learned that we are in a time of instantaneity and accessibility on a global scale, which has been argued to have both positive and negative affects. We find ourselves at a point in which time and space have been considered to have little or no value, and that critical analysis on our 'glocal' culture has lost its privileged position due to the very assimilative manner resulting from indulgences in communication technology. We have also learned that the meaning of context and contextual responsibility in architecture has changed in scale, and has progressed adaptively from site to individual. One particular method of satisfying the cultural and social implications of architecture in a global society is to make society itself understand its ability to process information to refine what can be appreciated to be the properties of the world. Hybrid space needs to tackle the private realm as a model for establishing individualism and prevent the misuse of digital space that can make architectural inventory ubiquitous, and the role of the architect meaningless. Potentially using anthropomorphic design and augmented reality as a new platform for hybridity, architecture could celebrate a new era of responsible, successful design practices.

CHAPTER 2 - CASE STUDIES

Materializing Digital Space: Sky Ear and Soft Facade

Establishing awareness to the digital spaces that we are constantly surrounded by is an approach to hybrid design that is user oriented. The influence a user has on their physical environment is reduced to the scale of the individual, making interaction and the importance of architectural space greater. One project that exemplifies this materialization of digital space is the work of Usman Haque and his Sky Ear installation project launched in Fribourg, Switzerland and Greenwich, London in 2004. The Sky Ear project is a non-rigid carbon-fibre structure that is embedded with one thousand glowing helium balloons and several dozen mobile phones. In addition to providing the force to suspend the carbon fibre structure in the sky, the balloons contain miniature sensor circuits that respond to electromagnetic fields (see Figures 2.1 and 2.2). These sensors react particularily to electromagnetism produced by cellular phones and, when activated, co-ordinate to cause ultra-bright coloured LEDs to illuminate. The product is a thirty meter floating display of light and color that constantly changes by users who dial into the embedded phones (Haque Design and Research). The Amodal Suspension project by Rafael Lozano-Hemmer discussed earlier was a project that displayed text messages in the sky and was more of way to externalize the social networking aspect of mobile technology into public space. The Sky Ear project is intriguing because of the physical form it produces. The project in a sense freezes the rapid movement of digital space and uses its presence to create an interactive spectacle at night. This materialization of digital space into a skin that can be manipulated is a key concept that will fuel design decisions to follow.

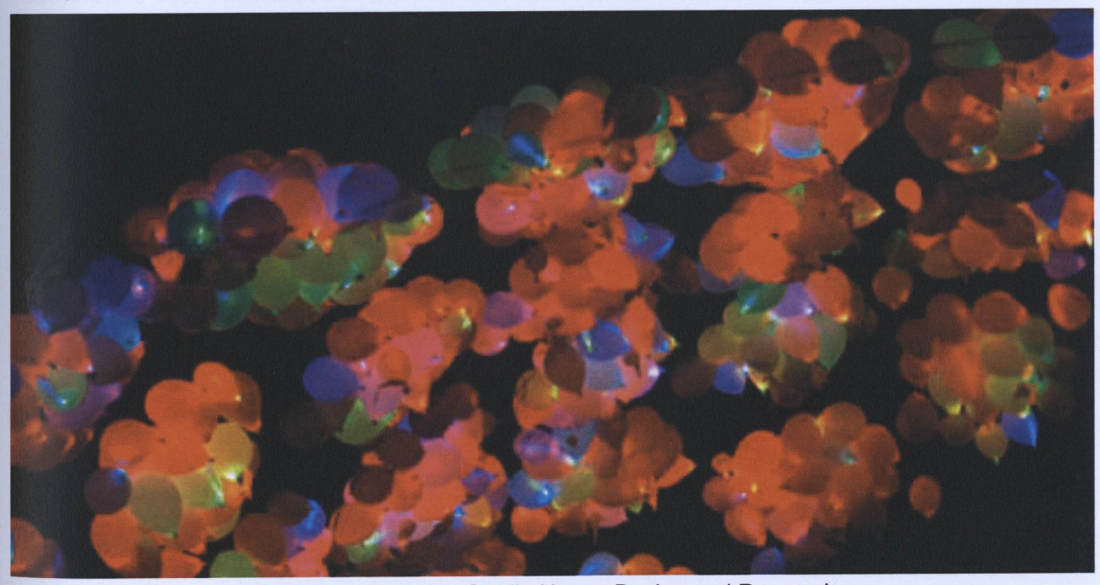


Figure 2.1 Sky Ear. Credit: Haque Design and Research.

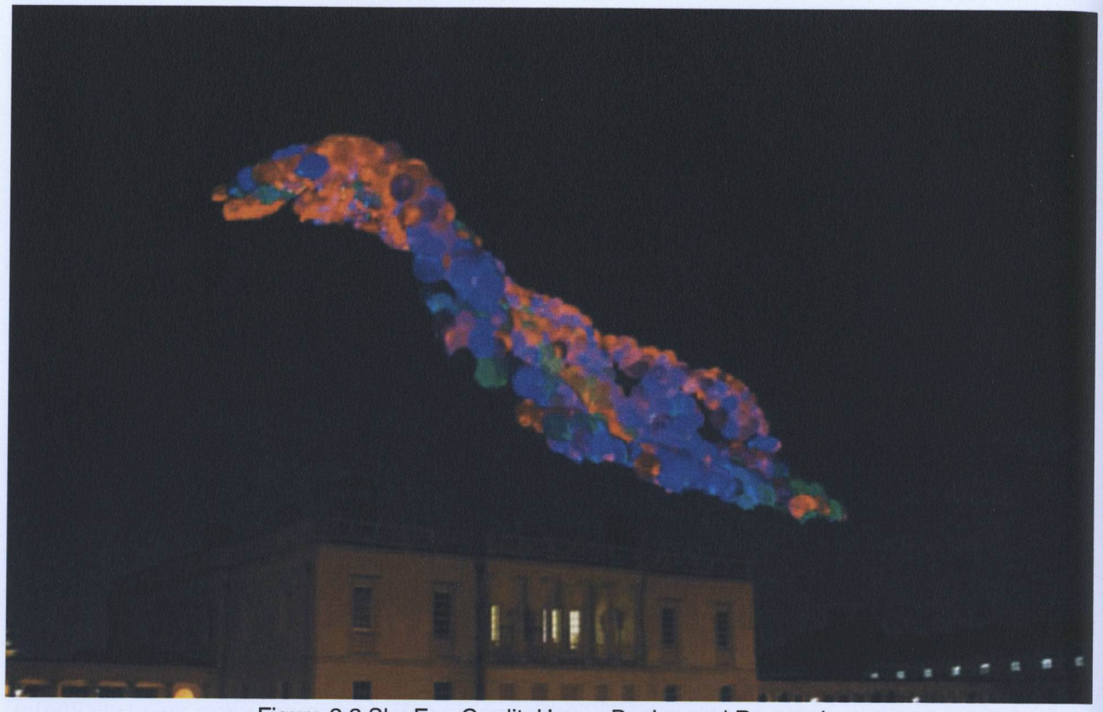


Figure 2.2 Sky Ear. Credit: Haque Design and Research.

A user engaged skin system for a building was developed by a group of students at the Massachusettes Institute of Technology (MIT) that grants the user the ability to change the degree of transparency of that skin (Cardoso, 2007). The technology of microfilming within glass is not a revolutionary technology and many examples exist, particularily in office environments, that take advantage of the ability to change transparency with the flick of a switch. The interesting part of this particular study by MIT however, is that the transparency is changed at the desired location of the skin. The system is organized into a series of ETFE panels that are filled with air. If a person applies pressure to a specific panel, the pressure sensor reads the increase of pressure and disengages the microfilm that causes the opacity, making the panel clear (see Figure 2.3). Although the technology involved is not revolutionary, the effect of being able to manipulate the transparency of a skin constantly is revolutionary in architectural design and the productive capability of physical space. User-engaged changes of physical space that reflect the instantaneity of digital space are powerful demonstrations of hybrid architecture that will influence the final design.

Interface Manipulation

Physical surfaces that reflect the movement and flux of digital space can be beneficial when demonstrating to a user that the space is hybrid. Surfaces that respond to users physically, and are initiated digitally (either through sensors or commands) can have spatial effects that

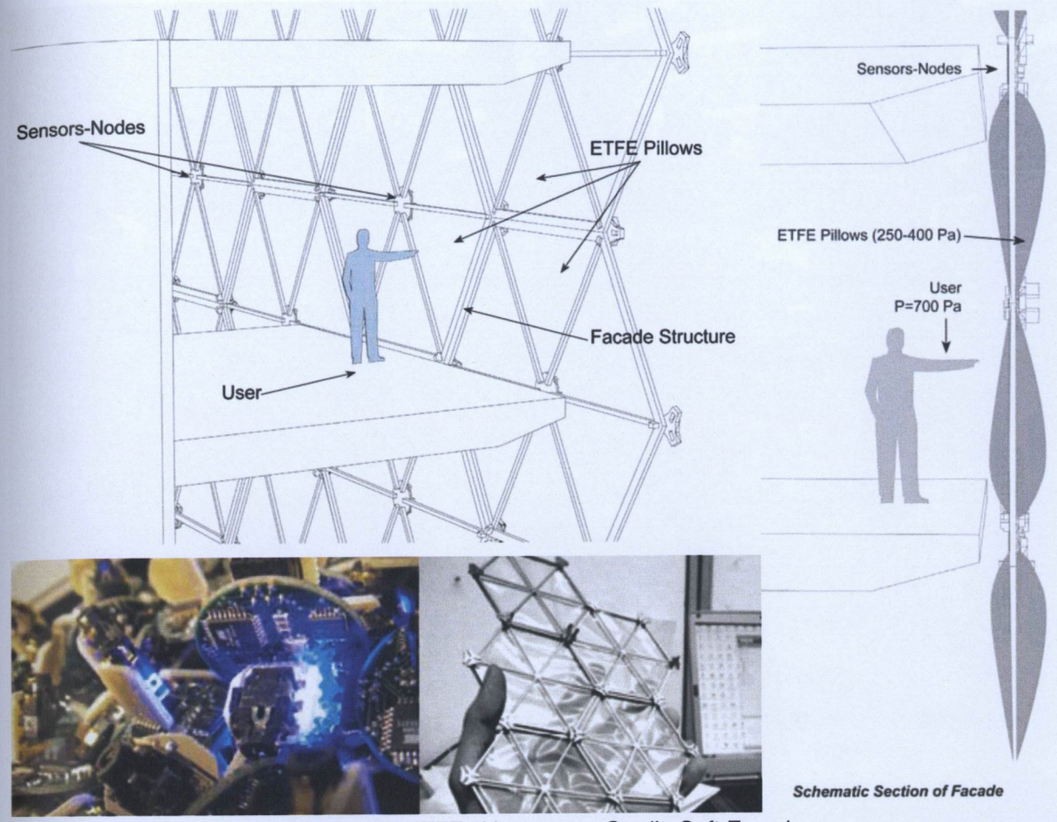


Figure 2.3 ETFE skin system. Credit: Soft Facade.

redefine the user experience of architecture. The Hyposurface is one such example. Designed by Hyposurface Corporation, the Hyposurface is the world's first info-form device (Hyposurface Corp.). Physically, thousands of actuators controlled by information bus technology deform a pliable surface to created images, text, patterns, etc. (see Figure 2.4) Digitally, the surface can receive imput from sound, movement or the Internet and respond accordingly to these external influences (see Figure 2.5). The most influential part of the Hyposurface is not the fact that it is responsive to users, but rather its realization as a physical product. The ability to have a moving, flexible surface that can change its characteristics digitally is a very interesting quality of an interface that is pursued in the design phases. The Hyposurface is an excellent example of the constructability of extruding surfaces, the density this technology can have when producing a surface and the beginnings of their effects on physical space and interaction.

The work of Philip Beesley is also an excellent example of the technology required to have responsive physical environments. Similar to the Hyposurface, Philip uses tiny actuators and other micro mechanisms to create moving, changing physical forms. The creation of these interesting environments coupled with the digital layer that enables the further growth and expansion of the perception and experience of the space is a hybrid affect that is sought after for design. An Example of Philip's work that demonstrates the hybrid effect of physical

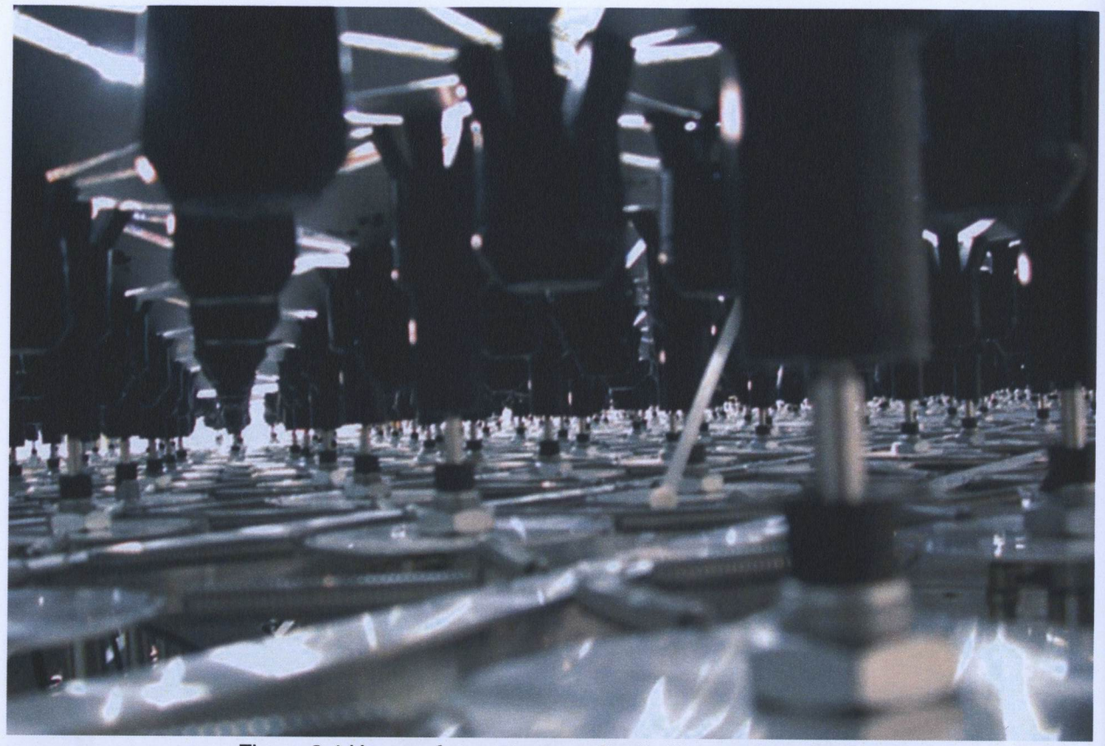


Figure 2.4 Hyposurface actuators. Credit: Hyposurface Corp.

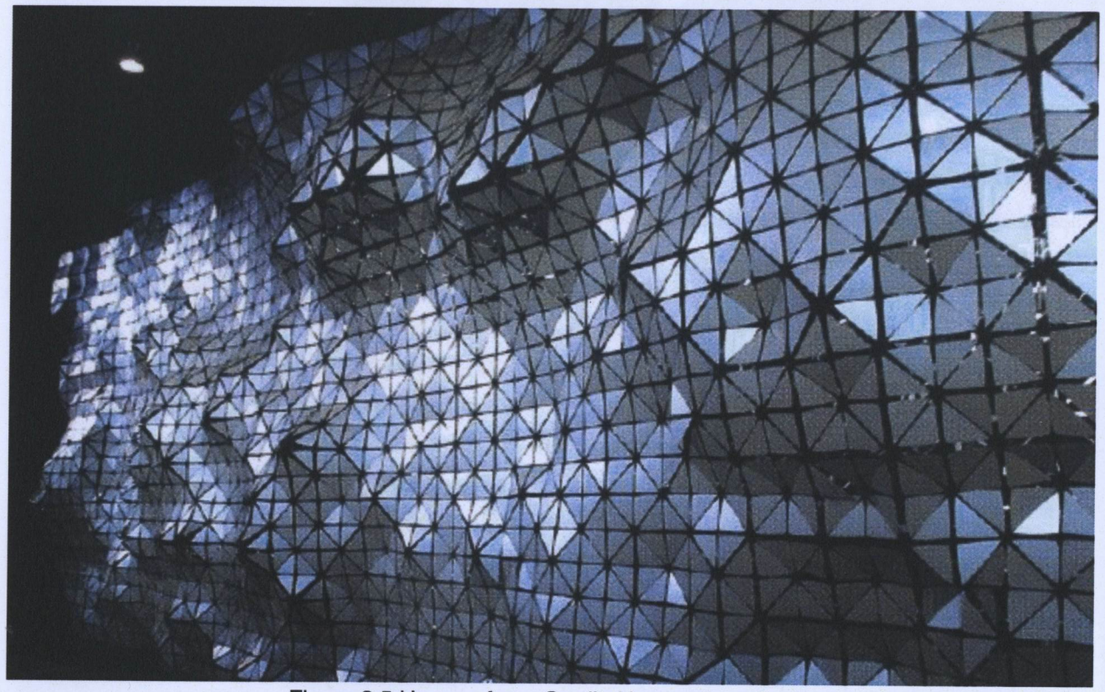


Figure 2.5 Hyposurface. Credit: Hyposurface Corp.

movement with digital processing is the Hylozoic Soil project in 2007 (see Figure 2.6). The Hylozoic Soil project is an installation where a geo-textile mesh is constructed that senses human occupants using motion sensors, and responds to that presence with air movement that is generated by the moving parts (Philip Beesley Architect Inc.). This project in particular illustrates the tiny scale that the moving parts of an object or skin can have. This knowledge improves the design process, removing the restraint of space required to achieve moving surfaces, and improves the accuracy of speculation into the micro-capabilities of surfaces and skins in the future.

Figure 2.6 Hylozoic Soil. Credit: www.philipbeesleyarchitect.com

The Demonstration House

A demonstration house is an architectural piece that describes a designer's vision of the future. Based on research and observations of past and present trends, the demonstration house speculates about the forms of social interaction that may take place or be accepted in the near or distant future. Demonstration houses are powerful tools that can create discussions and debates on what the future of architecture holds. Whether the house depicts an apocalyptic scenario or a utopian one, the questions derived from the design are more important than the design itself.

Archigram can be seen as one of the earlierst groups of designers who provided architects with a vision of future. Situated within the modern era of design, Archigram displayed an active involvement with the growing 'machine' technology of the time (Cook, 1999). Such projects as The Walking City or the Plug-In City were designed based on mobility and cities

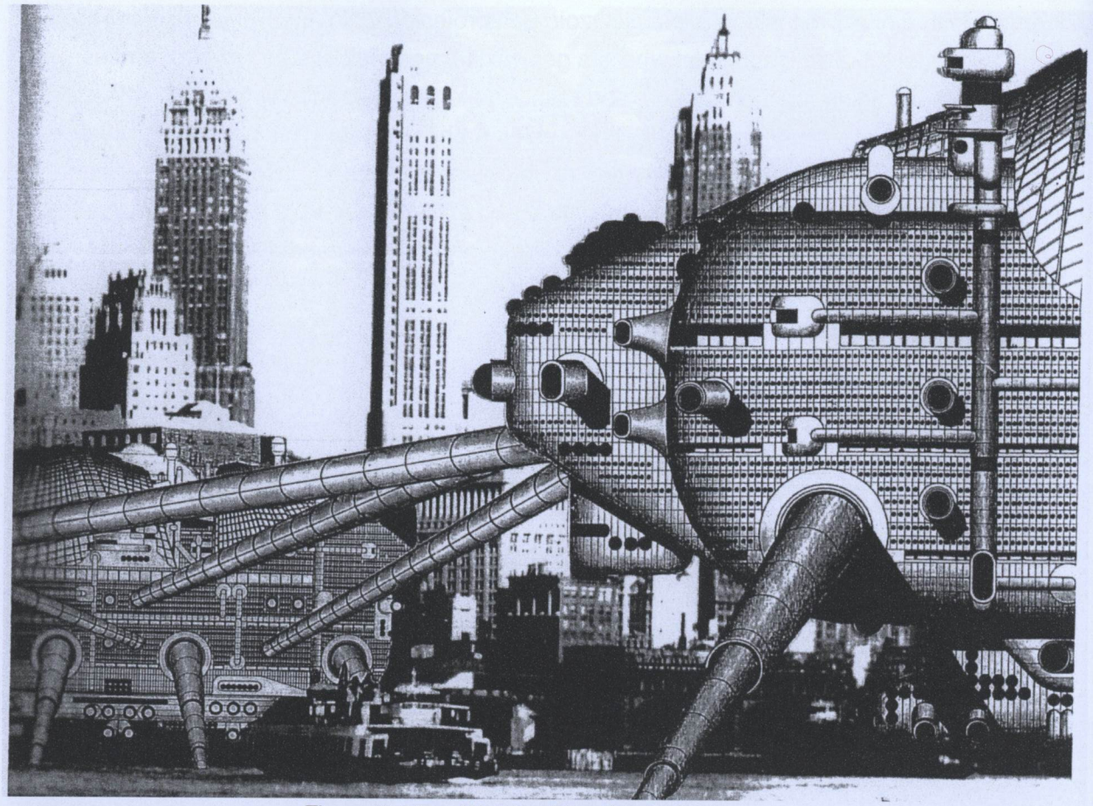


Figure 2.7 The Walking City. Credit: Archigram.

avoiding turmoil in times of war (see Figure 2.7). In this sense, Archigram demonstrated to the architectural community that the future will be a dangerous place if we continue to fight in war, and that the ridiculous depictions of life in the future that they showed, wanted or not, may be a solution. As time progressed and the technology evolved in to the Information Age, some demonstration houses were designed to oppose or expose the negativity of the pervasiveness brought by the new network communication society. One in particular is the Slow House by Diller and Scofidio. This house was meant to slow one down from the fast paced world brought on by network communication (Riley, 1999). This is shown in plan as a progression through space, building the anticipation of the view to come (see Figure 2.8). The design demonstrated that living within a home and being physically present in the home should overwhelm the presence of digital space and be a place of reflection-illustrated by the juxtaposition of the digital screenshot of the water view against the actual view itself.

Another example of a house that commentates on the negative qualities of digital space is Bernard Tschumi's Glass House in the Sky. The house is an intervention on an existing high rise tower (see Figure 2.9). Although the house clearly represents an alternative to urban sprawl by making use of the dead spaces on top of buildings, the house also demonstrates an awareness to users of the house as well as the public the influence of digital space in our

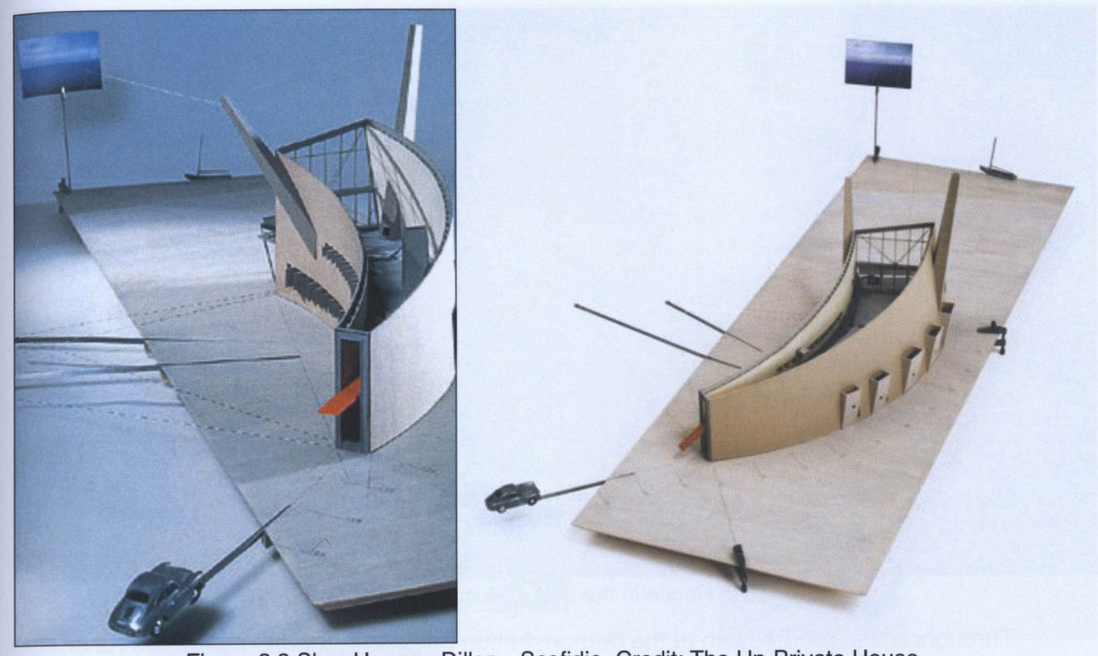


Figure 2.8 Slow House - Diller + Scofidio. Credit: The Un-Private House.

lives (Bernard Tschumi Architects Inc.). The house exteriorizes the private life of the users by projecting images of their daily activities on a large wall that runs the length of the home and can be seen outside from the large glass skin that covers the structure (see Figure 2.10). The house demonstrates that even when you are in your most private space - your house, the public digital space is present. As a result, Tschumi materialized the presence of digital space through visual images to compensate for the physical isolation resulting from using communications networks such as the Internet so frequently (Bernard Tschumi Architects Inc.).

Figure 2.9 Glass House in the Sky. Credit: http://www.tschumi.com

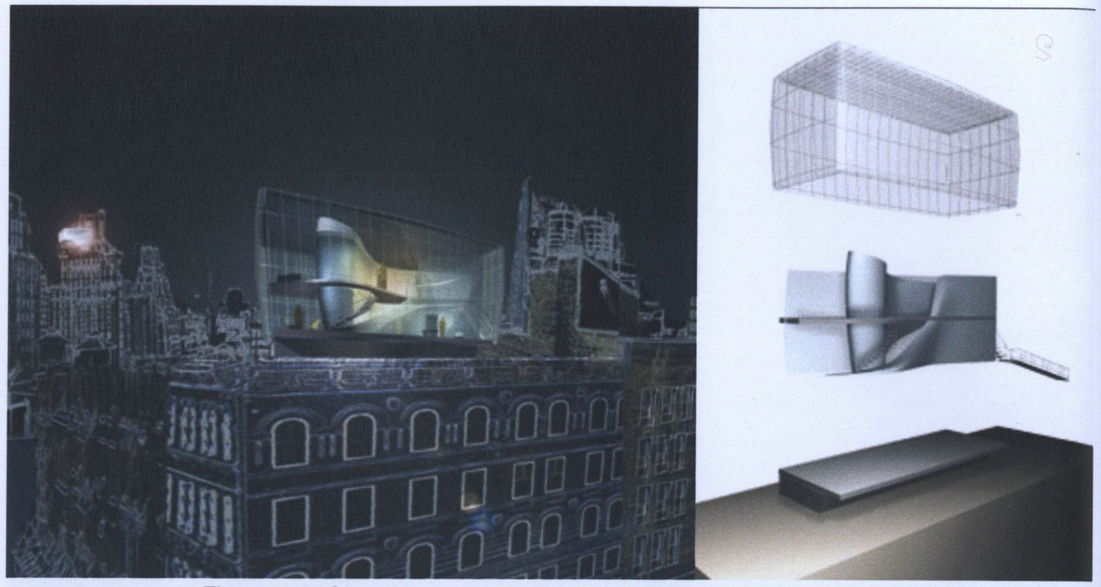


Figure 2.10 Glass House in the Sky. Credit: http://www.tschumi.com

Throughout the progression of the demonstration houses described above, we have seen that speculation for the ways of living in the future were reduced in terms of time, and the houses began to become more of a commentary on present society than a vision of the future. The following demonstration houses are based on hybrid architectural techniques that express the potential of technology, rather than enforce a speculative vision of life. These houses are interesting because they describe user relationships within the home and how technology can be used to improve these relationships.

Ubiquity and Place: Style Park and The Remote Home

Style Park, by J. Meyer H. in Berlin is an apartment type space based on the corridor – described as a space freed from extraneous formalities which has been created out of itself (see Figures 2.11 and 2.12). The corridor design method was used to provide a means for unconventional abstract spatial characteristics and experiences to take place (Verb, 2004). Essentially, Style Park became a testing ground for new innovative products geared towards user responsive environments, meaning sensual relationships to space, light, sound and heat (Verb, 2004). The problem with Style Park is that it provides a space that performs for the user and responds to the control of the user, becoming part of a more 'distractive' model of architecture. The space becomes more about the information interfaces than the physical space, and although there is a constant play between the two, the space will only change based on newer technology, not the evolution of the user themselves. If an environment is based on media information, it becomes increasingly difficult to establish a sense of place (see Figure 2.13).

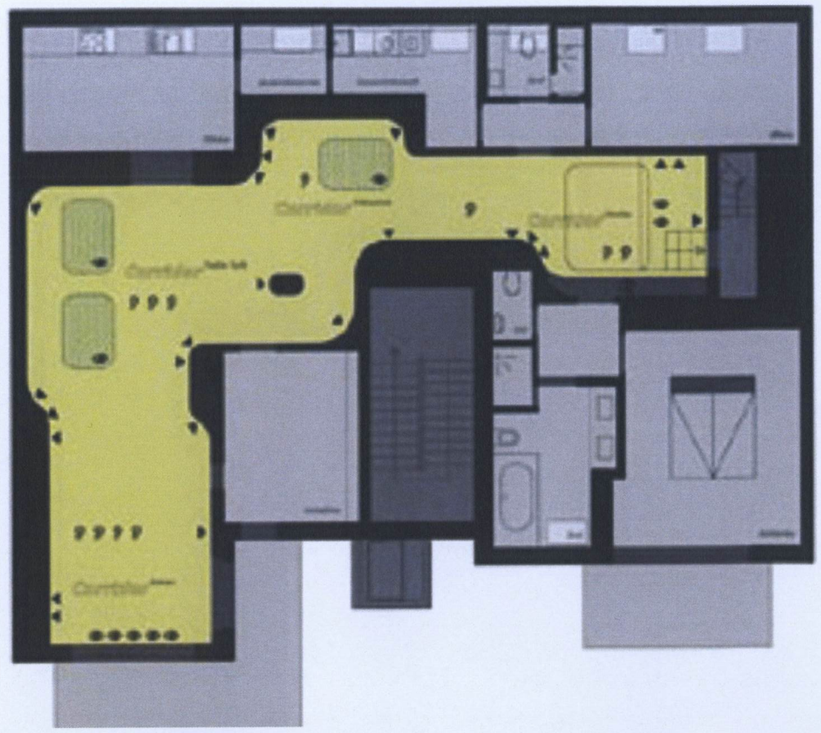


Figure 2.11 Plan of Style Park. Credit: Verb Matters.

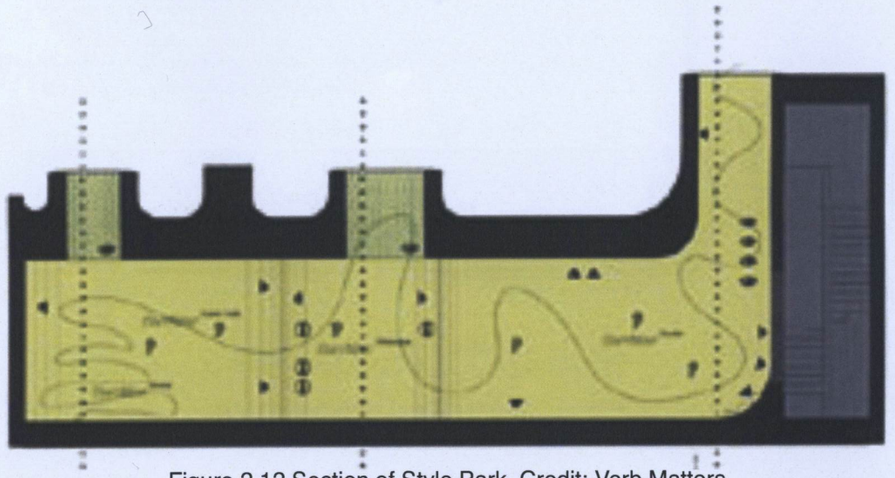


Figure 2.12 Section of Style Park. Credit: Verb Matters.

There have been attempts to improve this condition by having spaces respond to intangible qualities of the user, the most important being emotion. One example from Seattle, the Remote Home by Tobi Schneidler, attempts to mediate the space as a social proxy and introduces emotions, not functionality, as a developing driver (Lally, 2007). The Remote Home is essentially a learning space that will eventually perform autonomous behavior based on the emotion and interaction of the user, making the space context specific (see Figure 2.14)(Lally,

Figure 2.13 Interior Perspective of Style Park. Credit: Verb Matters.

2007). In the case of Style Park and Remote Home, they differ in their use of the creation of physical emotion. Style Park is a very personalized, digital space that can potentially recognize users and adjust its environment based on the pre-programmed user requirements. The Remote

Home however, uses tactile and spatial experience as a digital interface of communication (see Figure 2.15). With the help of artificial intelligence, the Remote Home establishes a new mental relationship with space, treating architecture as a realm of unexpected outcome – making that space more grounded in its location, yet mobilized as a physical interpretation of digital communication. When a space reacts to emotion, it becomes extremely context driven.

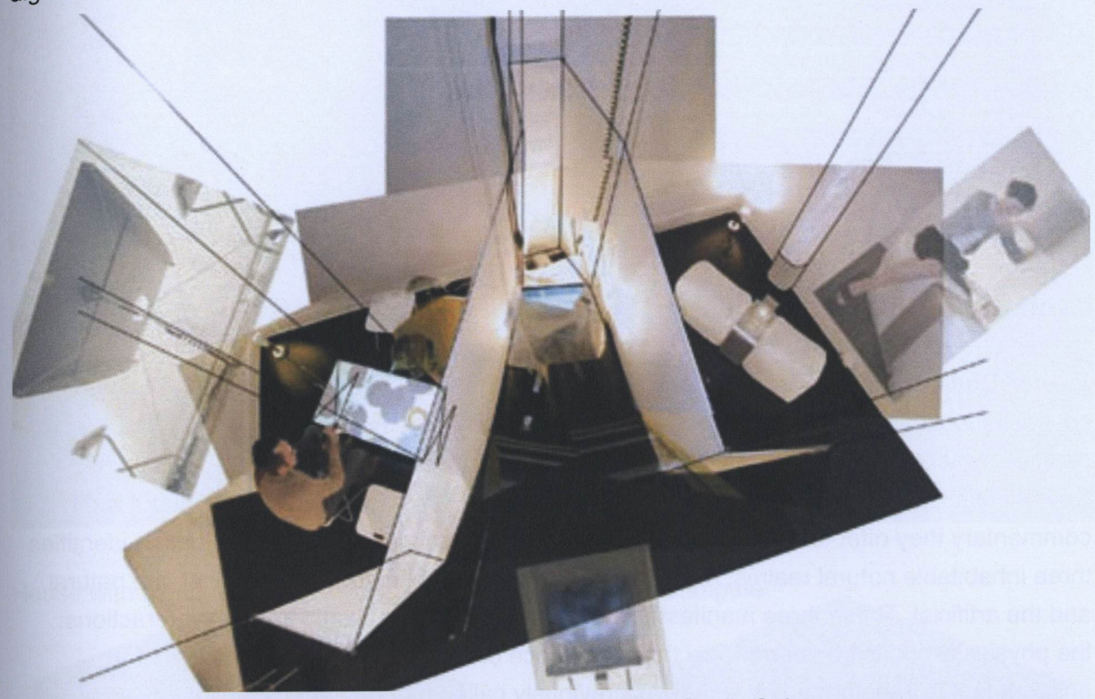


Figure 2.14 Remote Home - Translocation. Credit: Softspace.

Figure 2.15 Remote Home - Responsive fields. Credit: Softspace.

An example is D Tower by NOX architects, which can glow a certain color depending on the emotion (love, fear, happiness and hate) derived from the online questionnaire completed by the community members of Doetinchem, Netherlands (see Figure 2.16). The artifact becomes a physical representation of online dialogue and interaction of the some forty five thousand users. That intangible quality of emotion can affect the usage of space. In the case of NOX, the knowledge gained by understanding the 'feelings' of that community may affect the emotion of the audience, affecting their usage of that hybrid space.

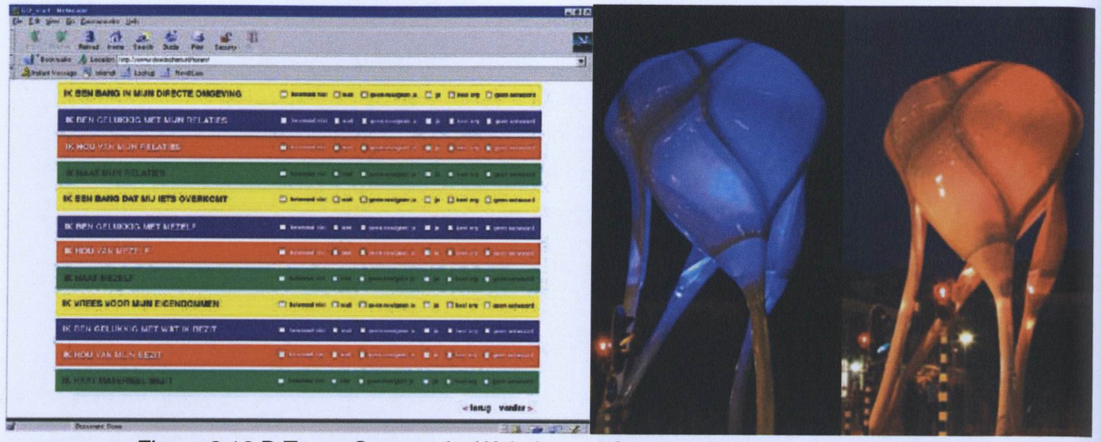


Figure 2.16 D Tower Community Website and Sculpture. Credit: NOX Architects.

Achieving Hybrid Space Chimerically - The Media House Project

Vicente Guallart and the MIT Media Lab have persued a design methodology in which hybrid space is productive and advantageous for users. They have developed the concept of meta-realities, which are intelligent realities in which the uses of information technologies further a way of inhabiting a networked world (IAAC). The most interesting quality of their work is the commentary they offer for the physical inhabitation of digital network society. Guallart identifies three inhabitable natural realms: media, mountains and architecture or the digital, the natural, and the artificial. These three manifestations call for a new organization of their interactions: the physical world is transformed by the emergence of the digital world; the constructed environment is transformed by what was previously called natural and the digital develops its own internal laws and builds its own operative world (IAAC). All three phenomena therefore vibrate simultaneously when faced with any kind of human action (IAAC). This research has focused on the capacity for people to construct an inhabitable environment by assuming this new three-way interaction. Guallart hypothesizes that the end purpose of architecture is not solely to build but also to define environments where human life can be organized (IAAC). The Media House Project is an attempt to redefine the way a house and its functional organizations are interpreted and used (see Figure 2.17). This new shift defines inert architecture as an obsolete design platform. The investigation of design by the Media Lab is based on structure, which is appropriate considering that the project is meant to demonstrate a play of corporeal (inert matter) and incorporeal relationships (living matter/digital space) (IAAC). Although this piece, as well as the Media Lab's installation at the 2008 Venice Biennale, can be viewed more as an art installation than an architectural intervention, the project nonetheless demonstrates a hybridity that is both adaptive and productive. The Media House offers a participatory approach to design, making users aware of the advantages of simply equipping household devices with IP addresses. The simplicity of the idea, making the house the network, enables users to change the relationship of objects in the house at will (see Figure 2.18). As a practical measure, they

Figure 2.17 Media House. Credit: IAAC.

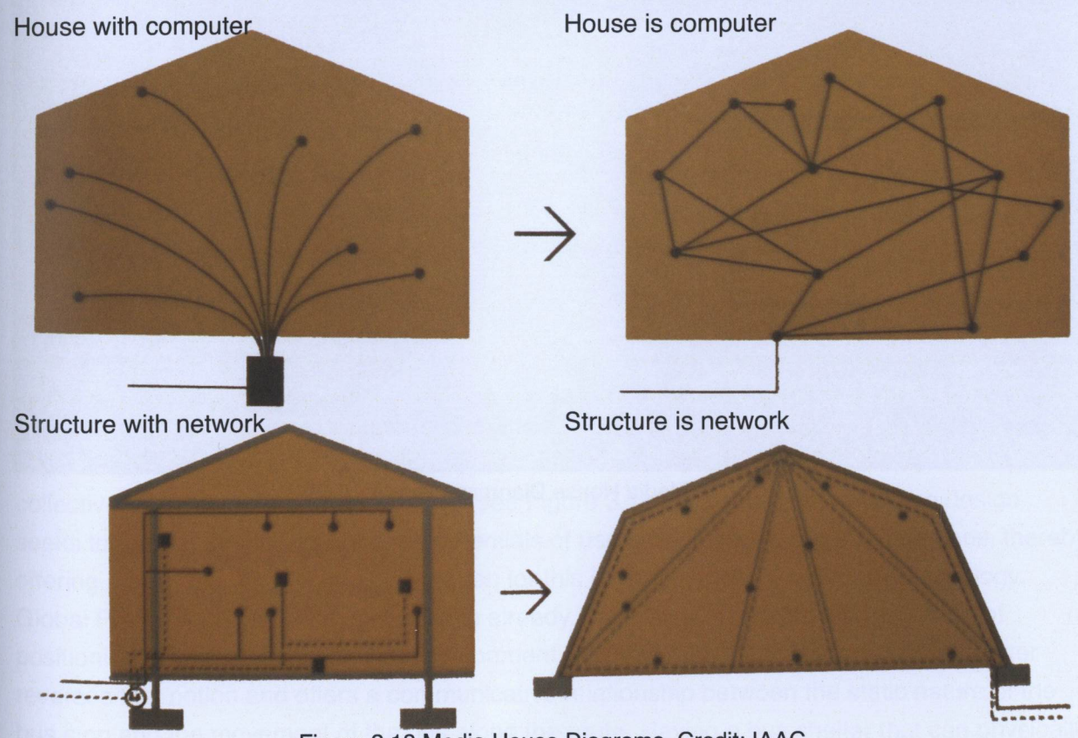


Figure 2.18 Media House Diagrams. Credit: IAAC.

developed a structural system that could support such interactions to take place, allowing the nature of networks – multiple paths between destinations – to become fully realized in physical space. Interestingly, this study focuses on the interior interactive spaces of everyday life rather than the mediating envelope that has driven most designs, particularly media facades (see Figure 2.19). Having an approach that focuses on individual usage and interaction within the house, form of design therefore can be more representative of a specific context, since its mediated surface is dictated by other forces and its internal organizations are allowed to grow and evolve.

Figure 2.19 Media House Diagrams. Credit: IAAC.

CHAPTER 3 - DESIGN STUDIES

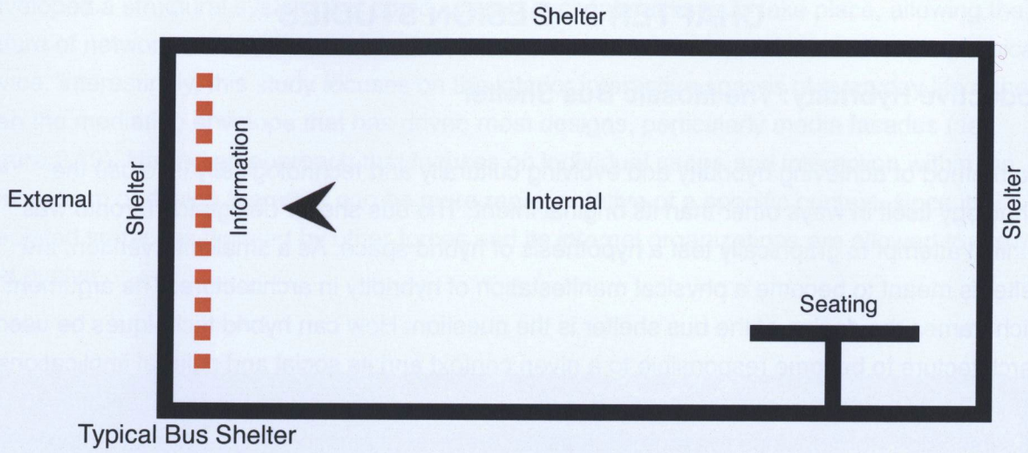
Productive Hybridity: The Mosaic Bus Shelter

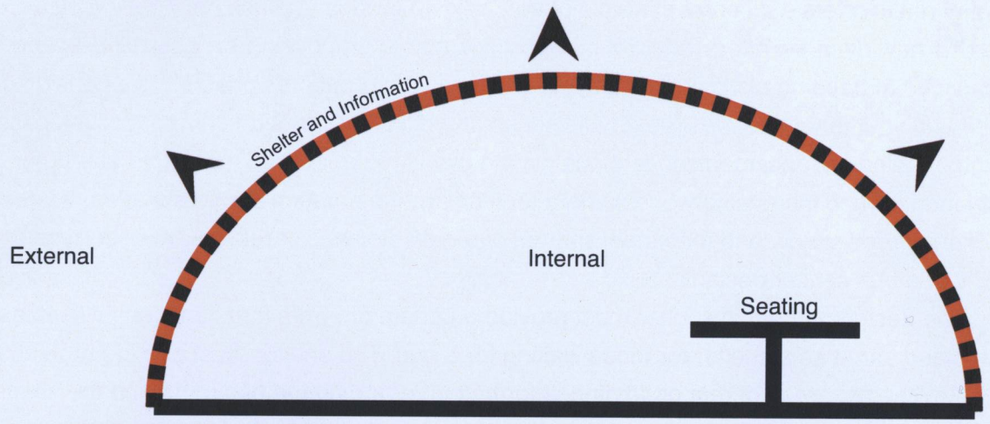
One method of achieving hybridity and evolving culturally and technologically is to use the technology itself in ways other than its original intent. The bus shelter design for Toronto was an initial attempt to graphically test a hypothesis of hybrid space. As a small intervention, the shelter is meant to become a physical manifestation of hybridity in architecture. The argument which frames the design of the bus shelter is the question: How can hybrid techniques be used in architecture to become responsible to a given context and its social and cultural implications? Part of the research included understanding the popularity of digital space and its attractiveness to users. Aside from obvious reasons such as its temporal diminution and democratization, the digital realm offers a different dynamic of properties by which humans must reside by on earth. This new dynamic offers different perspectives and approaches, new possibilities, and new chances to become more than what you are – the new properties enable the extension of yourself and your innermost desires. In this sense, the digital realm is a very productive space. Through ongoing advancements in technology, the digital realm is becoming more autonomous or self-learning, and increasingly becoming a tool for experimentation and exploration. It is this notion of productivity and the establishment of a new dynamic of rules that will enforce the hybridity of a bus shelter design.

The design of the bus shelter must provide a certain program that can identify itself as a bus stop and serve as a shelter for those waiting for a bus. The shelter must provide protection from the elements, areas of rest or seating, information regarding the bus route and the shelter must remain physically grounded in one location as a stop along a route. Once the program was understood, three questions were asked:

1. How can architecture inform users of their location relative to the bus?
2. How can architecture improve user control of their surroundings?
3. How can architecture become a productive space that can communicate and evolve?

The design of the shelter looked to devise a fused relationship of digital technology into a physical form, making the architectural space produced and the technology implemented to collectively become the primary gesture (see Figure 3.1). As discussed earlier, the design seeks to analyze technology and the potentials of use other than the original intentions, thereby offering a new use. The technology chosen for this particular design was GPS technology. Global Positioning Satellite systems have already been used in automobiles as a way of positioning themselves in a moving environment relative to the static earth. The bus shelter reverses that notion and offers a communicative relationship between the static nature of the bus stop and the movement of the bus along the route. Having a bus shelter that can physically





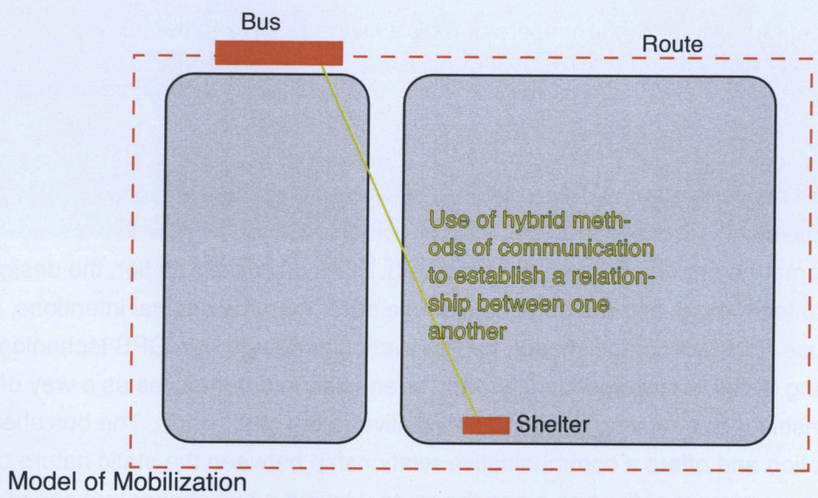


Figure 3.1 Bus shelter diagram.

communicate the time/distance of the bus from that specific location creates a productive environment that establishes the control of the user by understanding the location of the bus relative to that specific location and the time associated with that distance (see figures 3.2-3.7).

This is done through a simple grid framing system, that allows a variety of paneling options of infill. A simple continuous membrane provides both structure and shelter for its users and acts as a display for the amount of time left before the bus arrives. Each transparent panel of the frame is equipped with LED lights of the entire color spectrum around its frame. GPS technology is networked into each panel, which will create volumes of color amongst the panels that relate to the number of minutes left before the bus arrives. The effect of this hybridity allows the bus stop to grow from its typical inert sense and become more liquid as a physical representation of a moving vehicle. This mobilization of space offers a new dynamic of rules to the nature of the bus stop and becomes more productive within its specific context. The bus shelter becomes even more grounded within its specific location, portraying the arrival of the bus to that specific location. In this sense, the shelter is contextually responsible, productive, and supportive of public transportation.

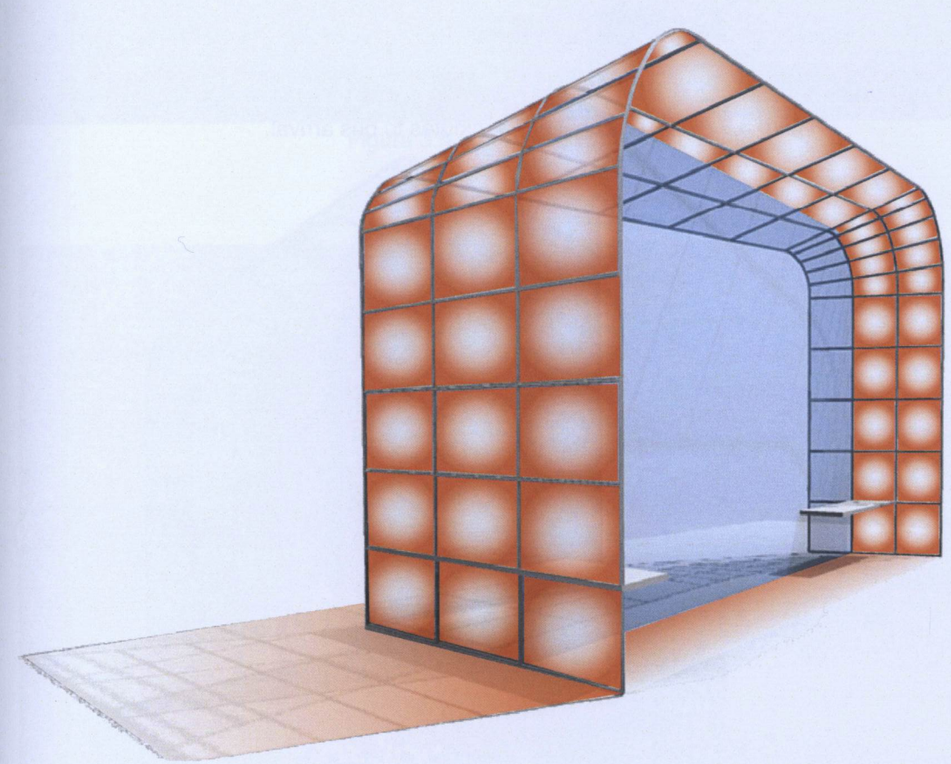


Figure 3.2 Active bus shelter - 1 minute to bus arrival.

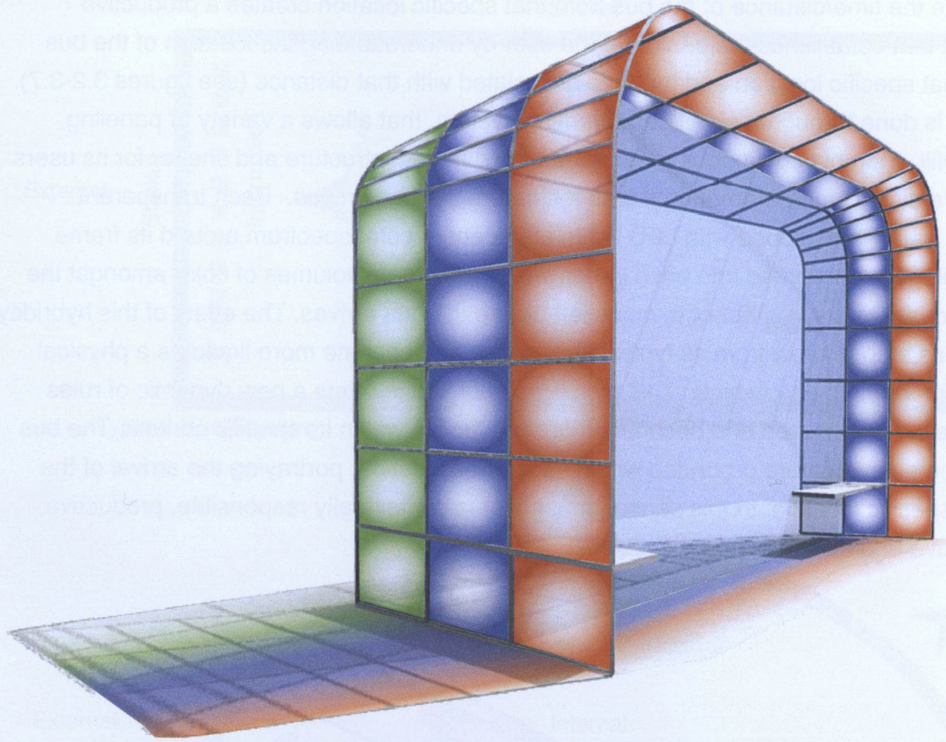


Figure 3.3 Active bus shelter - 3 minutes to bus arrival.

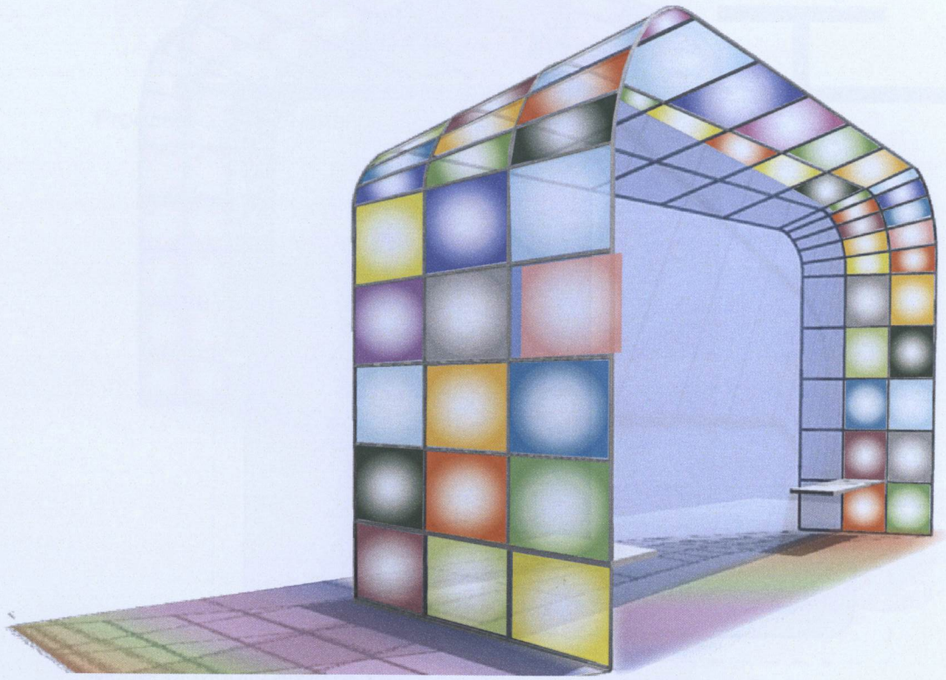


Figure 3.4 Active bus shelter - Traffic jam.

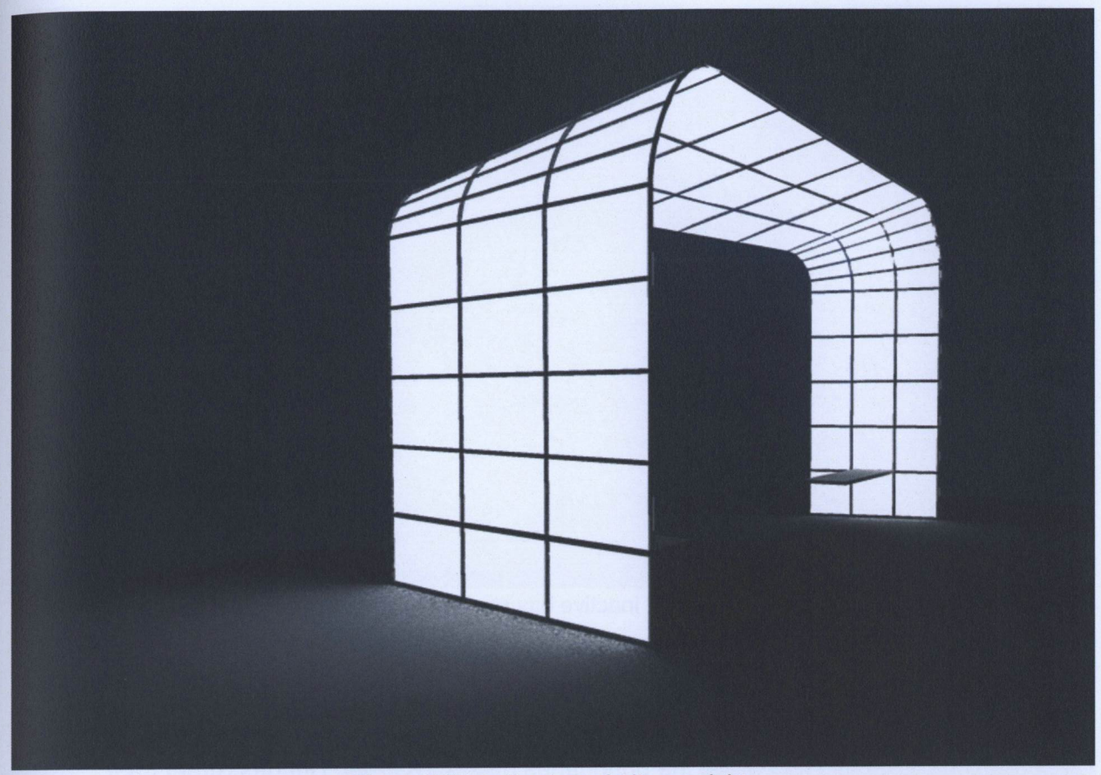


Figure 3.5 Inactive bus shelter at night.

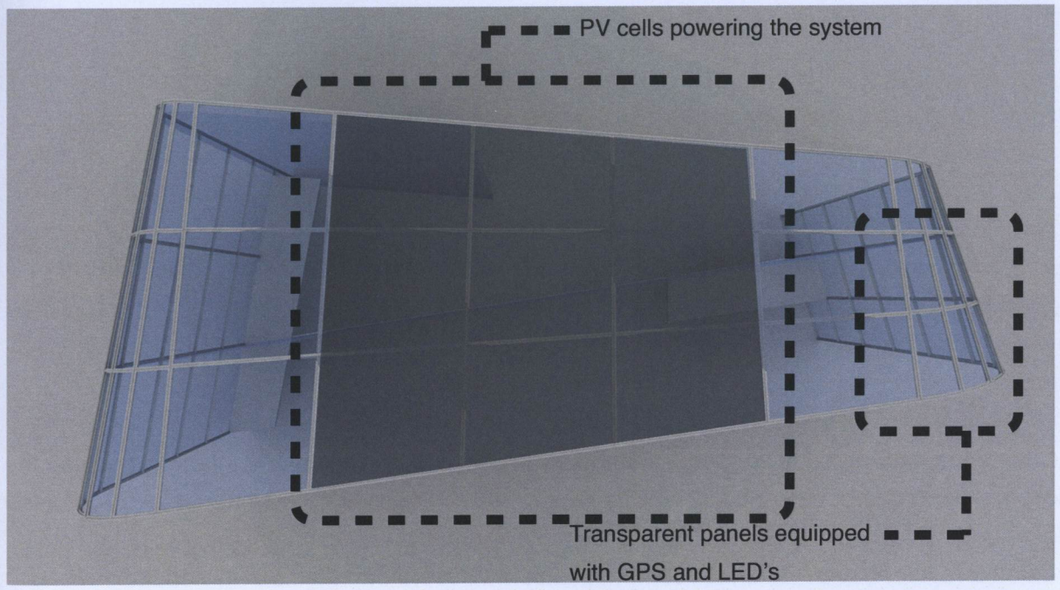


Figure 3.6 Inactive bus shelter roof plan.

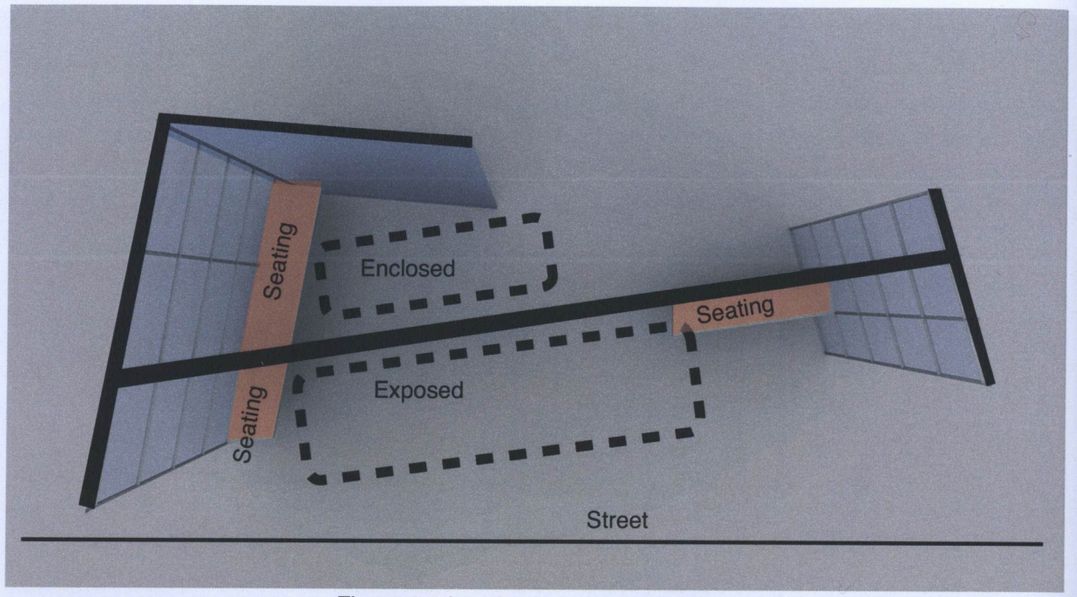


Figure 3.7 Inactive bus shelter section.

Dundas Square Surface Analysis

The purpose of the Dundas Square analysis was an attempt to map out all of the potential spaces which presently exist within the boundaries of Yonge Street, Dundas Street East, Victoria Street and Dundas Square Laneway (see Figure 3.8). The analysis was carried out graphically to represent the conditions within which certain public events and spaces are contrived and the influences, tangible and intangible, of these conditions (See Appendix B). As a result, the research was dedicated to understanding the surfaces of interaction, the interfaces that enable the activities carried out annually in Dundas Square. More importantly, the research was carried out to understand the forms of hybrid space that occur in the square and the influences of these forms.

Dundas Square falls within the notion of the absence of real public spaces and collective icons within Toronto, resulting in the empty visual marker developed to signify the presence of culture within a city (Sumrell, 2007). This urban condition creates the necessary illusion that individuation and autonomy remain options even as society continues to move toward immaterial culture (Sumrell, 2007). The various surfaces of Dundas Square reflect this immateriality of contemporary culture, demonstrating a constant flux in time and space and a constant change of use. After an extensive analysis into the various surfaces of the square including the hard and soft surfaces, animate surfaces, soundscapes, and intangible layers, the most intriguing and popular quality was its location as a wireless internet hub, or wi-fi zone (see Figure 3.9). This combination of wireless technology and the public open space populates the area on a regular basis – and also communicates with users through its own website. Among the wi-fi signals are other forms of digital space, such as Global Positioning Satellite technology,

Figure 3.8 Dundas Square surface analysis.

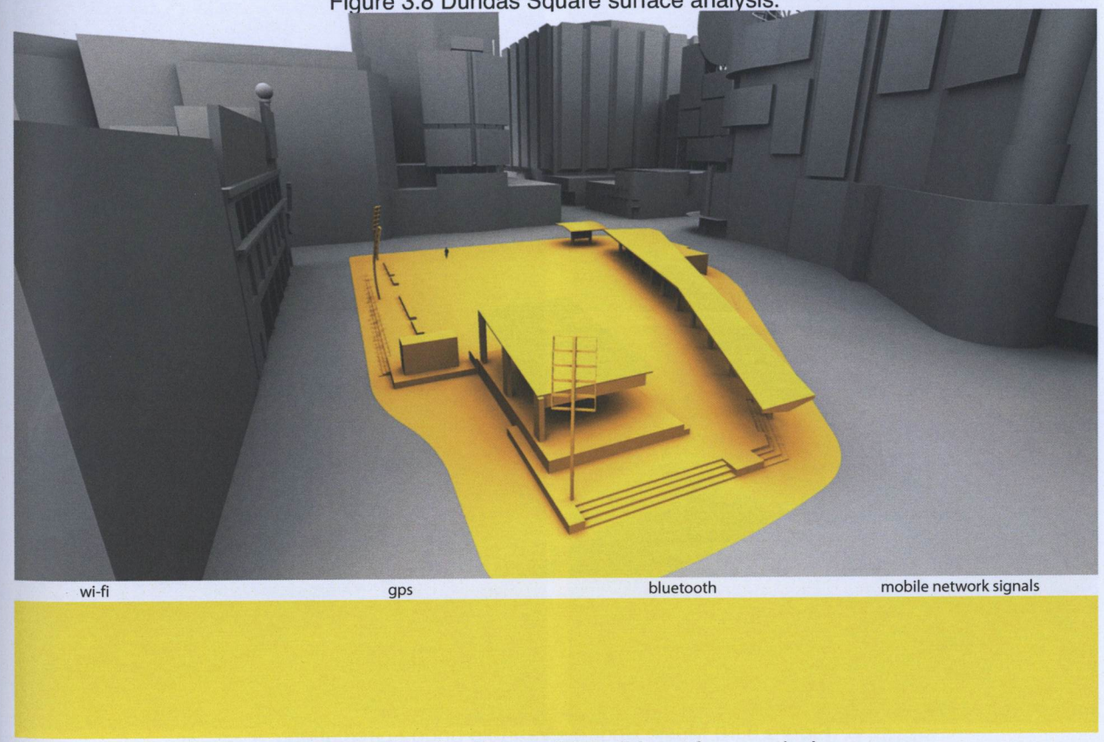


Figure 3.9 Dundas Square intangible surface analysis.

Bluetooth sync technology and Mobile Network signals used for cell phone and other handheld devices. The presence of these devices and signals on the site amplify the social value of the space as well as its position as a static space in the city of Toronto. The events taking place can instantly become shared and networked to remote areas, attracting users who would otherwise be unaware due to their physical location. These intangible surfaces therefore become all of the surfaces of Dundas Square. Their interfaces can be found on every surface on the site. However it is the physical dynamic of the architectural space - both open and sheltered, ambient and bustling, soft and hard, animate and static – that offer an interesting evolving space that uses the spontaneous and instantaneous potentials of information technology to make the space much larger and more useful than what it spatially offers.

Connecting Cultural Space: The Bridge Experiments

The bridge experiments were demonstrations of the drastic change a design can have when the application of digital space is known at early stages of the design process. A bridge, an

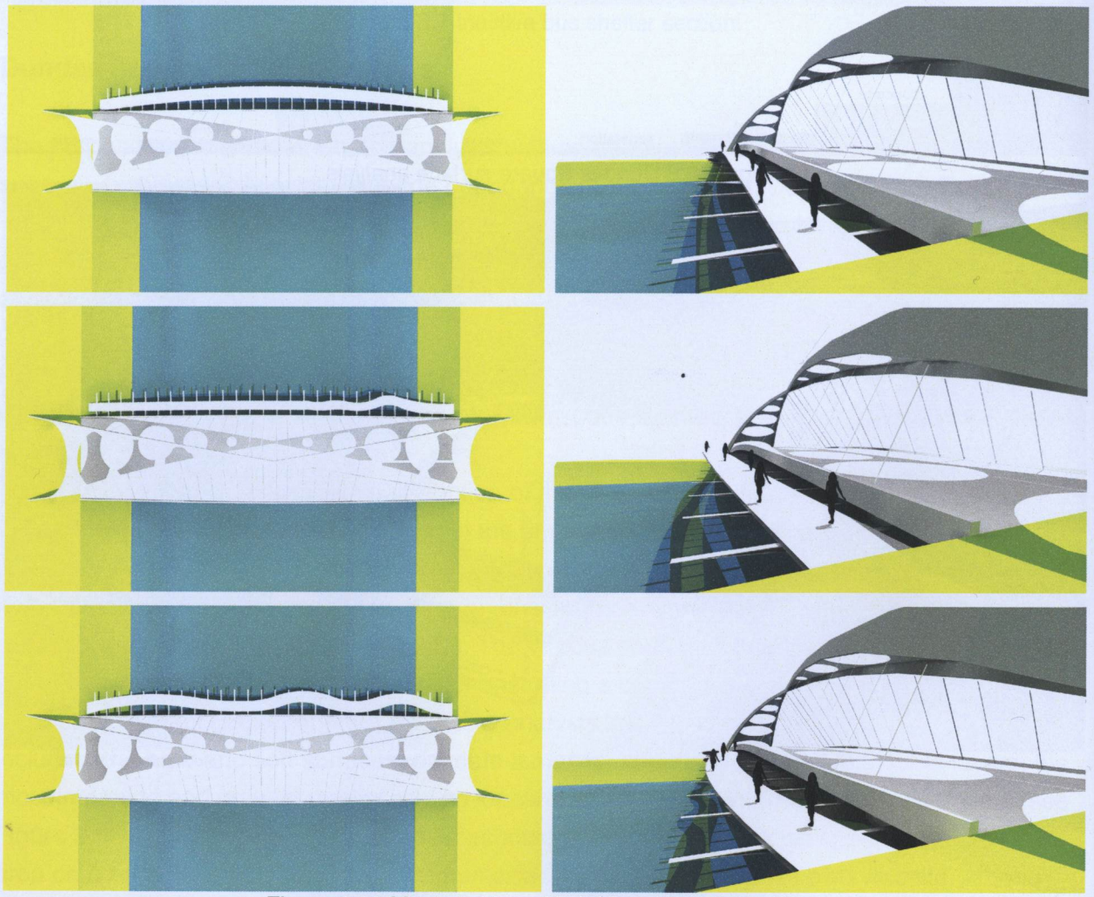


Figure 3.10 Music Bridge - Variable bridge circulation.

expensive intervention, can retain social and cultural identity and symbolism, act as a moment of transition, serve as a monumental landmark, and support many forms of function, including vehicular, pedestrian and rail systems of circulation. A bridge, like an elevator, must retain a certain inert quality due to its overall function as a connecting element to two or more fixed positions and as an integral structural entity to support its general transportation function. The severity of the structure depends on the program of the bridge.

The Music Bridge

The initial design of the Music Bridge was to have the bridge itself take information digitally, process that information accordingly, and physically display that self-process. The design developed as a connecting element that could process digital music files sent by users of the community, combine the nature of each song to form an original piece of music, then mechanically change its pedestrian circulation patterns based on the frequency of the music produced (see Figure 3.10). At the end of the week, users could download the song created by the bridge, and the process starts over again. Lighting was also incorporated into the design, having cool colors represent low rhythms and bright vibrant colors representing fast rhythm. The

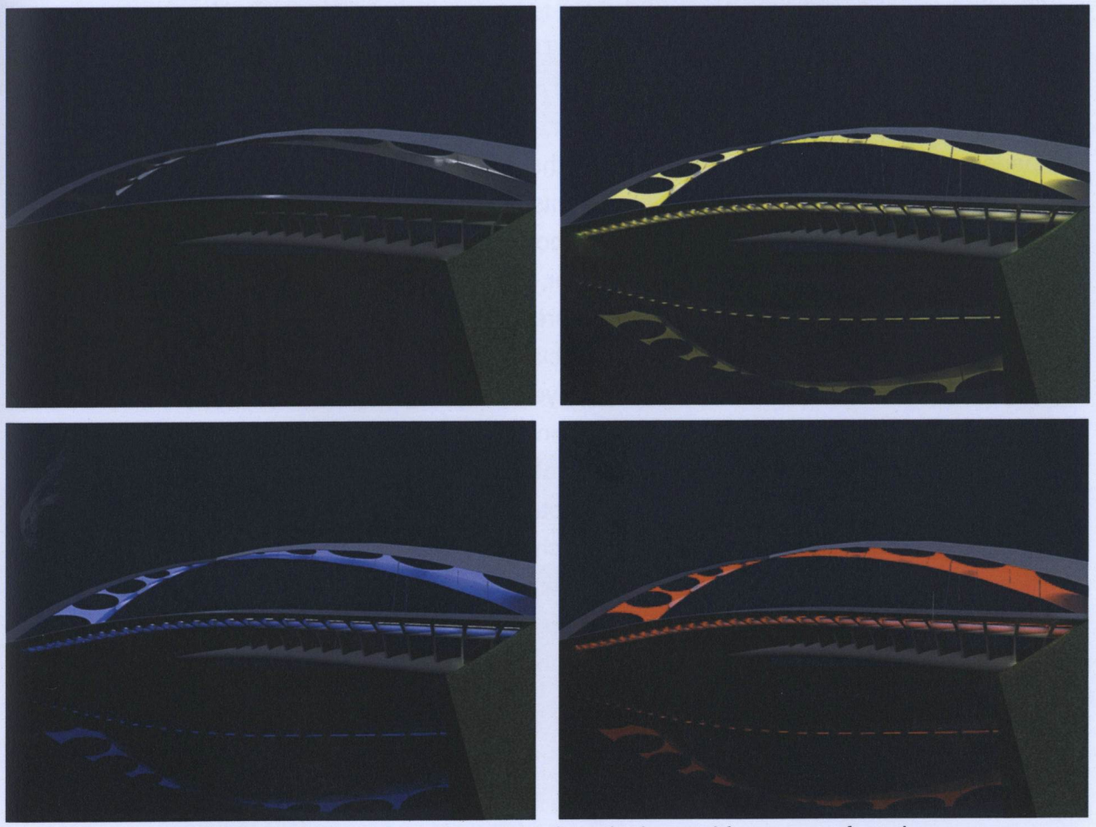


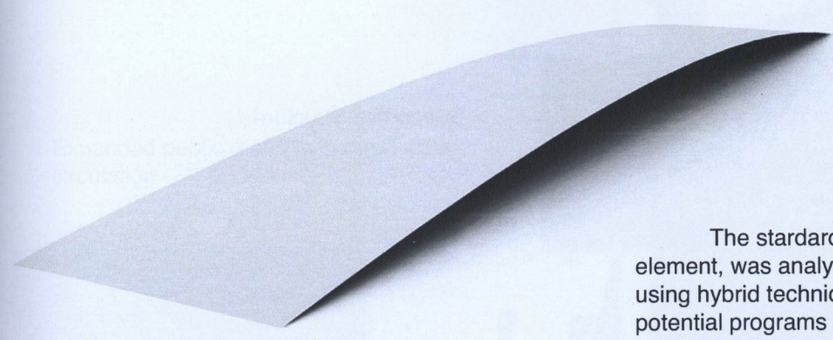
Figure 3.11 Music Bridge - Colours reflect rhythm and frequency of music.

idea was to have a bridge represent the shared music of its community and have the ability to create music on its own and physically demonstrate its musical ability (see Figure 3.11). The program of the bridge would incorporate vehicular and LRT systems on a separate deck from the pedestrian area, which would cantilever from the main structure and incorporate a flooring system that is mechanically operable. Throughout the course of a day, the pedestrian path of travel may shift its form three times, depending on the nature of the song. The mechanical systems would be powered by the peizo-electric flooring system of the main deck.

The Wireless Fidelity Bridge

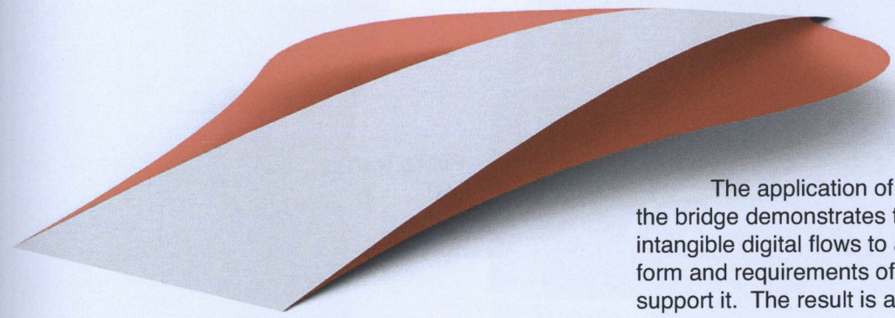
The second design attempt came from the phenomena of the internet and public space, as demonstrated by Dundas Square. Having public Internet access within a public space can affect its usage significantly. Internet access in wi-fi zones renders users static, and the space designed must accommodate the needs of users annually and in greater numbers. The Internet is a tool used by a large majority of society and its areas of access have the tendency to attract more users simply due to its invisible presence, or absolute surface coverage. How would the design of a bridge have to change if the bridge became a wi-fi zone? What design modifications must be made to allow the bridge to have a digital address and become a physical representation of that digital address? The bridge therefore grows from its traditional design into a public forum (see Figure 3.12). An emphasis is placed on the pedestrian realm, separating its function on the bridge by creating a new deck for public pedestrian circulation. The pedestrian deck is comparable in scale to the vehicular and public transportation deck, allotting adequate space for various public events and interactions to take place. The pedestrian deck begins at the same level as the bridge at both ends, then winds down below the vehicular deck, bringing the pedestrian closer to the water, away from the sound and pollution generated by the vehicles, and within an environment where the focus is on the unanticipated results generated by combining physical and digital social networking. The bridge becomes a digital and physical landmark, a connection in both physical and digital landscapes. It becomes a cultural forum, a physical space of interaction amongst users, and a flexible urban public space while incorporating elements of public transportation and vehicular transport (see Figures 3.13-3.16). This design demonstrates the physical potential of digital space. When adding a simple electronic signal hub to a physical structure, such as a bridge, the architectural design must significantly change to provide areas that accommodate the usage of such digital spaces as the internet, and the physical, static action that results. It is important to understand how digital space can create new and exciting programs into traditional structures and promote circulation, health and vitality amongst a community.

1. DISCOVERY



The stardard bridge, a connecting element, was analyzed to redine its function using hybrid techniques and assign new potential programs that enable the bridge to become a place of static public engagment.

2. APPLICATION



The application of internet access to the bridge demonstrates the potential of intangible digital flows to affect the physical form and requirements of real space to support it. The result is a bridge that must grow.

3. IMPLEMENTATION

As an initial design attempt, the bridge will enforce the presense of pedestrian circulation and provide a separate place for interaction. As a whole, the bridge becomes a connecting element in both the digital and physical worlds.

Figure 3.12 Wi-Fi Bridge - Concept diagram.

Supportive Structure

Expanded public realm to support static circulation

Public Transporation
LRT

Vehicular Deck

A Physical and Digital Landmark

Figure 3.13 Wi-Fi Bridge - Layer diagram.

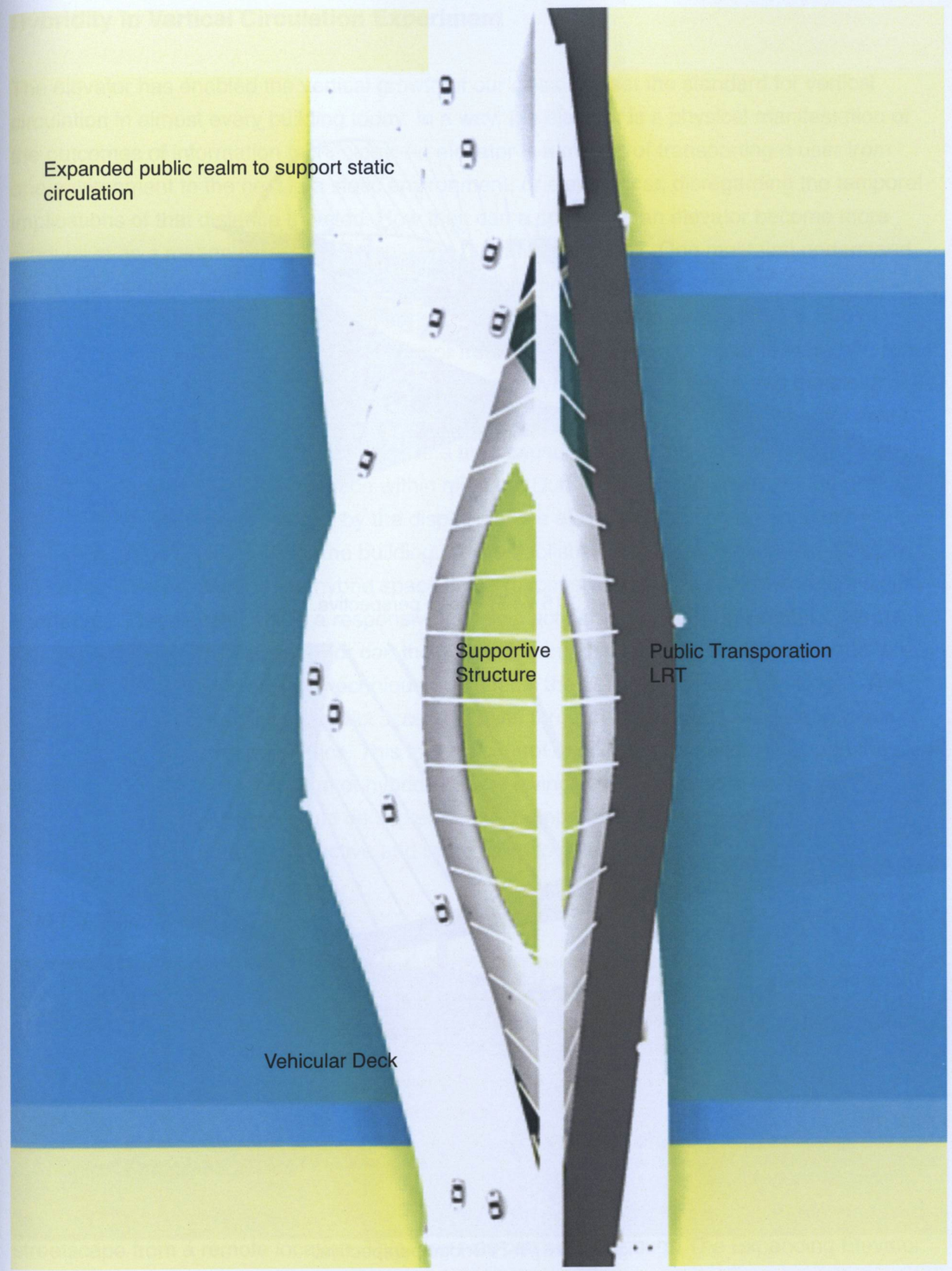


Figure 3.14 Wi-Fi Bridge plan.

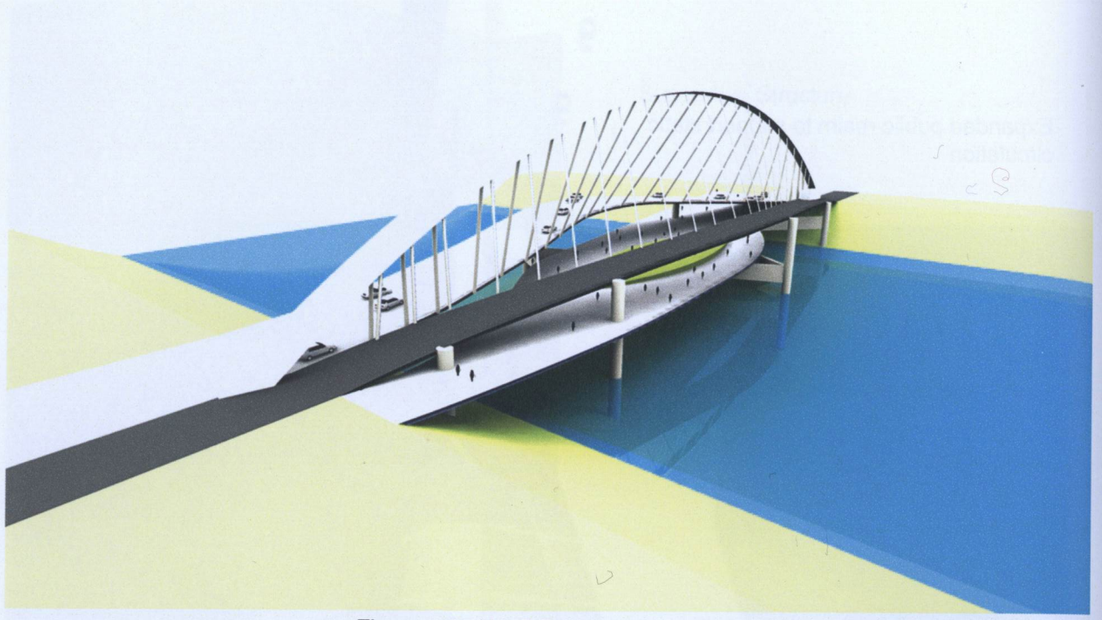


Figure 3.15 Wi-Fi Bridge perspective.

Figure 3.16 Wi-Fi Bridge perspective.

Hybridity in Vertical Circulation Experiment

The elevator has enabled the vertical growth of our cities and set the standard for vertical circulation in almost every building today. In a way, the elevator is a physical manifestation of the outcomes of information technology. An elevator is a means of transporting a user from one environment to the next in a static environment, or elevator car, disregarding the temporal implications of that distance traveled. How then can a space like an elevator become more productive as a means of transportation using hybrid techniques? One must first understand the usage of the elevator, its static nature within a building and hybrid spaces that are already created by elevators. The first form of hybrid space created by elevators is through communication. When one enters an elevator from a floor, the elevator is car is more of a room from a corridor than a mechanical circulation system. When the doors close and the elevator begins to move, the space is disconnected from that location and becomes a separate entity. The experience of an elevator is almost like a time capsule, where the closing and opening of the car doors reveal a different space within minutes. During the trip, however, the purgatorial state of the elevator car is broken by the displays of the elevator informing one of one's location relative to the height of the building. This establishes greater sense of awareness in the space. The second form of hybrid space is the responsiveness of elevators through digital interfaces. The elevator call is a responsive physical act carried out through digital systems. The responsiveness of the elevator car, the ability to bring this form of vertical transportation to your exact location is a digital technique that affects the usage of space in buildings. The elevator also has the ability to restrict access to itself through IR scanners and filters, touch and audio sensors, and magnetics. This form of control of access to a building through these digital techniques is another form of hybrid space. Having established the forms of hybrid space in elevators, what new form could be implemented to improve the present conditions of the elevator and make it more productive and responsive to its environment?

The Expanding Elevator

An initial attempt was to conceptualize the potential of horizontal movement or networking of elevators. The goal was to use hybrid space as a means to project the elevator out of its inert place and into the furthest depths of a building (see Figure 3.18 and 3.19). This involved using mobile devices to call an elevator, but proved to be too complex or short when grading the productivity of remote interaction with an elevator, since it must always be used at one location. Examples of attempts to broaden the spatial qualities of elevators include the Dimension Elevator, an installation where the walls of the elevator are projections of an exterior space in real time (see Figure 3.17) (Dandelion Collective). In this scenario, the user can experience the streetscape from a remote location. This idea was carried out though The Expanding Elevator. This was an experiment into the potentials of developing environmental experiences that could

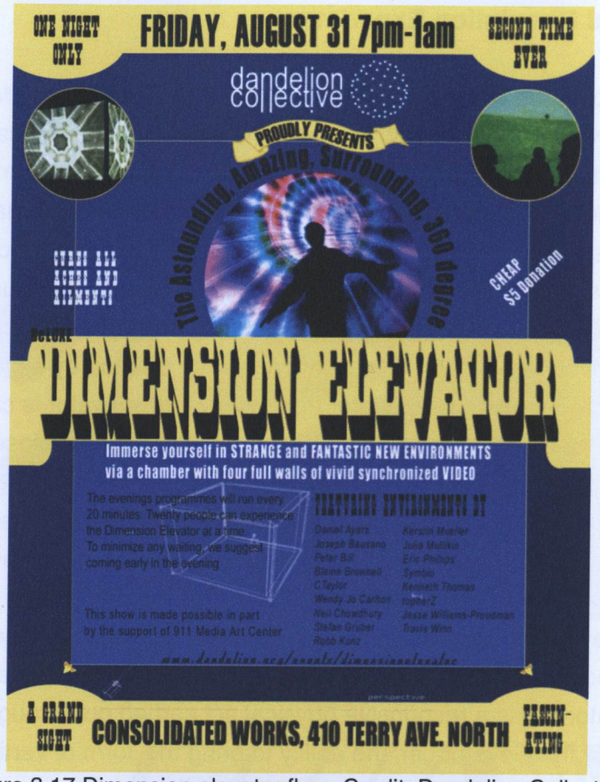


Figure 3.17 Dimension elevator flyer. Credit: Dandelion Collective.

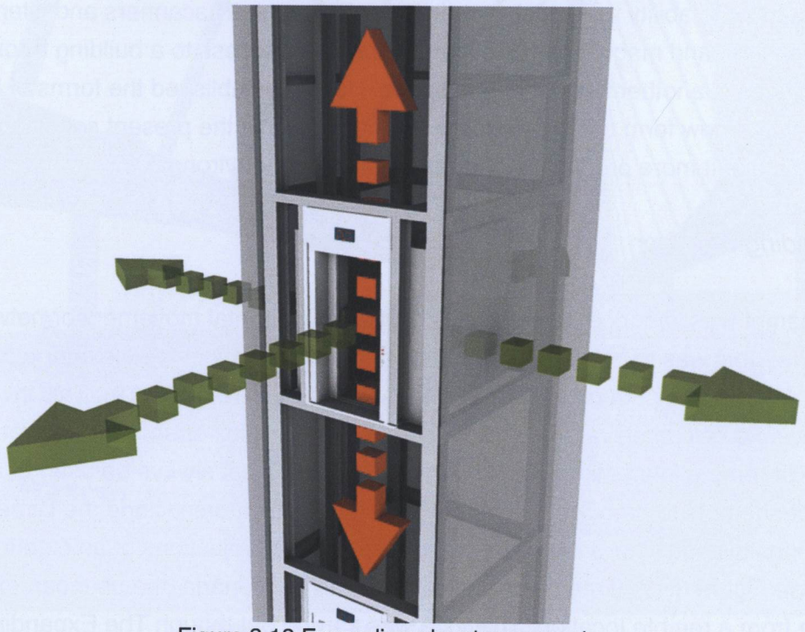


Figure 3.18 Expanding elevator concept.

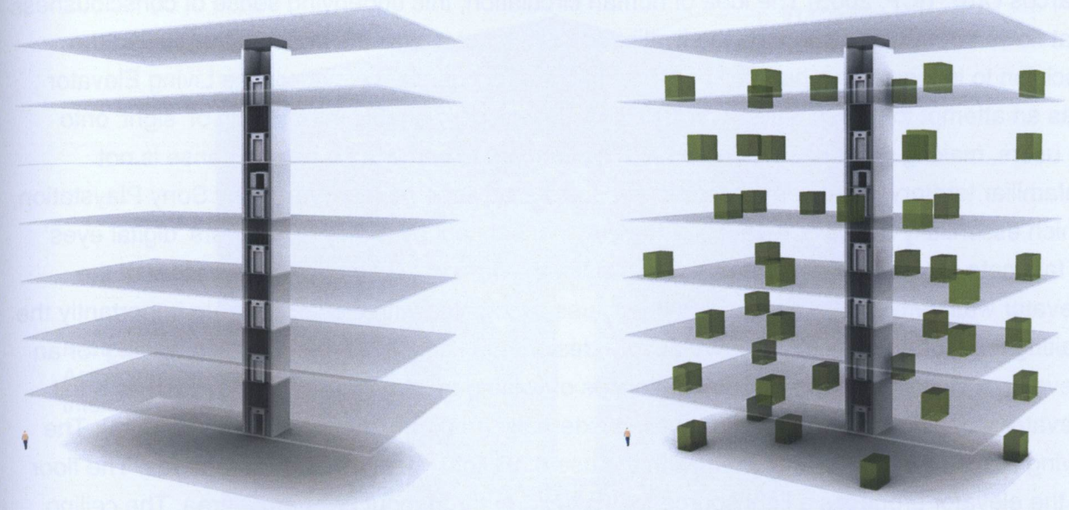


Figure 3.19 Expanding elevator - mobilization.

be displayed digitally and associated with the structure and temporal progression of an elevator through a building. The effect would create a spatial quality that extends beyond the confines of the elevator car and establishes a more realistic feeling of elevator travel over the timeless box a captive audience uncomfortably awaits their stop in (see Figure 3.20).

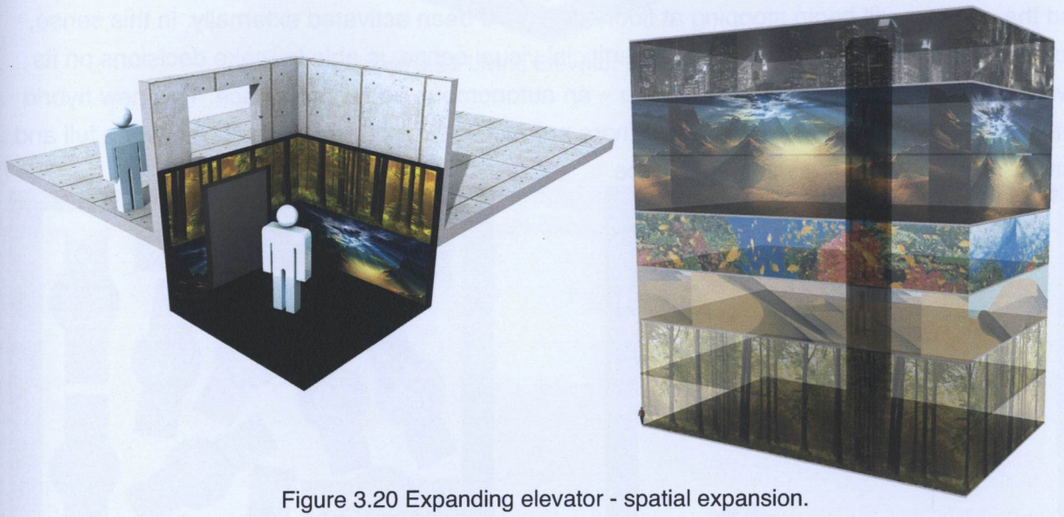


Figure 3.20 Expanding elevator - spatial expansion.

The Living Elevator

The second attempt as a response to the challenge of a new hybrid space was the design of the Living Elevator. There are many examples of design initiatives for circulation that are based on biologics of the circulatory system of the human body; the flow of cells through vessels; the living building, as seen by the New England Biolab and New Tomihiro Museum proposals by

Marcos Cruz. (ICP, 2005) The idea of human circulation, this underlying sense of consciousness that flows through and supports the livelihood of its master, was the concept that fueled the decision to incorporate a humanistic sense into the mechanized elevator. The Living Elevator was an attempt to devise a living organism by theoretically enabling the ability of 'sight' onto its users, making decisions autonomous. The concept to construct a human sense is not unfamiliar territory in today's contemporary society, as seen by the Eye Toy by Sony Playstation, which essentially does the reversal of the elevator concept by giving the viewers 'digital eyes' to fabricate a new environment within the space they are in. (Gizmodo) The concept of the elevator was derived when reviewing the issues associated with elevators, more importantly the waiting time for an elevator to arrive at your designated floor. To save time when waiting for an elevator, a closer look was taken at instances of waiting that could be avoided, such as a full elevator stopping at floors that were called externally (from the interface in the corridors). The Living Elevator avoids this problem with the use of IR light filters and digital cameras. The floor of the elevator produces a light source that is uniform throughout its surface area. The ceiling of the car is equipped with IR digital cameras that can process the amount of light that filters through objects in the internal space of the car. When the elevator is full, very little filtered light will be read by the IR system which will tell the elevator car that it is full of people – this could be reinforced with weight sensors as well. If the elevator is full to the calculated point of no further entry into the space, the elevator car will only stop at locations activated through the internal interface – saving time. When people leave the car, more filtered light will reach the sensors and the elevator will begin stopping at floors that have been activated externally. In this sense, the elevator, through the induction of an artificial visual sense, is able to make decisions on its own, becoming a living entity in a building – an autonomous behavioral space. This new hybrid space created by the elevator becomes more productive by reducing wasted time when full and establishes more comfort within the space.

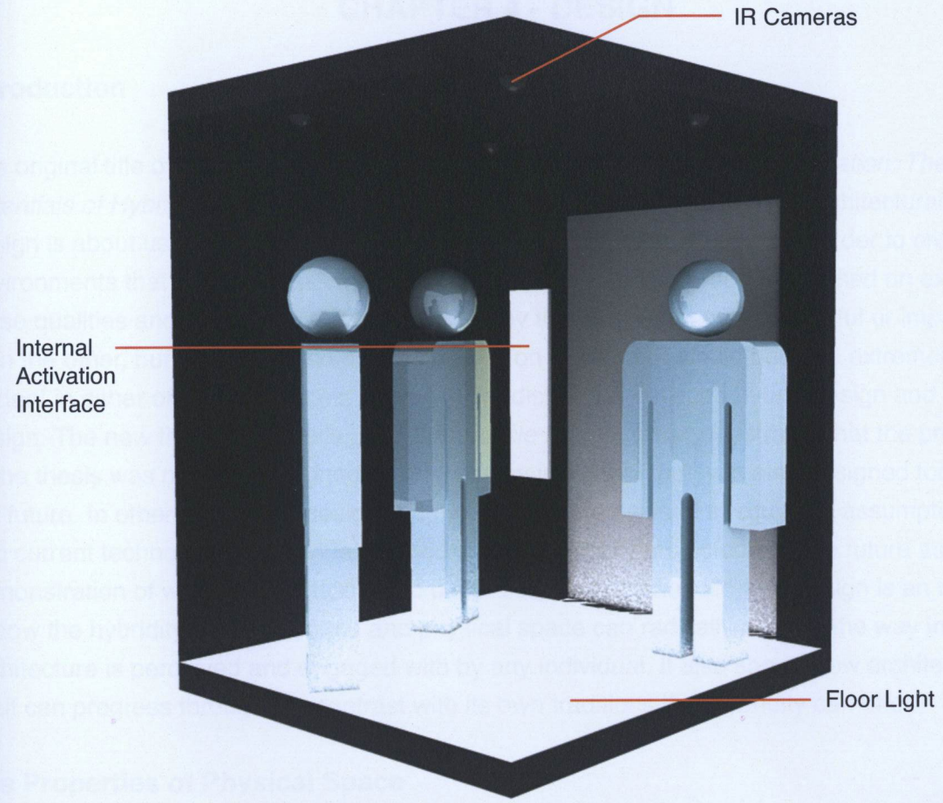


Figure 3.21 Living Elevator perspective.

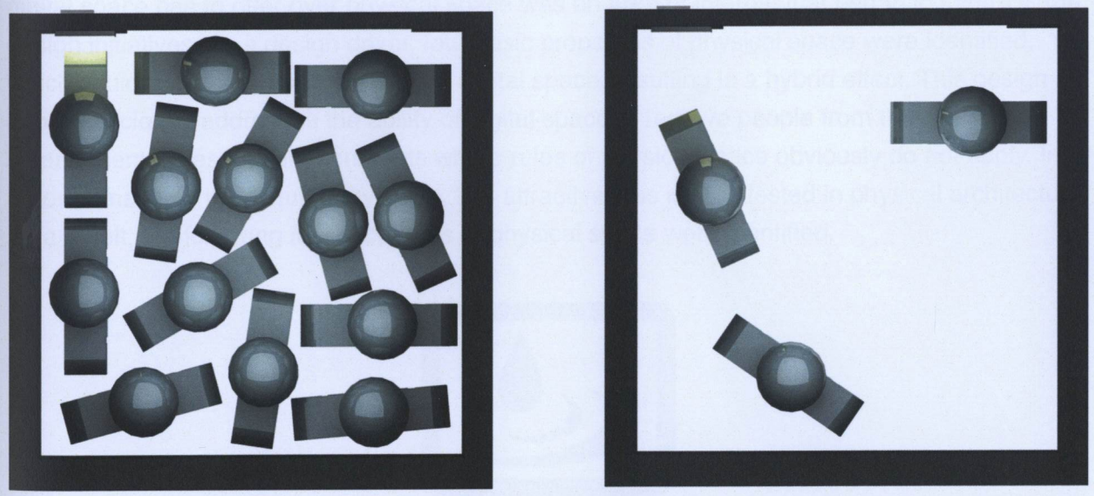


Figure 3.22 Living Elevator plans. Full elevator means less stops (left).

CHAPTER 4 - DESIGN

Introduction

The original title of the research provided above was *Transgression of Imagination: The potentials of Hybridity in Architecture*. The title basically implies that hybrid architectural design is about using the best qualities of both physical and digital space in order to create environments that are progressive and sought after. The design process is based on exploiting these qualities and integrating them in such a way that one is not more powerful or important than the other, but rather their complete reliance on each other would become extremely evident in either of their absences, stressing the distinction between hybrid design and standard design. The new title of the thesis, *The Compatible House*, clearly illustrates that the product of the thesis was not only designed to cater to any individual, but was also designed today for the future. In other words, the design is conceived on the basis of speculative assumptions and current technology and trends that could be realistically projected into the future as a demonstration of what architecture could be and represent. The following design is an example of how the hybridity of digital space and physical space can radically change the way in which architecture is perceived and engaged with by any individual. It also shows how architecture itself can progress through the contrast with its own traditions that hybridity can offer.

The Properties of Physical Space

The research portion of the design illustrated that digital space allows people to extend their senses and emotions into a new and extremely attractive world. The new rules or properties that digital space has to offer over physical space was an area of interest that began to inform some design initiatives. As a design driver, four basic properties of physical space were identified, which could be either bent or broken by digital space, resulting in a hybrid effect. This design approach clearly addresses the ability of digital space to remove people from their world and extend themselves into environments where rules of physical space obviously do not apply. In order to maintain the required hybridity, this attractiveness is manifested in physical architecture. As a result, the following four properties of physical space were identified.

Figure 4.1 Property 1 Symbol.

1. ***We cannot instantaneously manipulate what is presented to us as users of a space. Buildings cannot instantly move – they are inert.*** Structure is structure, and physical characteristics of buildings that adhere them to reality (ie. loading) cannot be changed without significant efforts (see Figure 4.1).

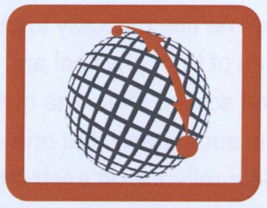


Figure 4.2 Property 2 Symbol.

2. ***There is a temporal association between the static and mobile abilities of physical objects.*** Simply, this statement stresses that the experiential qualities of a space can only be in one place at one time – a building cannot be in two places at the same time (see Figure 4.2).

Figure 4.3 Property 3 Symbol.

3. ***Architectural space is never a representation of the individual user, unless that individual is the designer.*** The statement is grounded in the notion that architecture, to be put bluntly, tries to satisfy everyone. Unless designed for oneself by oneself, architecture generally comes from the extraction of complex constructs and ideologies that usually reflect cultural or social aspirations. Occupancies and uses change over time, and the initial building is generally limited in adaptability (see Figure 4.3).

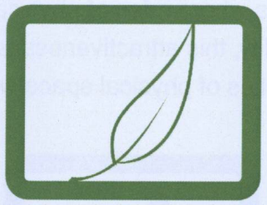


Figure 4.4 Property 4 Symbol.

4. ***Nature, and what is inherently natural to human beings can only exist in physical space.*** This refers specifically to intelligence and decision-making. Mimicry acts as a foundation for this property, however being indistinguishable from nature is much more exciting and further pursued. Examples of nature include the elements, physics, biologics, etc. (see Figure 4.4)

Hybridity can then be demonstrated by using digital space to break or bend those properties. Supplementing the properties of physical space, mainly as a tool for design, are some properties of digital space.

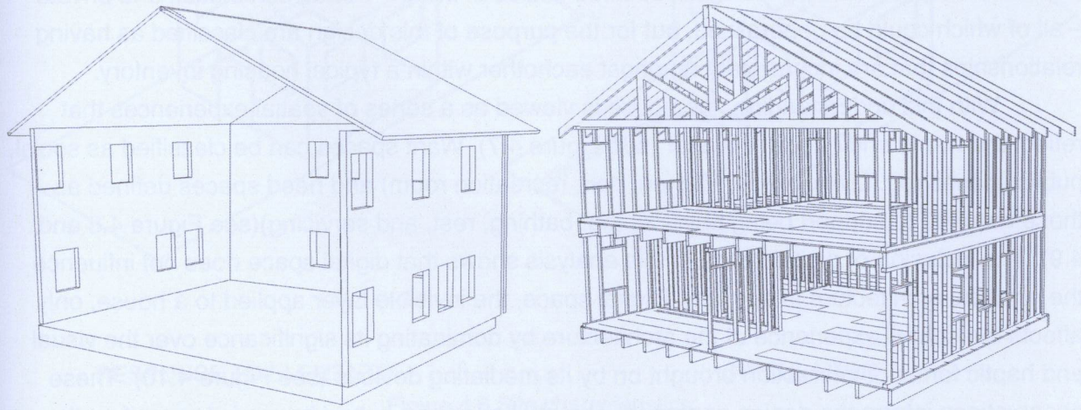
1. Digital space cannot be inert.
2. Human life cannot survive in or physical occupy digital space.
3. The origins of digital space were artificially created, therefore its function and response are conceived based on fundamental controls and commands (artificial governance).
4. Digital space can only be engaged with/experienced through mediating electronic devices.

More observational than conclusive, these properties act as secondary drivers to make the breaking/bending process more vigorous and rich.

Why a house?

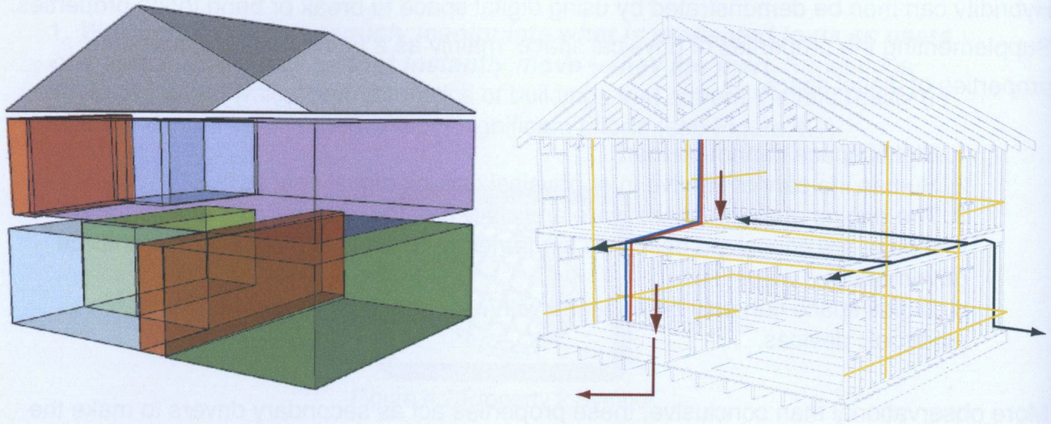
The house, once a private haven, has become with the advent a network communication an extremely public space. This new societal obsession has not, however, been adequately reflected in the architectural design of the house. The Compatible House demonstrates the possibilities of formalizing digital space architecturally to improve the social capabilities of the home, and to amplify the importance of individual, private space.

The typical house contains many architectural features that provide the standard to support life in physical space. These features are essential and frame the experiential qualities of that space. Simplified, a house is comprised of a series of skins. The exterior skin provides a means to enter at certain points, apertures that engage with context and orientation, angles



EXTERIOR WALL SKIN STRUCTURAL SKIN

Figure 4.5 House skins.

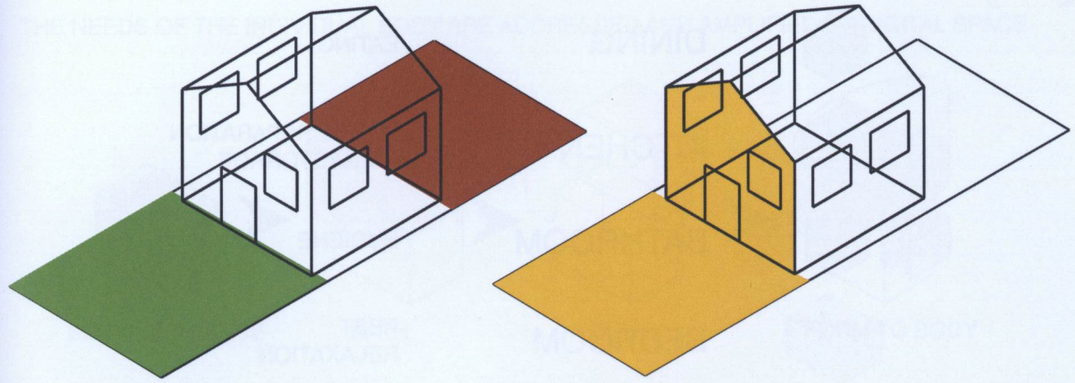


INTERIOR WALL SKINS SERVICES SKIN

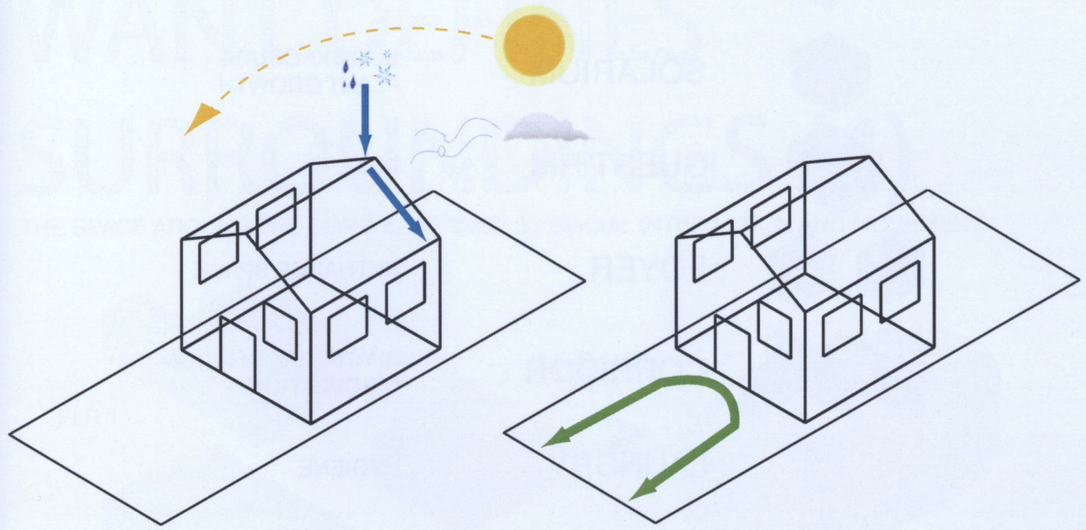
Figure 4.5 House skins.

that channel drainage and loading, and finishes that establish identity. The structural skin, made of vertical and horizontal members, provides basic differentiation of spaces (public exterior vs private interior, upper floor vs. lower floor) and physical integrity. The interior partition skins provide more extensive differentiation of spaces within the house, and the service skin enables the house to support life within (temperature control, water)(see Figure 4.5). The site of a house can also be simplified. A typical house on a site is currently responsible for distinguishing between public and private circulation and interaction (front yard, back yard, front entrance, views into both), identity/character to the existing context, and orientation/response to the elemental influences like the sun, rain, and wind loads (see Figure 4.6). Together with the skins and site, the house encompasses three scales of living – social, contextual, and private – all of which could be generalized, but for the purpose of this design are classified as having relationships that are inconsistent amongst eachother within a typical housing inventory.

With this understanding, the house is viewed as a series of spatial experiences that reflect the wants and needs of a user (see Figure 4.7). Want spaces can be classified as social, public spaces (eg. Living areas, kitchen, den, recreation room) and need spaces defined as those required to support being physical (eg. bathing, rest, and servicing)(see Figure 4.8 and 4.9). The inclusion of digital space in this analysis shows that digital space does not influence the physical architecture in any way. Digital space, the invisible layer applied to a house, only affects the spatial experience of the architecture by dominating its significance over the visual and haptic forms of interaction brought on by its mediating devices (see Figure 4.10). These observations inform the design approach. The challenge of a hybrid house is to manifest the digital space through physical architecture, enhancing the potentials of physical space beyond the digital device.



PUBLIC V.S. PRIVATE IDENTITY



RESPONSE TO ELEMENTS CIRCULATION

Figure 4.6 Site characteristics.

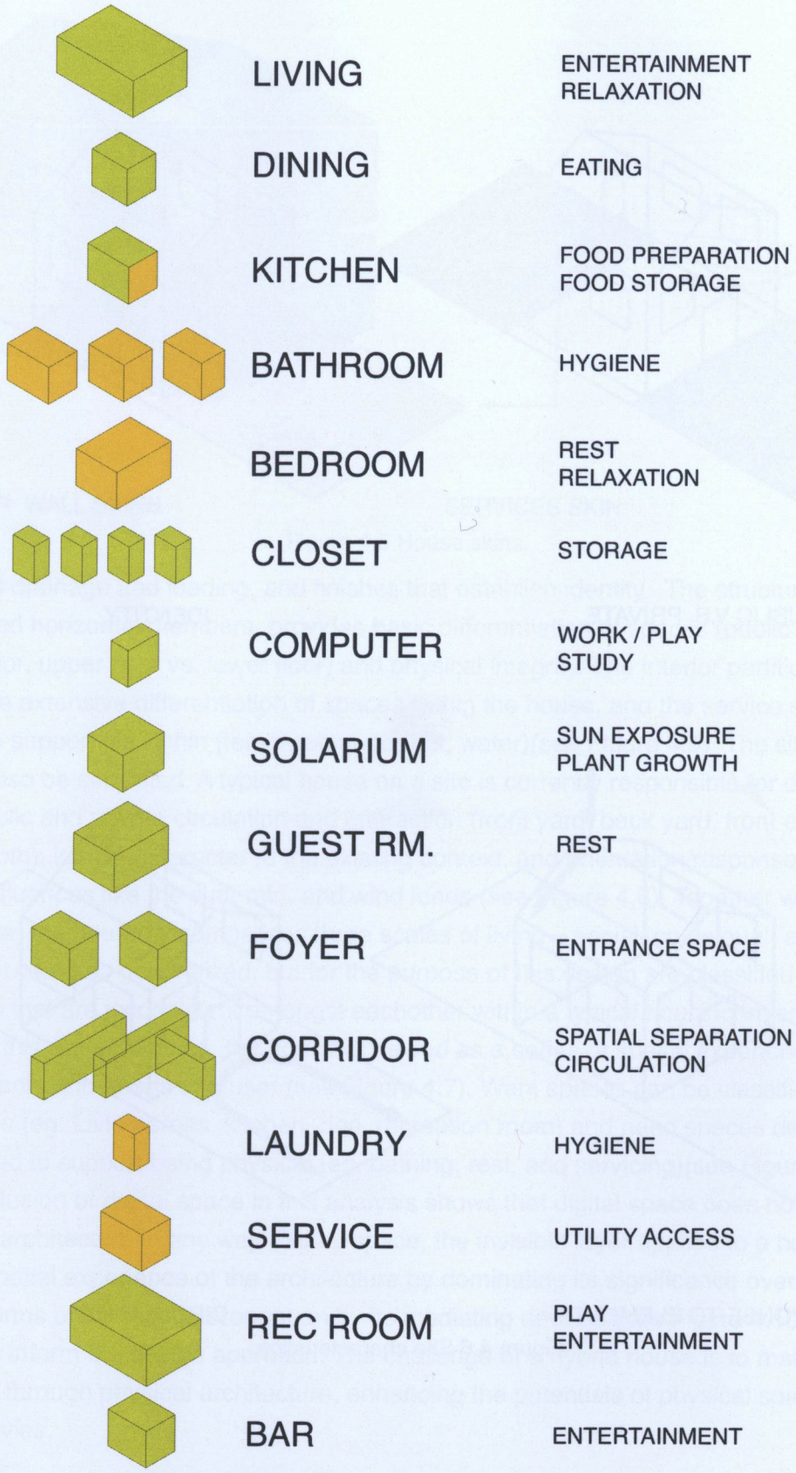


Figure 4.7 General spatial relationships in a house.

NEED DEFINES CORE (1)

THE NEEDS OF THE INDIVIDUAL BODY ARE ADDRESSED AND AMPLIFIED BY DIGITAL SPACE.

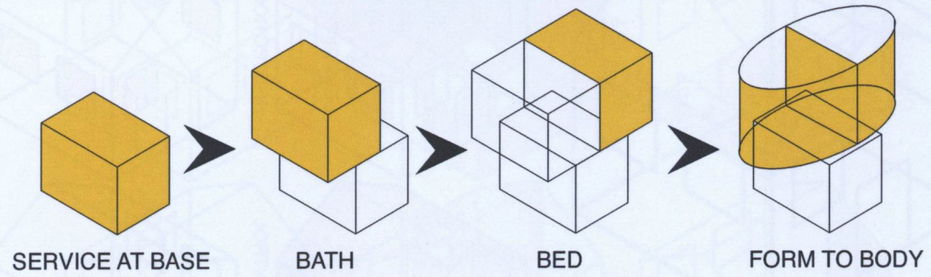


Figure 4.8 Diagram - Accumulated want spaces within core.

WANT DEFINES SURROUNDINGS (4)

THE SPACE AROUND THE CORE IS DEFINED BY SOCIAL INTERACTION AND MOVEMENT.

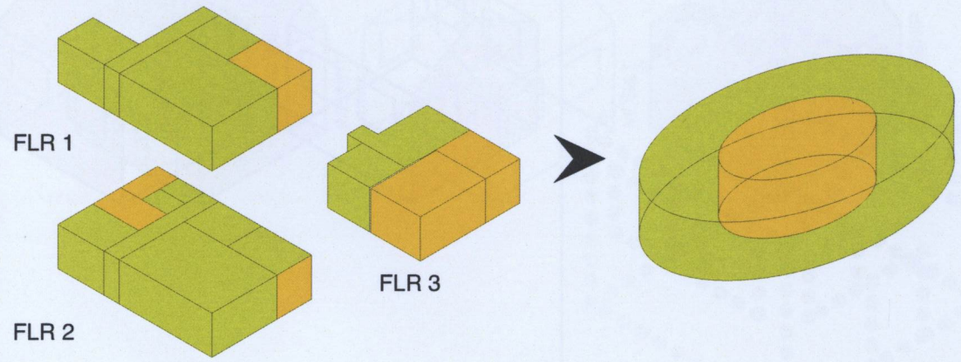


Figure 4.9 Diagram - Want spaces cradling core.

Figure 4.10 Diagram - Physical vs digital influences in the house.

Design Parti

As an speculative vision of our future, the Compatible House demonstrates how with the use of digital space, each of the three scales of the house (contextual, social, private) can become more distinct and adaptive to the wants and needs of any user. The house will be analyzed under three distinct spheres of action which work on three scales:

1. The intimate physical scale of the individual and the body.
2. The intermediate scale which embodies real and virtual social relations.
3. The pubic scale of the exterior, incorporating expanding and overlapping fields of energy, communications and control.

For the purpose of this project, the imperative of each scale is to express:

1. Physicality and the needs of the body.
2. Virtuality and the needs of the social.
3. Visuality and the potentials of public and private relationships.

The Contextual Scale: Form

Defining the house as a series of spaces that encompass wants and needs of a user began to inform the design decisions for the Compatible House. After analyzing the spaces of the house, and after understanding the role of digital space in these areas, a decision was made to make all the need spaces of the house situated within the core. This includes bathing, rest, and servicing. This configuration amplifies the importance of being physical by creating a focal point that all the social spaces surround. By creating a core that contains all the private spaces of a house, all surrounding spaces become social public space (see Figure 4.11). If the entire interior space of the house upon entry is semi-public social space, then the exterior context of that space can be public as well. Having the ability of the exterior context of the house to be completely public informed the formal decisions of the house.

Formally, the house must to promote movement around itself, as well as express its integration with digital space. Since we know that digital space occupies all surfaces, the house would be comprised of one surface that satisfied all the skins of the typical house – the roof becoming the wall becoming the floor, becoming the interior skins, and house servicing. Using a six point hexagonal structural steel system, the skin is allowed to make curved surfaces that express the movement around the entire structure as well as the flux of social interaction it protects within (see Figure 4.13 and Appendix C). This curved/unified skin is then split into two identical skins that converge and cradle the core of the house, expressing the movement of form even more thoroughly and the importance of physicality that the core represents (see Figure 4.12).

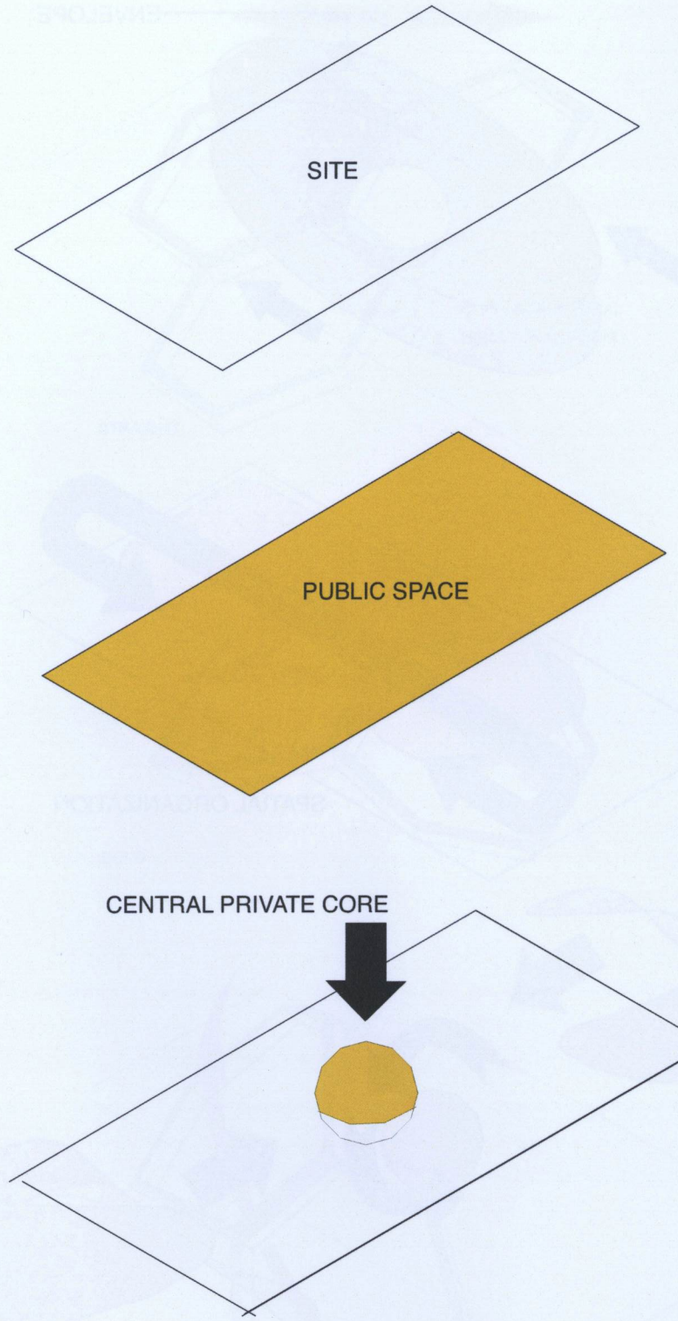
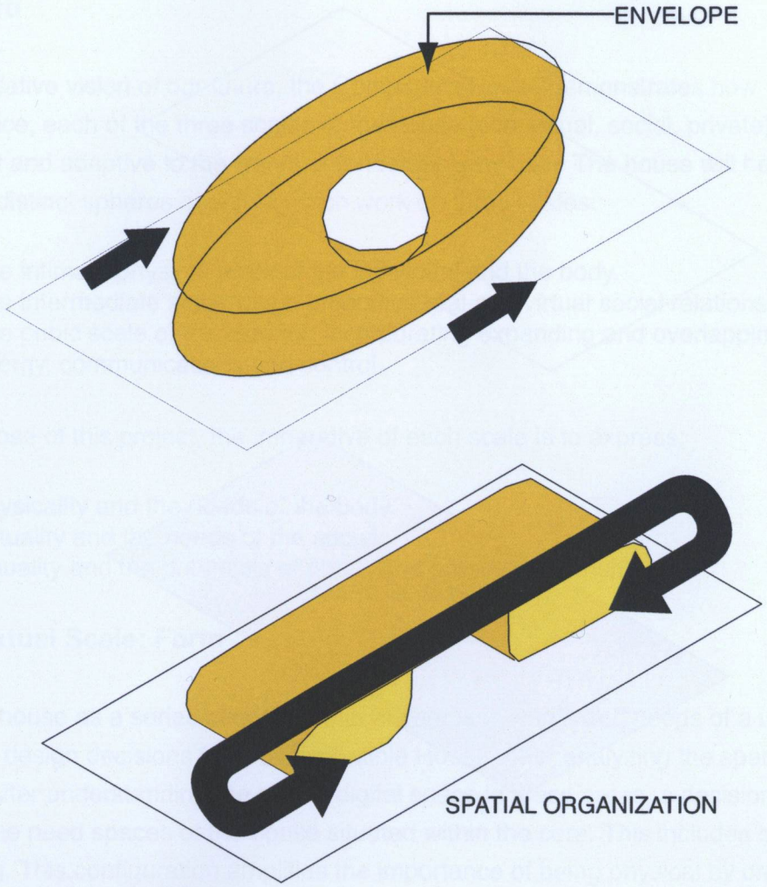


Figure 4.11 Diagram - Public site makes private core.



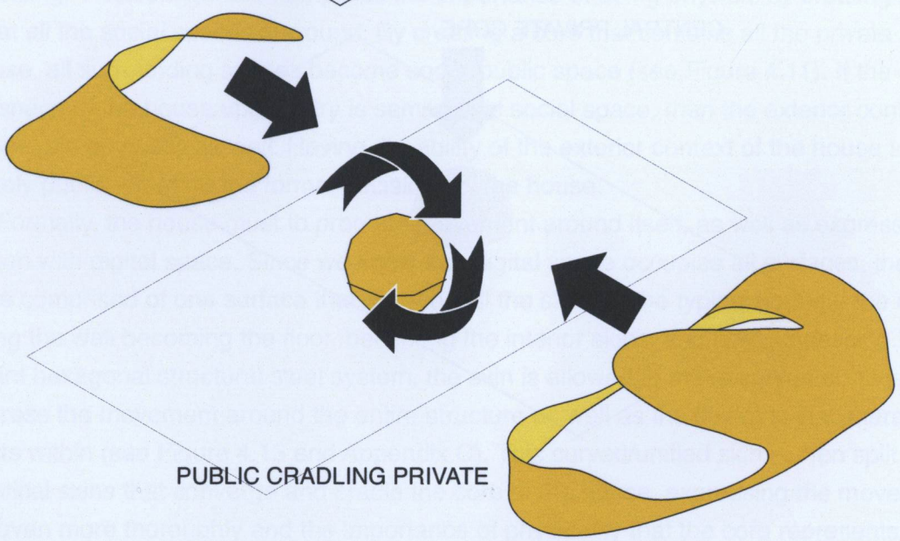
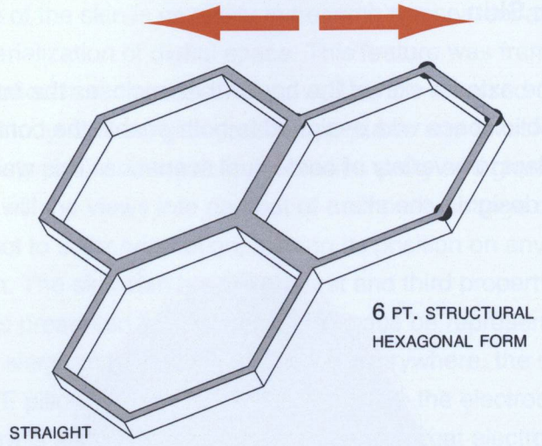
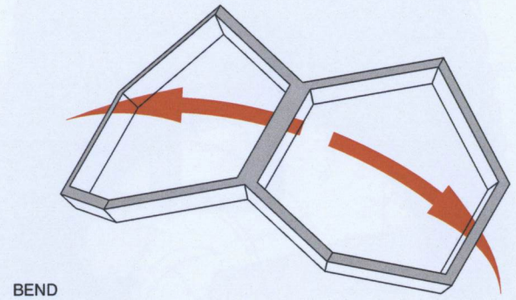


Figure 4.12 Diagram - Public movement.





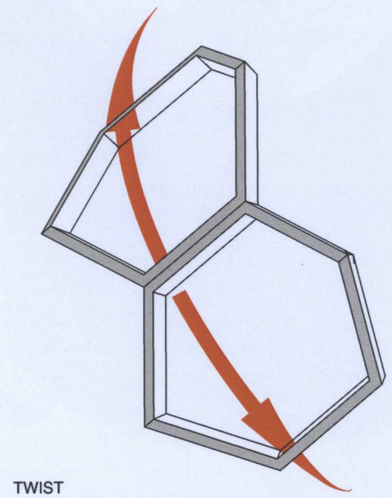


Figure 4.13 Diagram - Structural flexibility.

The Contextual Scale: Skin

In addition to structure, the exterior skin of the house that encloses the interior public space and fronts the exterior public space was designed to both enable the continuum of change with every user, but also to adapt to a variety of contextual scenarios. This was achieved through three major properties of design in the skin.

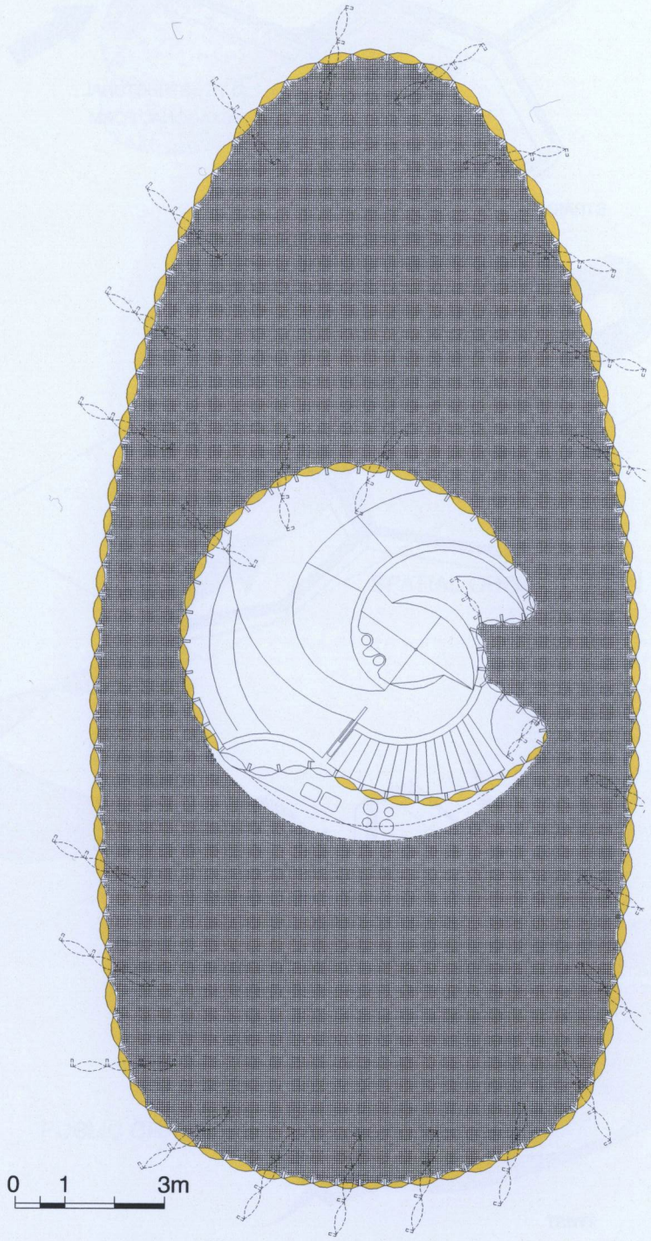


Figure 4.14 Floor plan.

The first feature of the skin is its ability to become transparent at any point. This idea is grounded in the materialization of digital space. This feature was framed by the public and private reversal observation from the research as well as the reversed usage of technology for the bus shelter design study. Since digital space is so public and invasive, this skin materializes digital space to reverse its nature as a public, pervasive entity and grant the user control of transparency. Not only will the views into and out of the house change constantly, but the house can also constantly react to solar orientation, making its position on any site inconsequential to natural light penetration. The skin also breaks the first and third property of physical space – the ability to change what is presented to us and have a space be representative of a user. As long as the skin is within an electromagnetic field, which is everywhere, the sensitive electromagnetic sensors within the ETFE pillows of the skin will trip and turn the electrochromic film within opaque. When pressure is applied, a sensor will disengage that electromagnetic sensor, making the skin transparent (see Figures 4.15 and 4.16).

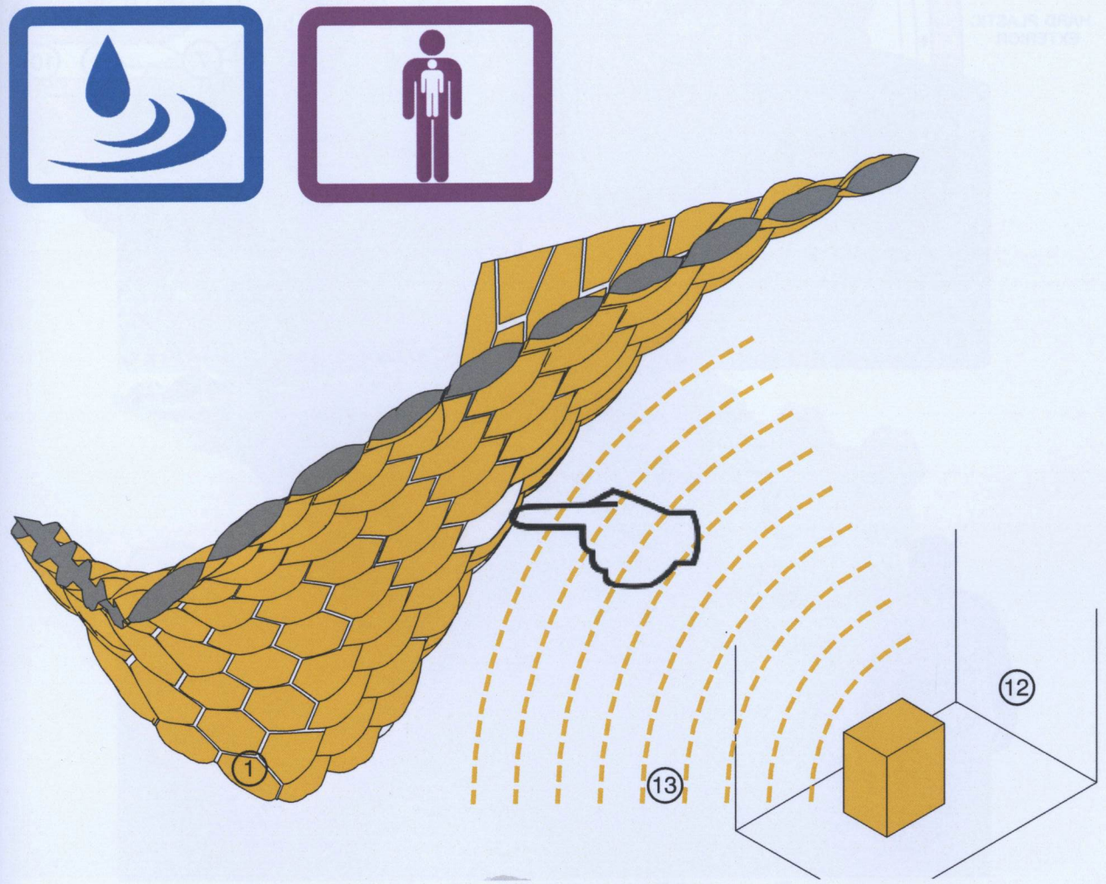


Figure 4.15 Diagram - Pressure skin.

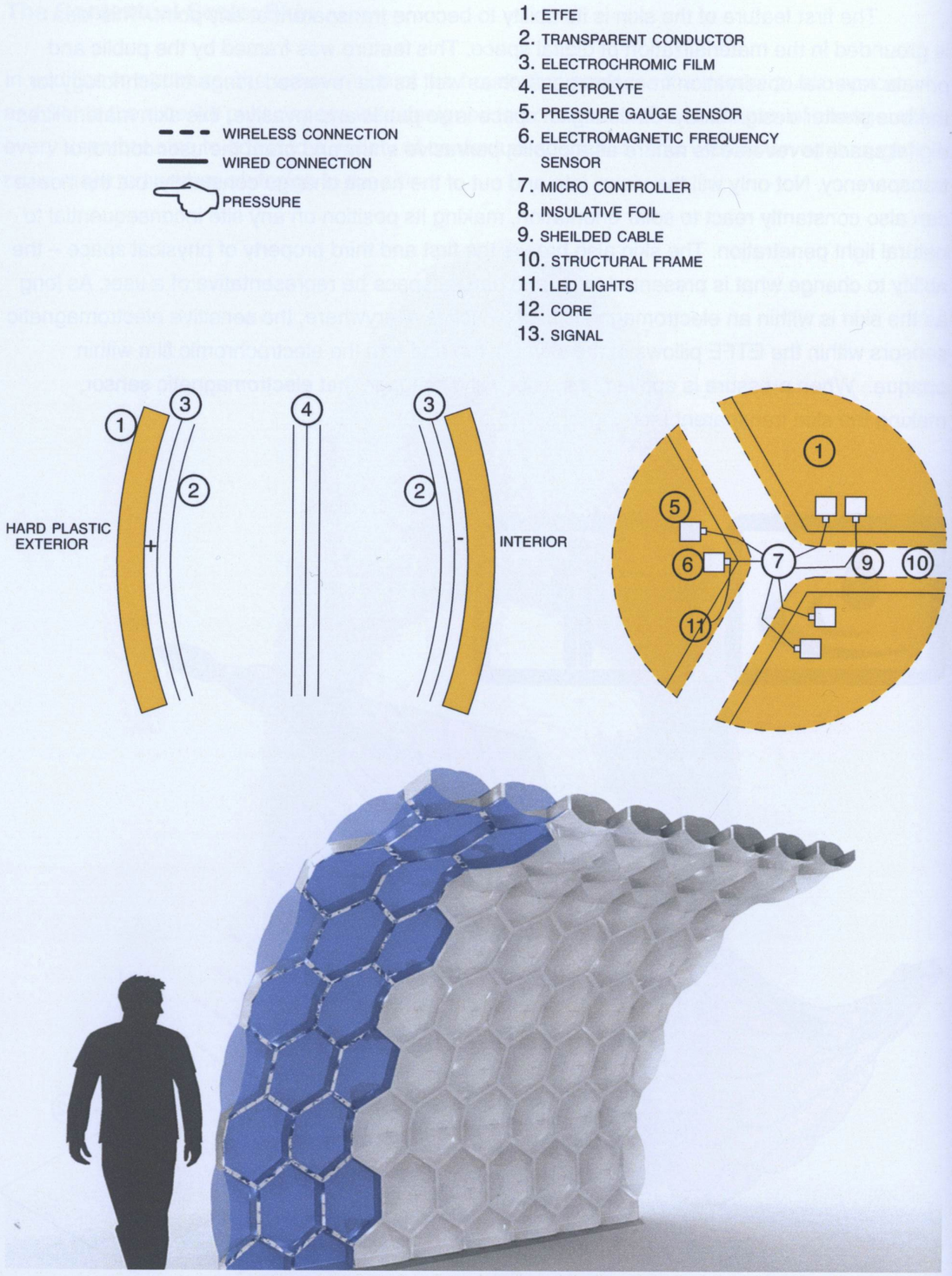


Figure 4.16 Technical diagram - Pressure skin.

The second feature of the skin is the ability to allow entry at any point (see Figure 4.17). This feature not only makes the house an extremely secure entity, but also supports the diminished importance of site, since there is no distinction or influence between public and private spaces surrounding it. This intervention also redefines the importance of circulation within and around the house, supplementing the social nature of the interior and exterior realms. This feature breaks the first property of space – the ability to change what is presented to us. The opening skin works through IR technology. The owner of the house or approved individuals are tagged with IR identification that disengages magnetic locks in the skin at based on three-meter range. Each panel that makes up the skin is on a central pivot that distributes overhead loading down to the foundation and also enables the swinging action of the entrance (see Figure 4.18).

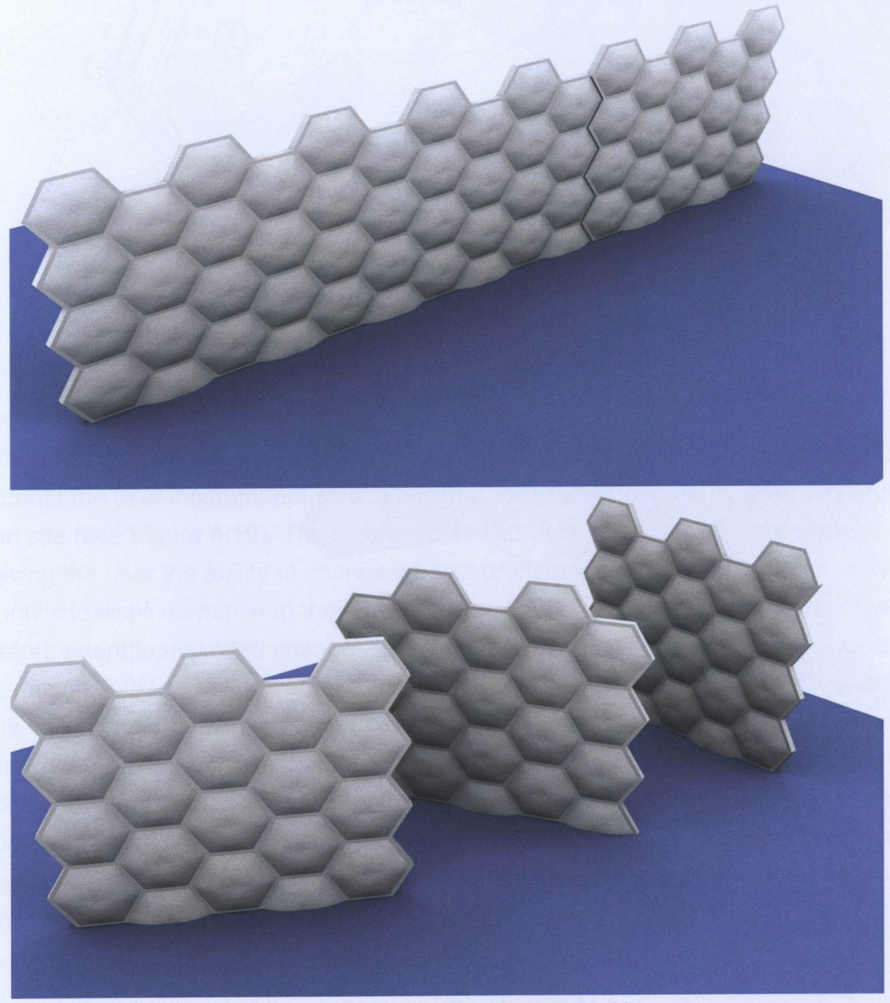


Figure 4.17 Rendering - Operable skin.

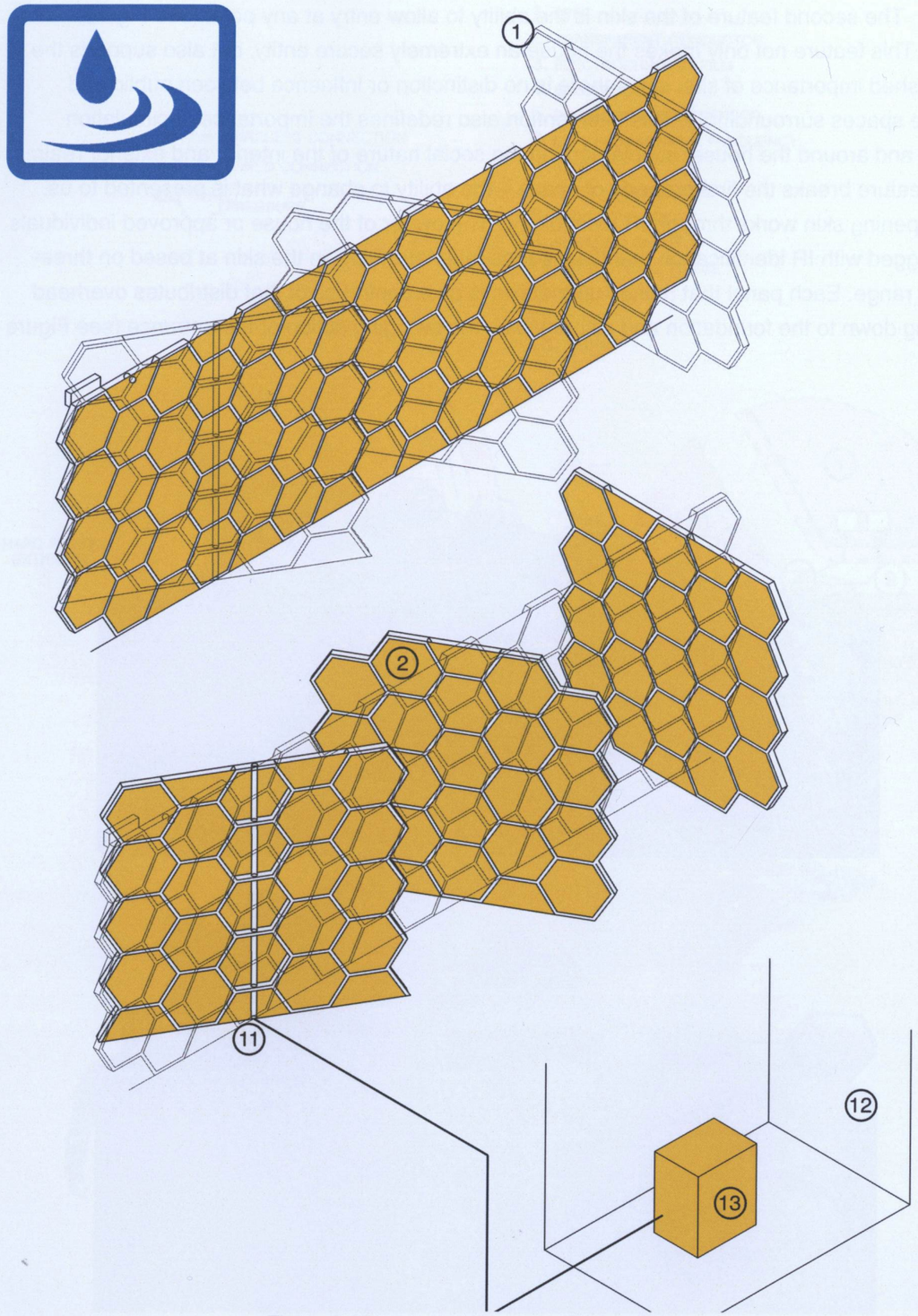
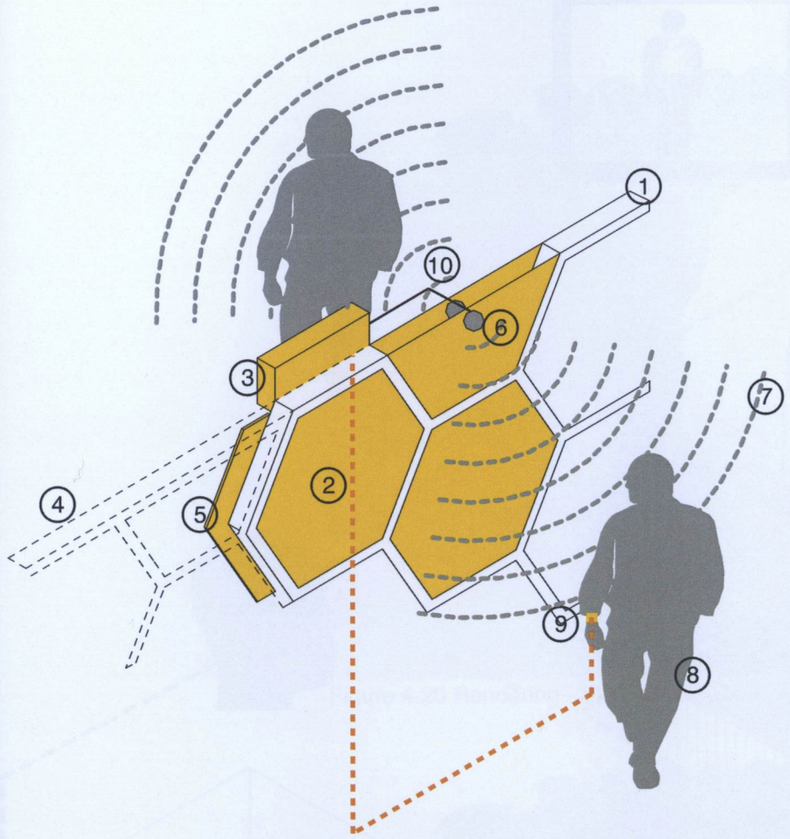


Figure 4.18 Technical Diagram - Operable skin.



1. STEEL FRAME
2. ETFE
3. MAGNETIC LOCK
4. ADJACENT FRAME
5. ADJACENT FRAME STOP
6. MOTION SENSOR
7. MOTION SENSOR SIGNAL
8. USER WITH PROPER TAG IN PLACE FOR 3 SECONDS
9. TAGGED OBJECT (WRIST BAND)
10. SENSOR TRIP FOR OPENING
11. ROTATING INTERNAL PIVOT FOR DOOR SWING (HOUSES SERVICES FOR WALL)
12. CORE
13. CENTRAL COMPUTING SYSTEM

WIRELESS CONNECTION
WIRED CONNECTION

Figure 4.18 Technical Diagram - Operable skin.

The third feature of the skin is that it is equipped with Augmented Reality tags. This feature grants the user instantaneous visual control over the identity and physicality of the home and site (see Figure 4.19). The inclusion of AR breaks the first and third property of space, giving the user the ability to change what is presented to him or her and to apply his or her own individualistic response to their context (see figures 4.20-4.22). The form of the house can therefore adapt to unlimited changes, granting the user power to be respectful to natural features, responsible to existing contexts, or unique to existing inventory. Through a viewing apparatus, the core of the house communicates to a viewer what to see over the tracking pads (see Figure 4.23). To be respectful to nature, the tracking pads can display a live video stream of the environment opposite to itself, creating a cloaking effect (see Figure 4.24). To be responsible to context, the skin may show materials and tectonics that reflect surrounding conditions (see Figure 4.25). To be unique, the skin may glow in an animated fashion to add to the luminance of the city (see Figure 4.26).

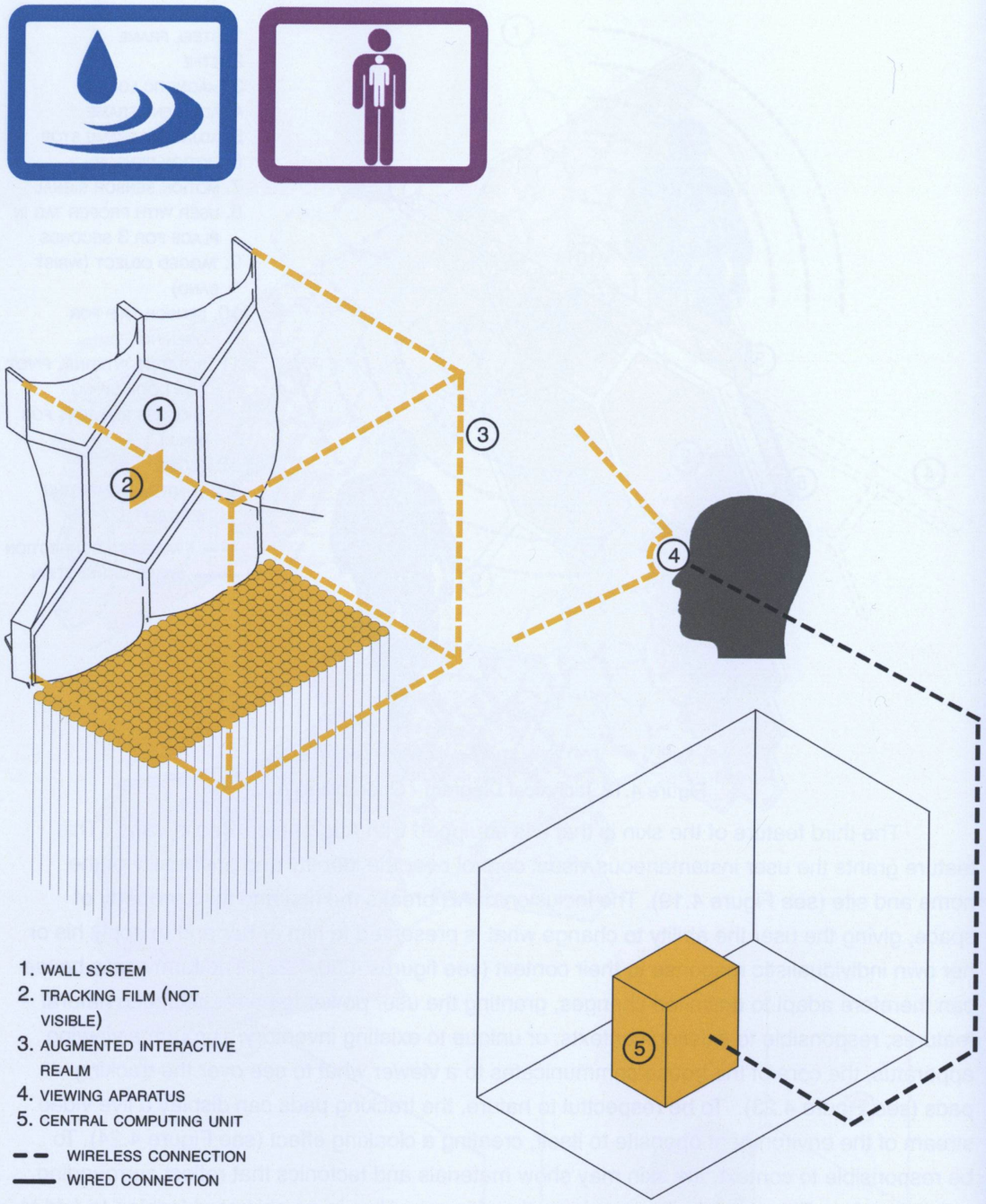


Figure 4.19 Technical Diagram - Augmented reality skin.

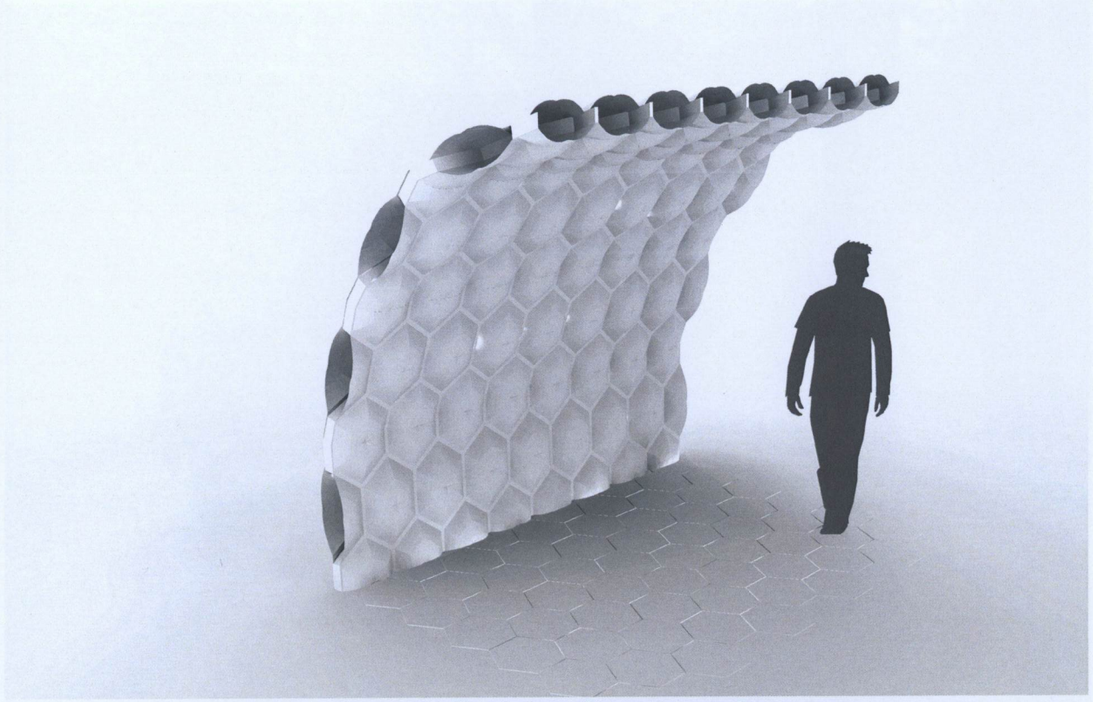


Figure 4.20 Rendering - Skin within reality.

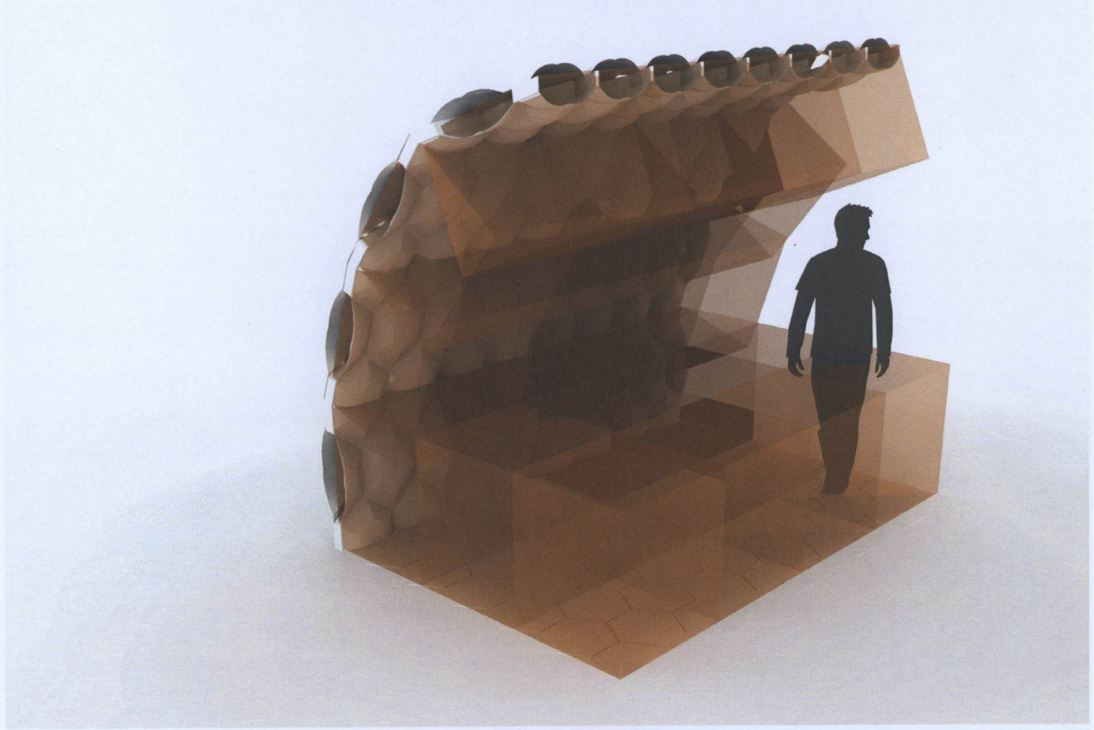


Figure 4.21 Rendering - Potential dimension of the AR digital layer.

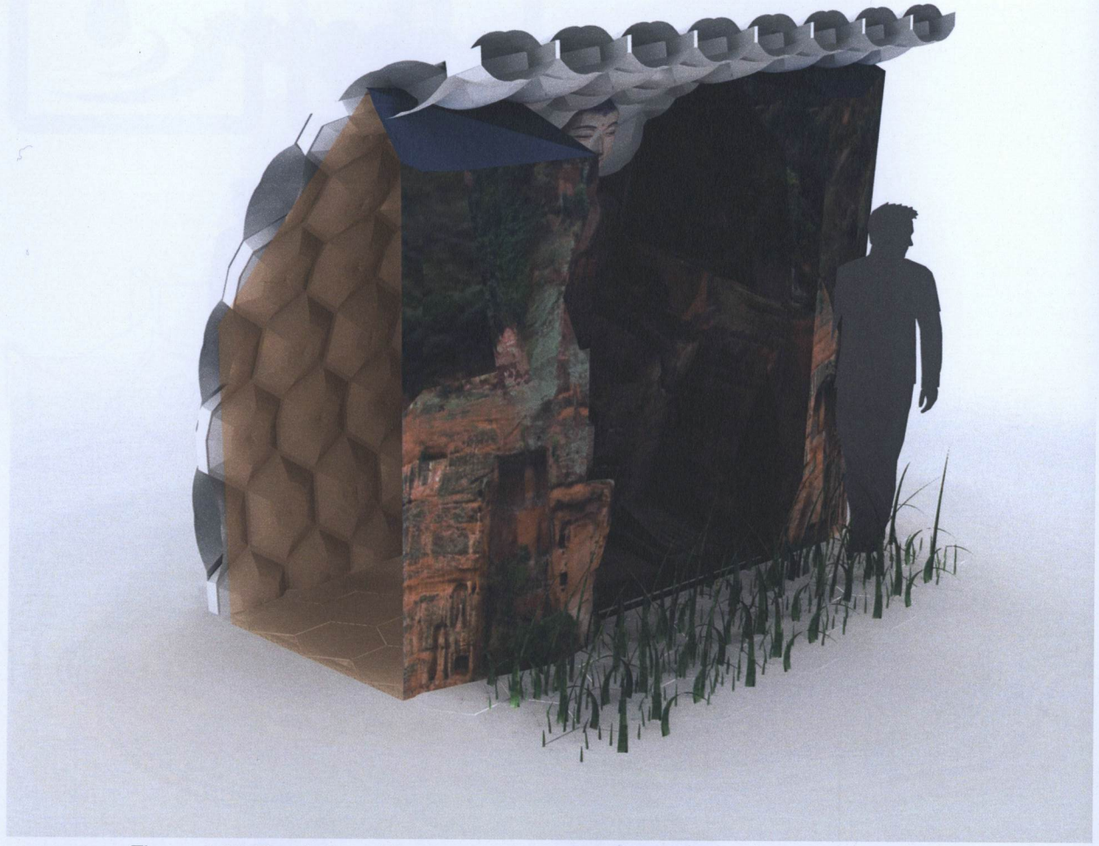


Figure 4.22 Rendering - The acquired spatial quality of objects documented in 3D.

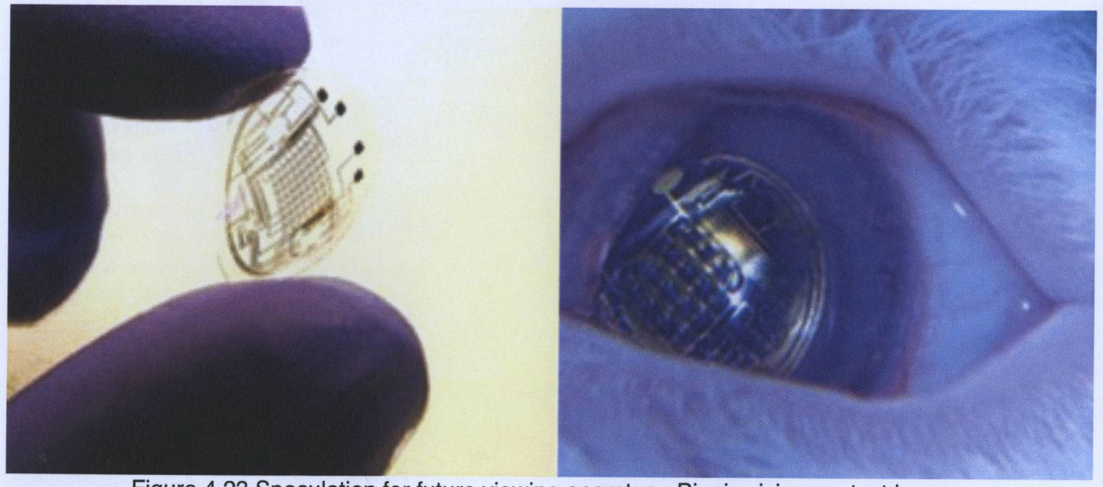


Figure 4.23 Speculation for future viewing aparatus - Bionic vision contact lenses.
Credit: University of Washington.

Figure 4.24 Rendering - Cloaking to be respectful to context.

Figure 4.25 Rendering - Altering tectonics to be responsible to existing character.

Figure 4.26 Rendering - Altering tectonics to be responsible to existing character.

The Social Scale

The interior space is meant to express the influence of digital space on social relations. The intent behind the interior social space is to break the first, second, and third properties of physical space – manipulability, mobility and individualism. As a result, the architectural space is designed around two main features: the physically movable floor and AR. The marriage of AR with movable physical surfaces creates effects that compliment one another, and extend the potentials of social interaction far beyond the present house.

This design is not about using physical space to enhance digital space, but the opposite. This relationship involves exposing digital space and making users aware of its influence in our physical environment. The floor of the social space was therefore designed to use digital space as a tool to create an assortment of typologies and heirarchies of space (see Figure 4.27). With

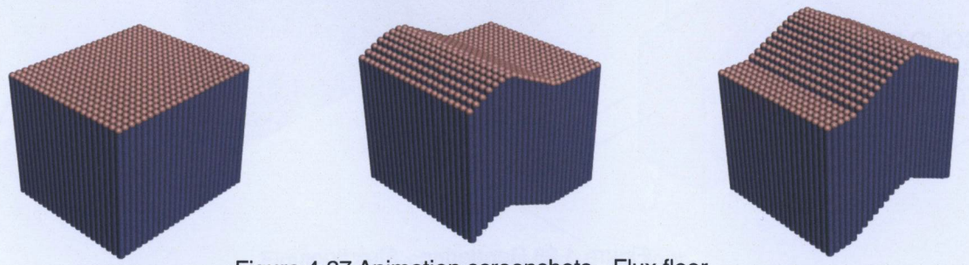


Figure 4.27 Animation screenshots - Flux floor.

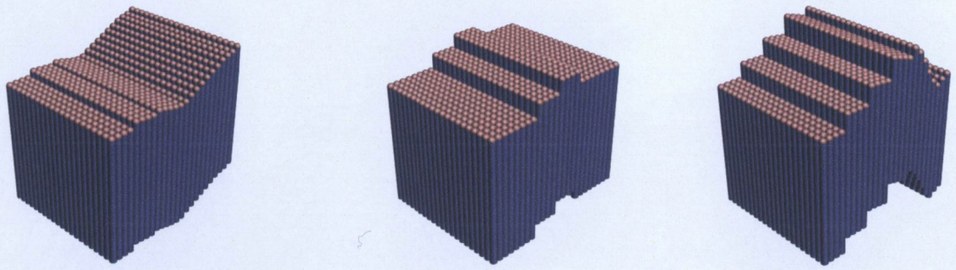


Figure 4.27 Animation screenshots - Flux floor.

the use of IR technology, the floor surface can form curvilinear or orthogonal extrusions that can identify and create new uses of the space (see Figure 4.28). This floor system can also form soft and hard surfaces, making the floor system more than a system for creating spaces, but a much finer system that can cater to the body (discussed more heavily in the core) (see Figures 4.29 and 4.30). The malleable floor can form seating arrangements from single to multiple persons, amphitheatre type spaces, mezzanines, stairs, platforms, tables, as well as customized curvilinear forms that comfortably conform to a given person. The floor system works by having a dense micro hydraulic system connected to dowels. Each dowel has its own hydraulic piston with an IR sensor on the top. The IR sensor reads output from a remote controlled system that dictates the action of the floor. Similar to the Hyposurface, instead of sound, it responds to IR light.

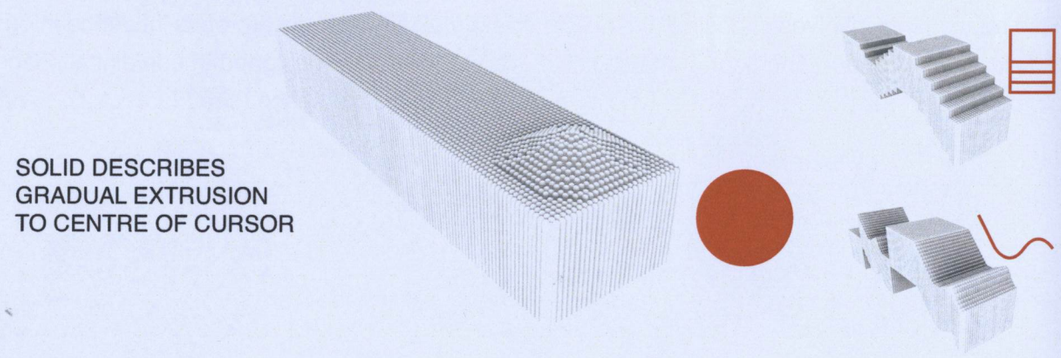
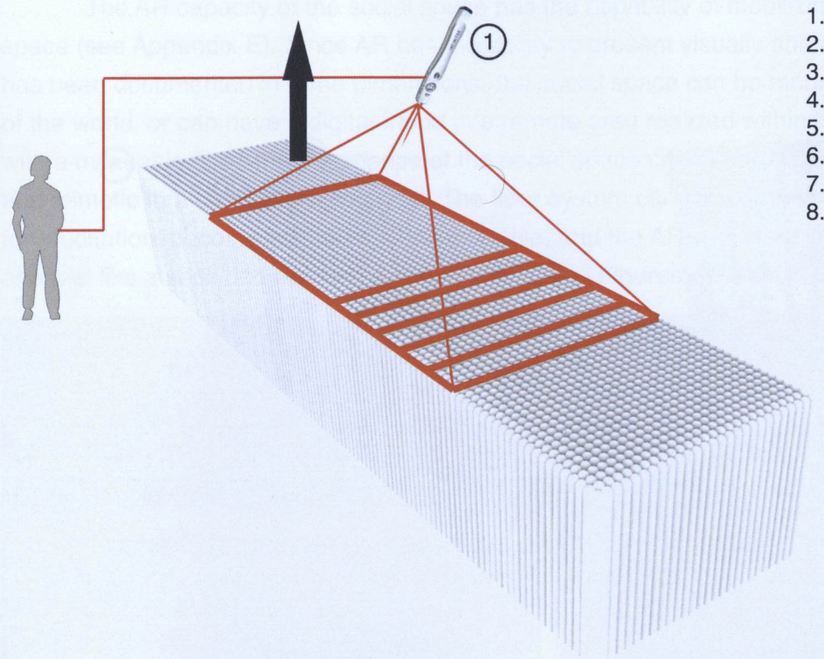


Figure 4.28 Rendering - Flux floor.



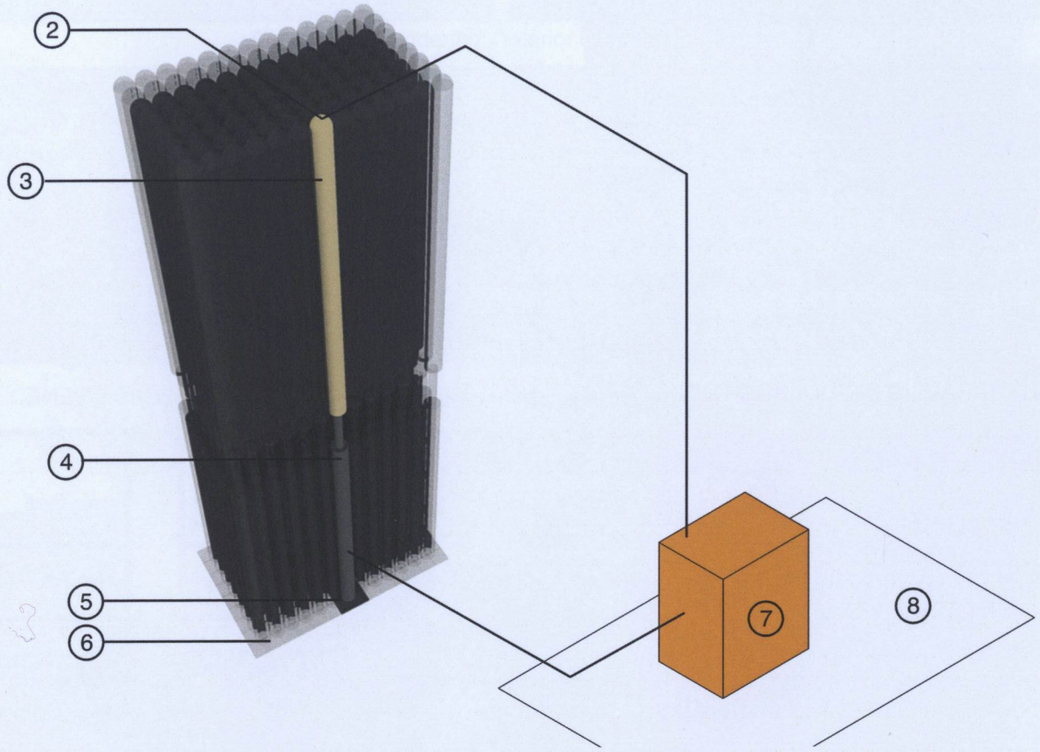
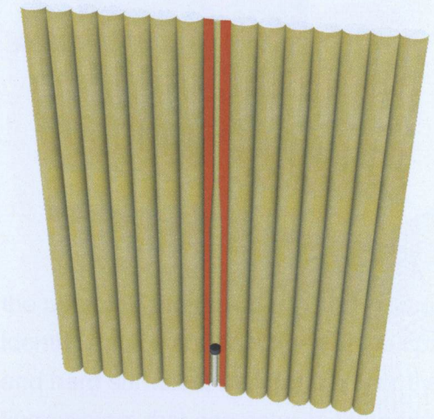
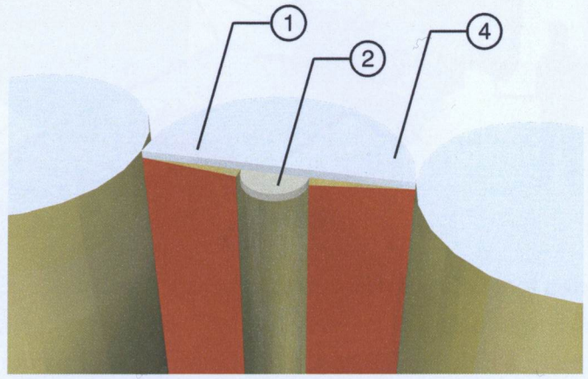


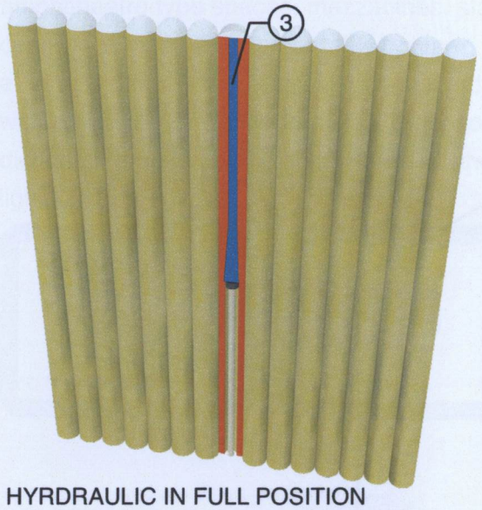
Figure 4.29 Technical diagram - Flux floor.



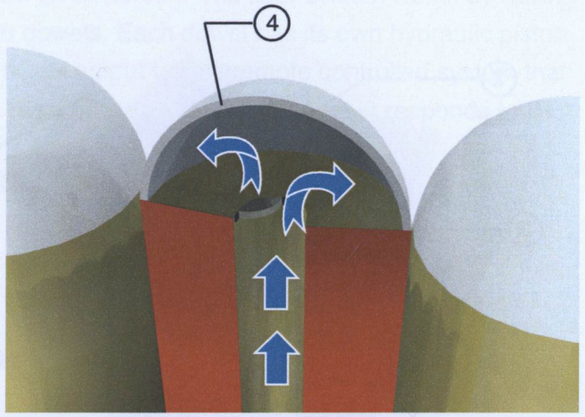
HYRDRAULIC IN LOWERED POSITION



HARD SURFACE - AIR PRESSURE CAPPED

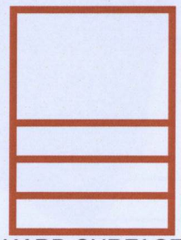


HYRDRAULIC IN FULL POSITION

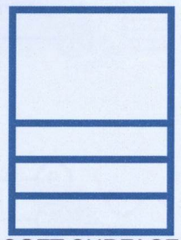


SOFT SURFACE - AIR PRESSURE CAP OPENED

1. IR SENSOR
2. AIR PRESSURE CAP
3. BUILT UP AIR PRESSURE
4. INFLATABLE PLASTIC FILM



HARD SURFACE



SOFT SURFACE

Figure 4.30 Technical Diagram - Soft and hard surfaces.

The AR capacity of the social space has the capability of mobilizing the experience of the space (see Appendix E). Since AR has the ability to present visually and aurally anything that has been documented in three dimensions, the social space can be mobilized to remote places of the world, or can have a digital friend in a remote area realized within the house. Coupled with a moveable floor, the experience of the social space can become completely immersive and mimetic to a desired environment. The floor system can for example create a yoga platform for meditation, become soft to ease the exercise, and the AR can make the surroundings appear and feel like a secluded opening in a rain forest (see Figures 4.31 and 4.32). One could even

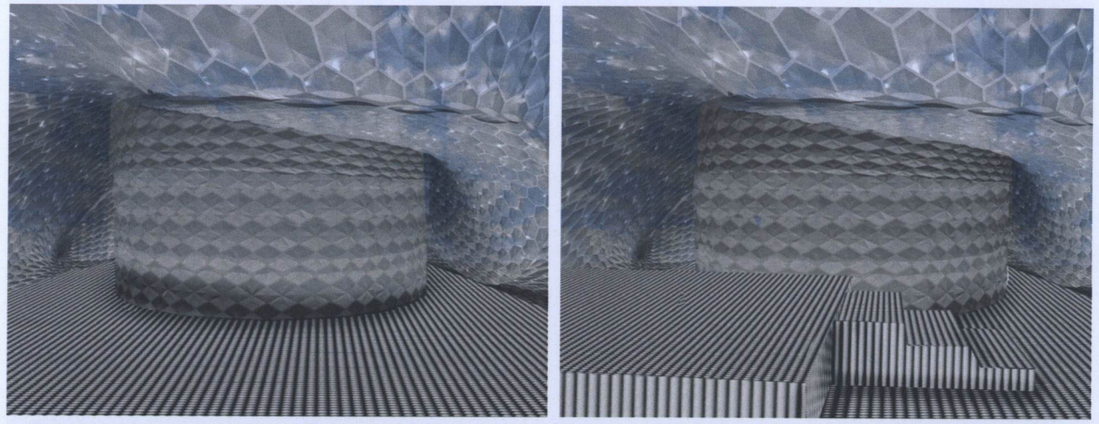


Figure 4.31 Rendering - Interior space extruded.

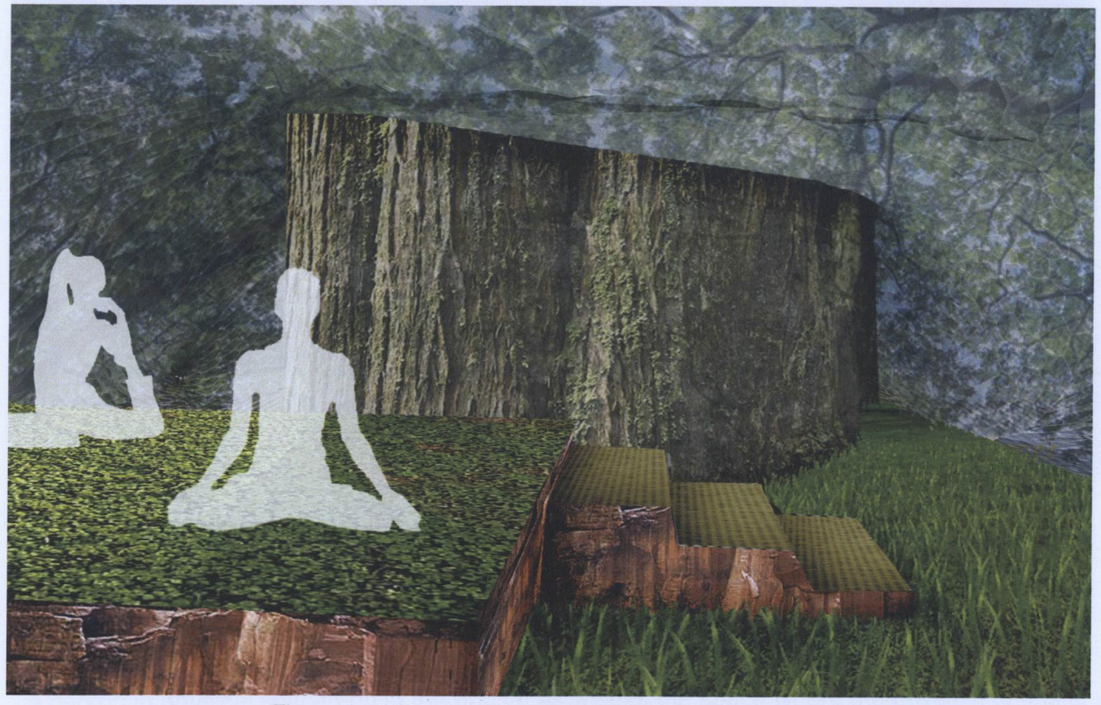


Figure 4.32 Rendering - Interior extrusion augmented.

enjoy a beach with a friend in Moscow by using the floor surface to create dunes, the AR to create the beach textures and objects, and the skin to bring in the feeling of heat from actual natural light (see Figures 4.33 and 4.34). The social space becomes one of immense flux, and

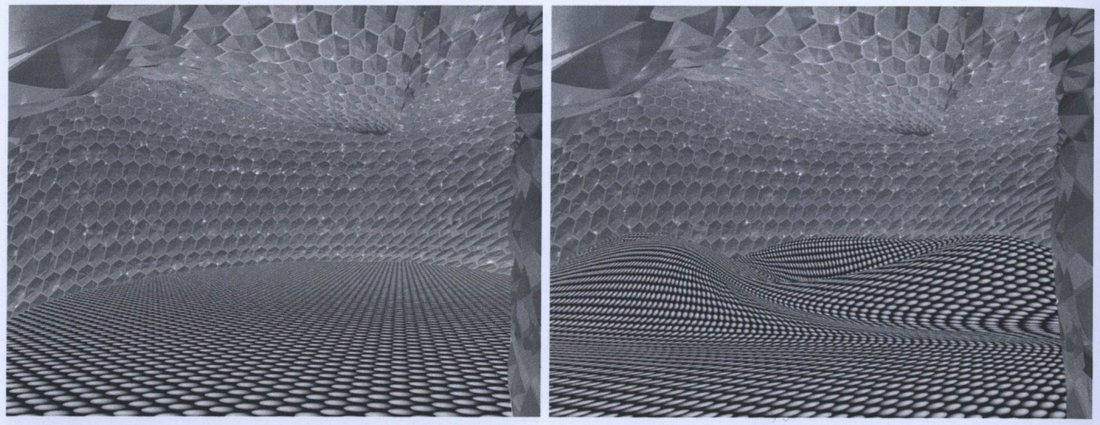


Figure 4.33 Rendering - Interior space extruded.

Figure 4.34 Rendering - Interior experience mobilized.

extreme public engagement. It embraces digital space and exposes its dormant forces as a physical interaction driver (see Figures 4.35 and 4.36).

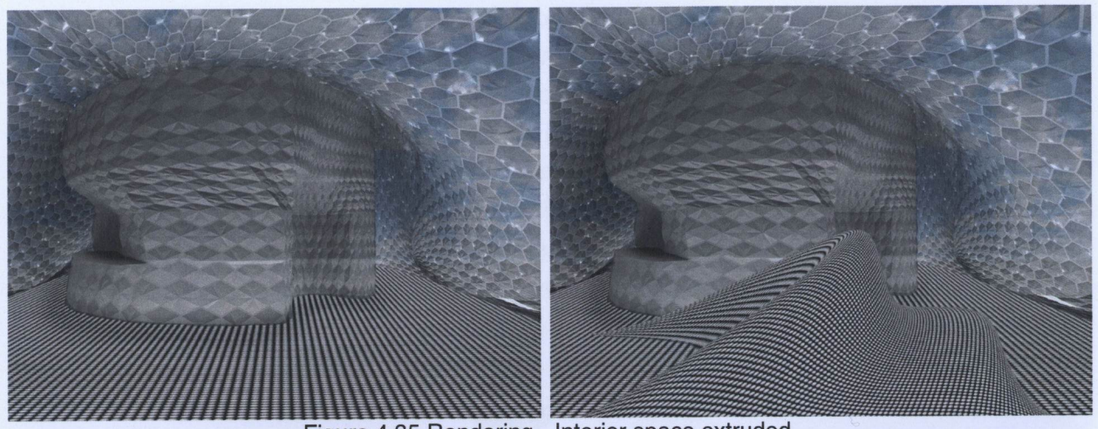


Figure 4.35 Rendering - Interior space extruded.

Figure 4.36 Rendering - Interior space shared globally.

The Private Scale

The core was designed to celebrate the private nature of the house. It is the space that identifies when the user is most physical and intimate, it establishes and provides the needs of a person in physical space and in the house, as well as the space where the physical and digital

abilities of the home are supported and grounded (see Figure 4.37). In the case of the core, the spaces are designed to be able to physically adapt to the needs of the body, and are coupled with the ability of digital space to autonomously engage with that adaptability. This amplifies the importance to be physical within the space. The core breaks the fourth and final property of physical space, nature, in the way that the spaces respond to the needs of the body without prior engagement or programming by the user. The digital factor supports the essentiality of the true meaning of the private spaces. These spaces are identified as the bed room and the bath room (see Figure 4.38).

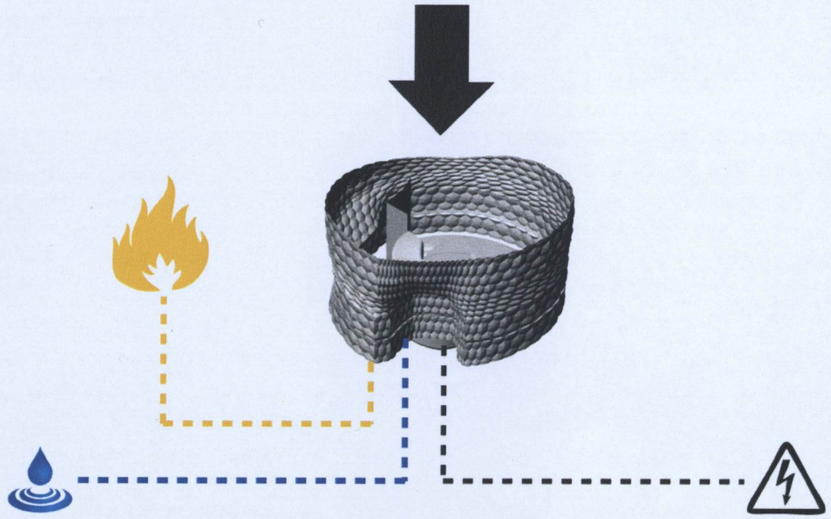


Figure 4.37 Diagram - Core.

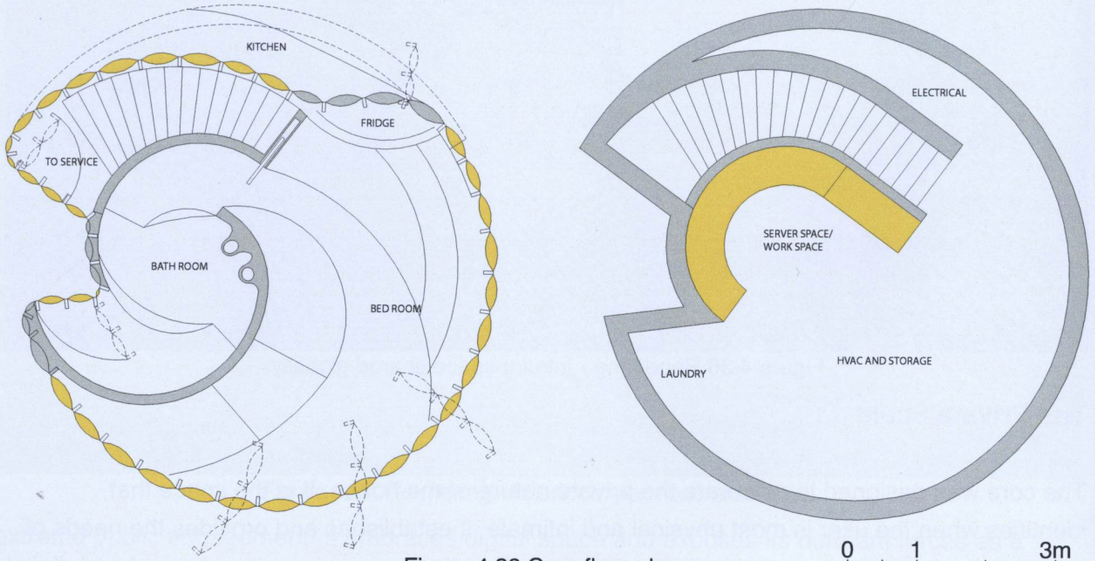


Figure 4.38 Core floor plan.

The bathroom was designed based on the simplification of its name – 'bath' 'room'. Questions were asked based on how we bathe and what is most important of bathing. In terms of bathing, the space would have to provide the ability to stand, sit and lay down, and would also need to provide usual bathroom amenities such as a toilet. The form would also need to demonstrate the importance of hygiene. As a result, the bathroom was designed using one surface that makes all of the positions of the body possible within the room (see Figure 4.38). The ramps that lead down from the public and private spaces of the house provide levels to rest in laying positions, then morph into the wall to form seating positions, then melt down into the floor forming a level space for standing positions. Aside from toilet and sink, the room does not identify the specifics of bathing, rather promotes the freedom and possibilities of bathing within the space.

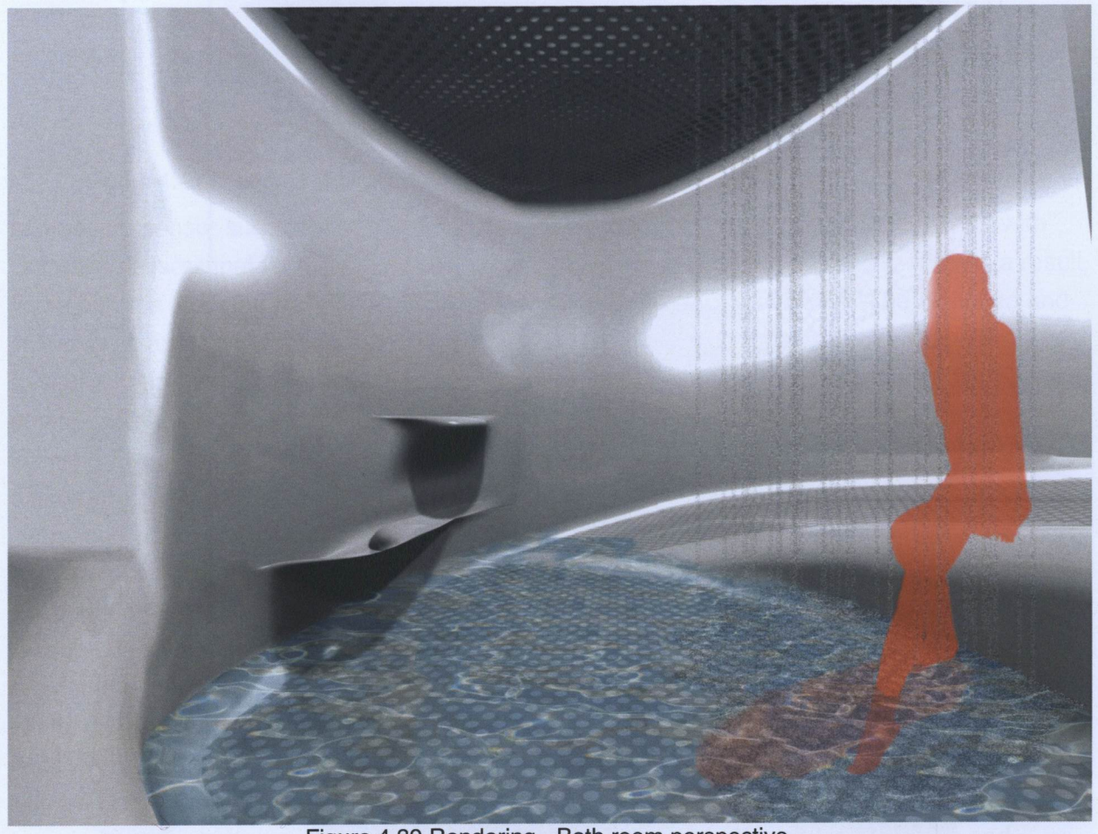


Figure 4.39 Rendering - Bath room perspective.

The digital layer is applied in the bathroom by giving the space the ability to understand where you are and when you are ready to bathe (see Figure 4.40). In this sense, the bath room recognizes the needs of your body and adapts to you. This is done using two types of technology. The first is heat scanning technology (see Figure 4.41). Your body unclothed will emit more heat than when clothed. As a result, when you are in the bath room, the room identifies when you are ready to bathe based on your naked state. The second technology used

1. PRESSURIZED WATER SERVICE
2. CENTRAL COMPUTING UNIT
3. HEAT SENSOR CAMERA
4. PRESSURE SENSITIVE FLOORING
5. ELECTRONIC VALVE

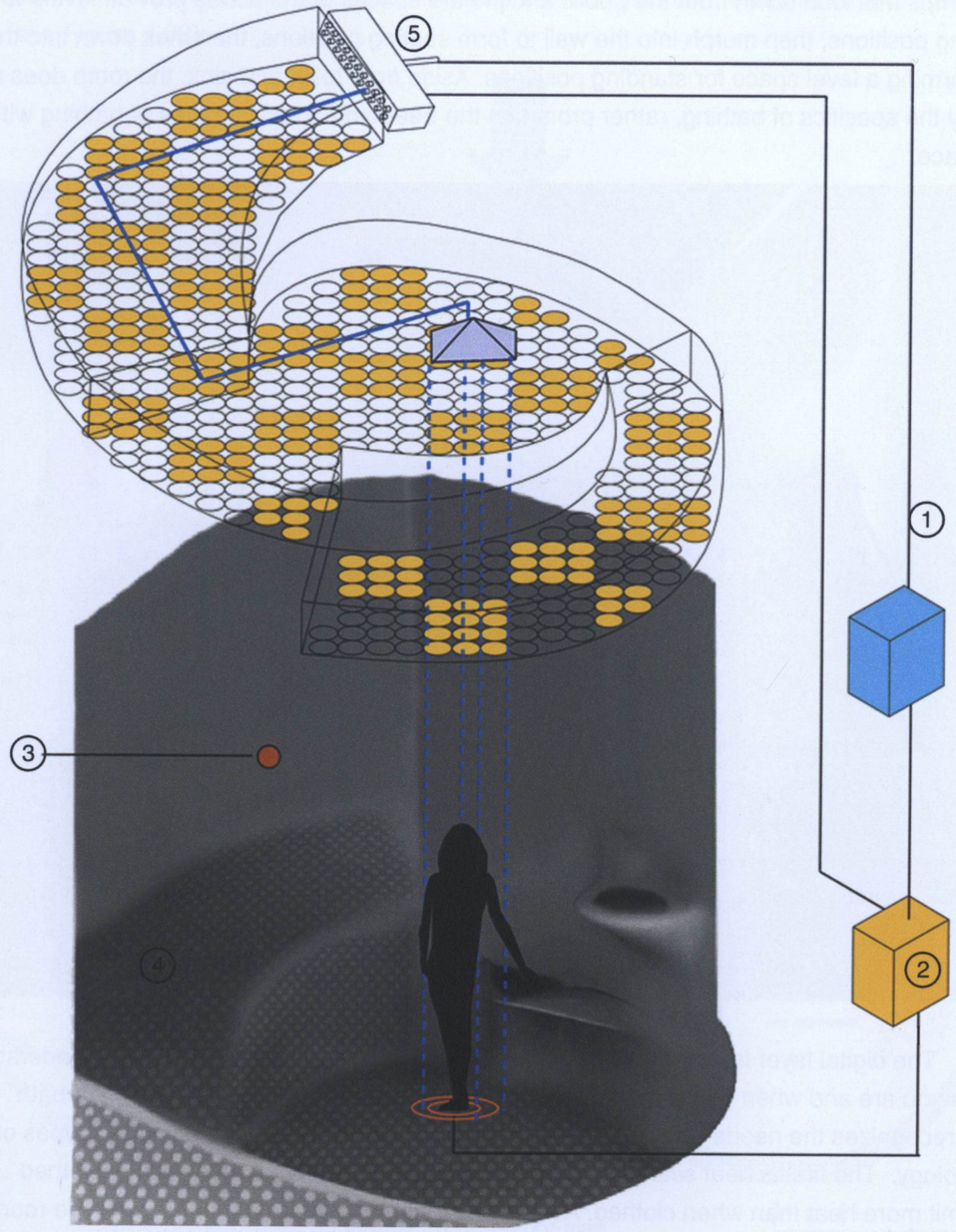


Figure 4.40 Technical Diagram - Bath room.

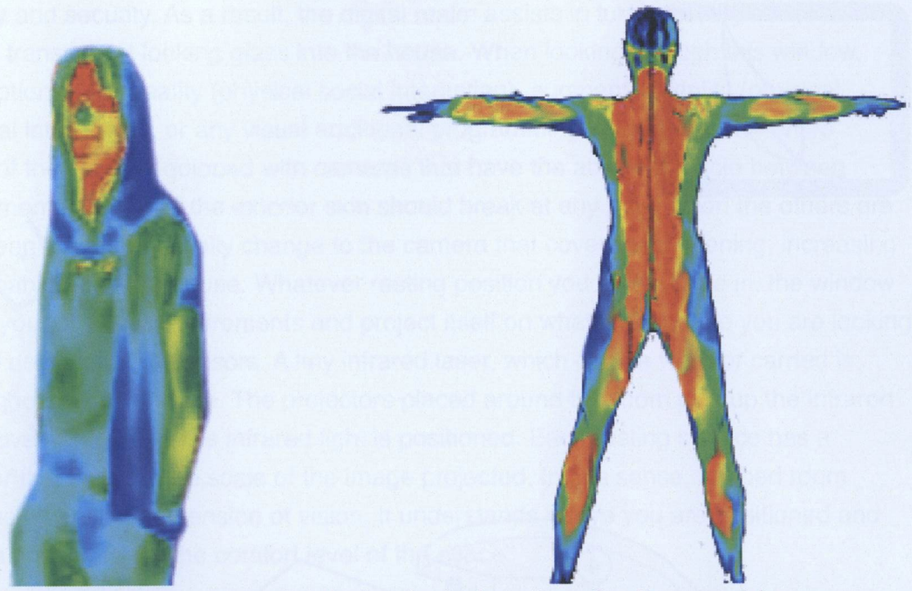


Figure 4.41 Thermal camera vision of clothed and naked readings. Credit: www.adobe.com

is pressure sensor surfaces. All the surfaces that the body can conform to are equipped with pressure sensors that let the room know where you are and how you are positioned. As a result, if you are in a standing position while naked, two small points of pressure will be activated and linked to an appropriate body heat percentage reading that will enable the water to be brought to your location through a computerized water valve. Temperature will be controlled by the vocal commands 'hot' and 'cold' then stored for the next time. If you are in a sitting position or in a laying position, the water will fall around you, giving you the choice of bathing in the water, or avoiding it. The running time of the water can be stopped at any time by using the command 'stop', and the average of all the running times will be recalculated to adapt to the showering needs of the individual. If the time ends too soon, the user can say 'start' and the process will begin again. Since the floor works with pressure, user ID is based on weight and voice recognition. When someone bathes, the floor detects uniform weight distribution and seals the drain in the floor. The room can fill up to a maximum of sixteen inches. Finally, since the room is one uniform surface with no crevices or hard edges, and since the ceiling is entirely made of water nozzles, the room cleans itself after every use other than bathing.

The bedroom is the most playful space of the house. Using the same uniform skin language as the bath room, its design is based on rest, providing many opportunities and locations in the room, vertically and horizontally for all bodily positions that make rest possible. Besides the vertical walls, all surfaces are layered with a cushion embedded in the forms of the room. Similar to the bath room, the bed room has resting spaces that flow into each other chimerically, hybridizing the physical nature of rest.

The digital layer is applied to promote the ability for one to rest, which is to feel comfortable within one's surroundings. Being comfortable has intangible qualities, such as the

1. IR RECEIVER
2. IR REMOTE
3. SENSOR
4. CUSHION

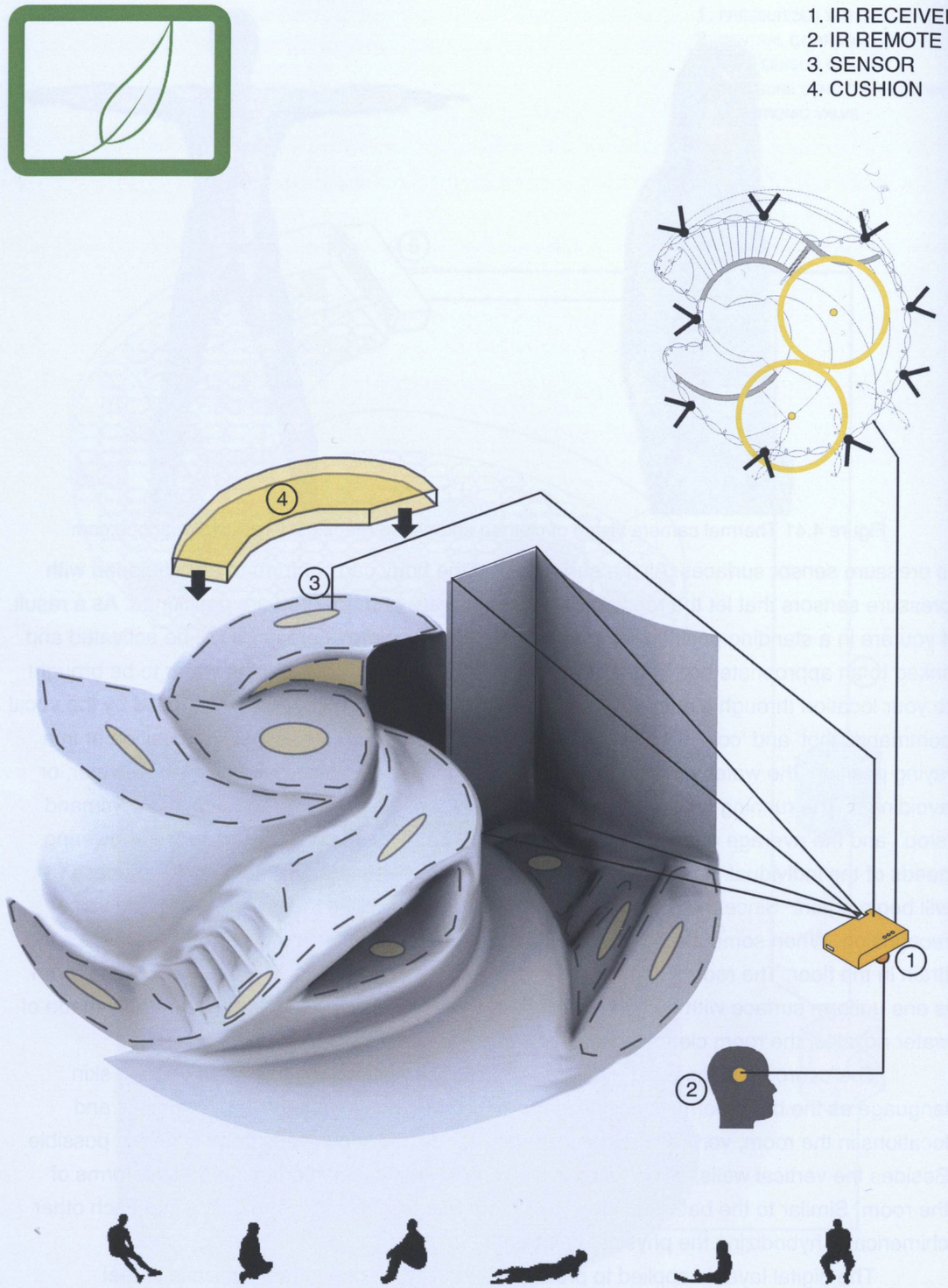


Figure 4.42 Technical Diagram - Bed room.

feeling of safety and security. As a result, the digital realm assists in turning every surface in the room into a transparent looking glass into the house. When looking through this window, you have the option to see reality (physical social interaction), augmented reality (physical and digital social interaction), or any visual additional programming you desire. The entire circumference of the core is equipped with cameras that have the ability to toggle between reality and augmented reality. If the exterior skin should break at any point when the others are closed, the screen will automatically change to the camera that covers that opening, increasing the security capabilities of the house. Whatever resting position you prefer to be in, the window will conform to your physical requirements and project itself on whatever surface you are looking at. This is done using infrared sensors. A tiny infrared laser, which can be worn or carried is positioned to shoot on any surface. The projectors placed around the room pick up the infrared location and move to wherever the infrared light is positioned. Each resting surface has a pressure sensor that controls the scale of the image projected. In this sense, the bed room adapts to you as a sensorial extension of vision. It understands where you are positioned and your orientation and improves the comfort level of the space.

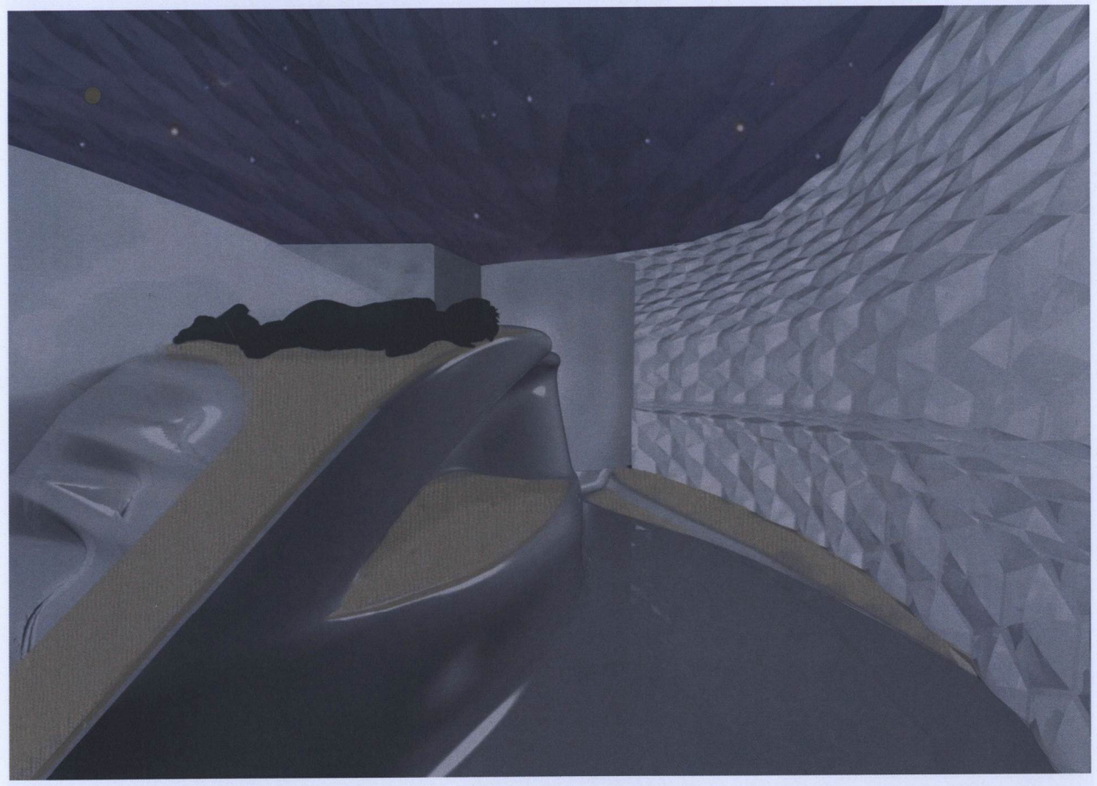


Figure 4.43 Rendering - Interior perspective of bed room.

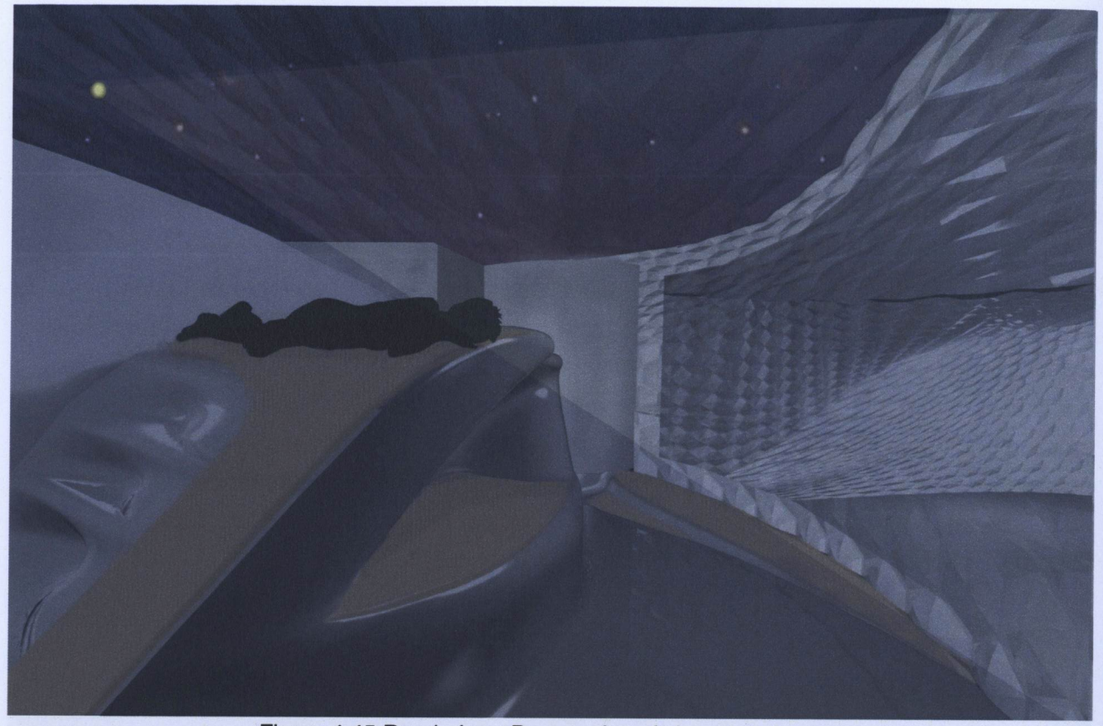


Figure 4.45 Rendering - Perspective of views into house.

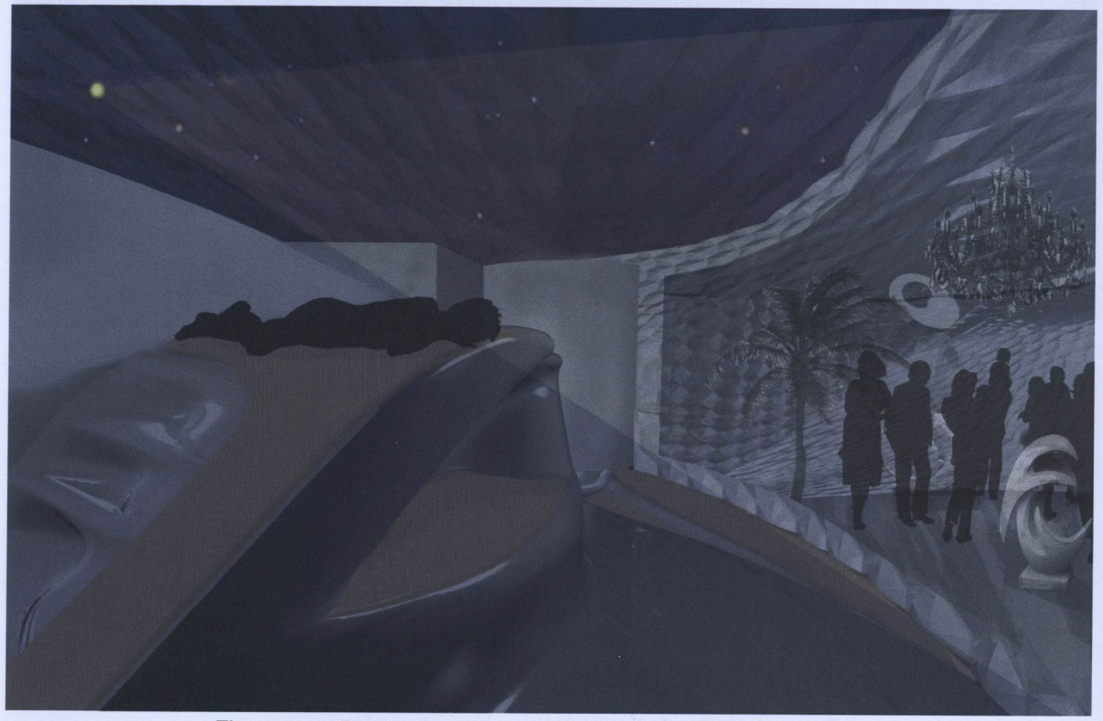


Figure 4.45 Rendering - Perspective of views into house with AR.

CHAPTER 5 - CONTINUING THE DIALOGUE

Concluding Remarks

The Compatible House demonstrates the potentials of hybridity in architecture. More interesting than its demonstration however are the issues it brings forward. Through the design, it has been shown that context does not have to be a primary design driver (see Appendix D). The project has shown that one simple skin can comprise all the skins used today and even push the boundary further by adding more possibilities. It has shown the difference real and virtual social relationships and their meaning within a house can have when the true materialization of digital space (the spatial involvement made aware to a user) occurs. It also raises questions of architectural representation and properly conveying the ideas behind a house that can consistently change. This thesis was meant to raise issues and questions about architecture and design as a basis for critical thinking of the future and the potential of hybrid design.
As a bold endeavor, the house questions the validity of standard architectural practices like site, circulation, spatial separation, and public and private relationships. Not to discard current architectural thinking, the juxtaposition created by the Compatible House creates the comparison that initiates progressive architectural thinking. The purpose of this project was to show the possibilities of architecture, the possibilities of user experience resulting from that architecture, and where the discipline itself may stand in that point in time.

Speculation for the usage of the Compatible House in the future is based on our increased obsession with digital technology and the decrease in scale with which this technology is becoming available to us. The future is seen as a place where people understand that they are physical beings and have physical needs and look to incorporate digital usage into that routine as a supplement, not as a replacement. The house attempts to exploit that supplementation of digital use and demonstrate not how life should be in the future, but that it could be adaptive to a lifestyle where digital space is heavily relied upon.

Research shows that the architectural ubiquity within our present society reflects the misuse of digital space. The scale of the sensorium of digital space has progressed from small devices to entire building facades and spaces – demonstrating architectural design practice as physical space enhancing digital space. As we question the role of the architect in the future, it is important to understand that the current relationship between physical and digital realities in design must be reversed. As more control and adaptability is granted to the user of a hybrid space, the architectural design practice must shift from satisfying large social constructs, to the performative qualities of a space that can cater to an individual. The importance of the architect therefore reflects his/her ability to understand the physical needs of space, the inherent responsibility of the space to support that physicality, and the nature of digital space to enhance that experience by refining the properties that we historically associate with physical reality.

APPENDIX A

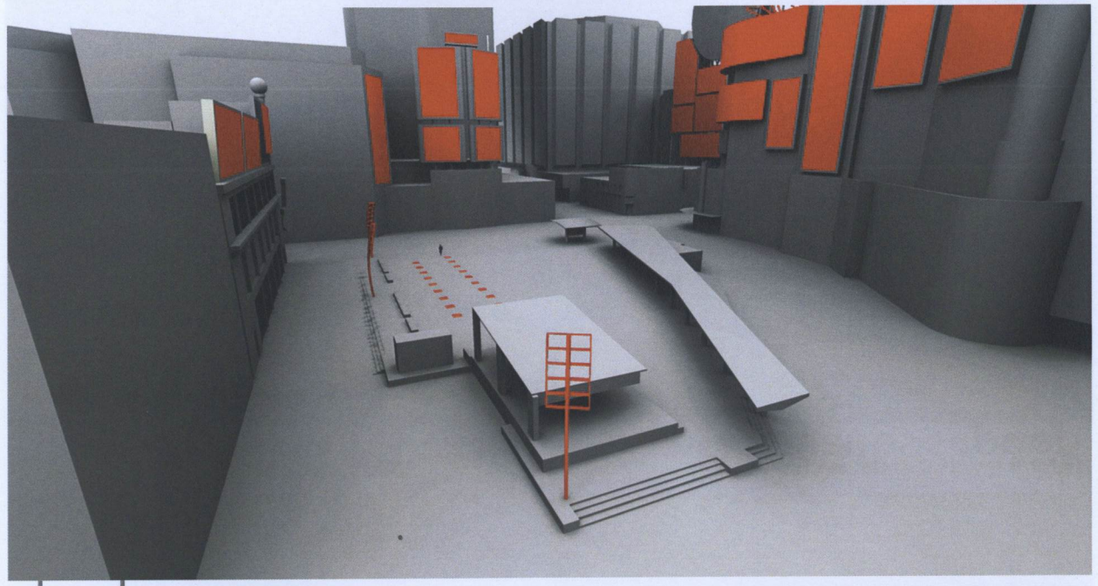
Daily Usage of Digital Devices

The chart below demonstrates the time allocated to physical interfaces with digital associations and the sensory response to their usage. The time was averaged over a three day period of study from 7:30 am to 12:00 am between home, work and in transport. The results demonstrate that significant amount of time is allocated to the use of battery power (mobile) and global networks - electromagnetics (wi-fi, sensors and radio) with the primary sensory engagement being vision, followed by audation.

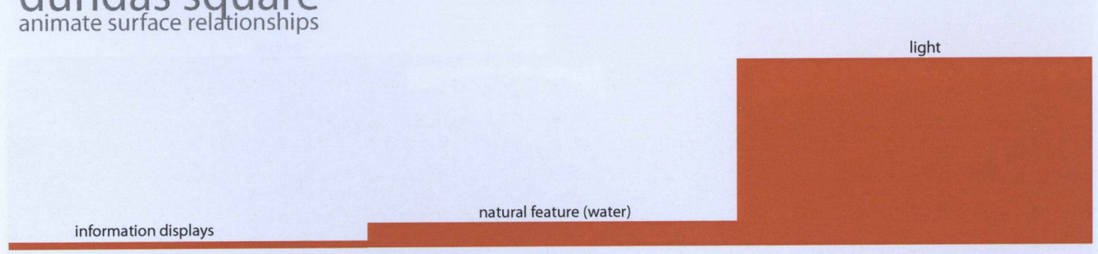
PHYSICAL INTERFACES		AMOUNT OF TIME ALLOCATED (H)																
		TYPES OF CONNECTIONS										PRIMARY SENSORY INTERACTION						
		TANGIBLE					INTANGIBLE											
		ETHERNET	PHONE CABLE	H/S CABLE	POWER CABLE (AC/DC)	BATTERY POWER	SATELLITE NETWORK	ELECTROMAGNETISM	INFRA RED	MOTION SENSOR	HEAT SENSOR	PRESSURE/WEIGHT	TEMP./HUMIDITY	AUDITION	OLFACTION	VISION	GUSTATION	MOVEMENT
@HOME (6.5 H MAX.)	CELL PHONE					0.5	0.5	0.5				0.5		0.5		0.5		
	STOVE TOP				0.5						0.5	0.5						
	PORTABLE PHONE					0.5		0.5				0.5		0.5				
	LAPTOP COMPUTER					5.5		5.5								5.5		
	TELEVISION			0.5	0.5											0.5		
	PLAYSTATION				0.5			0.5								0.5		
	REMOTE CONTROLS					1.0		1.0	1.0			1.0						
	ALARM SYSTEM				0.5				6.5	6.5								6.5
	RADIO/AMP				0.5			0.5						0.5				
	HVAC				0.5						6.5		6.5					
@WORK (9H MAX)	CELL PHONE					0.5	0.5	0.5				0.5		0.5		0.5		
	PORTABLE HANDHELD					9.0	9.0	9.0						9.0		9.0		
	TELEPHONE		2.0		0.5									2.0				
	DESKTOP COMPUTER	2.0			0.5											9.0		
	ALARM				6.5					6.5								6.5
	RADIO				0.5			9.0						9.0				
	HVAC				0.5						9.0		6.5					
CAR (1H MAX)	CELL PHONE					0.5	0.5	0.5				0.5		0.5		0.5		
	G.P.S.					1.0	1.0	1.0				1.0				1.0		
	RADIO				0.5			1.0						1.0				
	GARAGE DOOR				0.5					0.1								0.1
	REMOTE CONTROL					0.1		0.1				0.1						
	PORTABLE HANDHELD					1.0	1.0	1.0						1.0		1.0		
		2.0	2.0	0.5	12.5	19.6	12.5	30.6	7.5	13.1	16	4.6	13	24.5		28		13.1

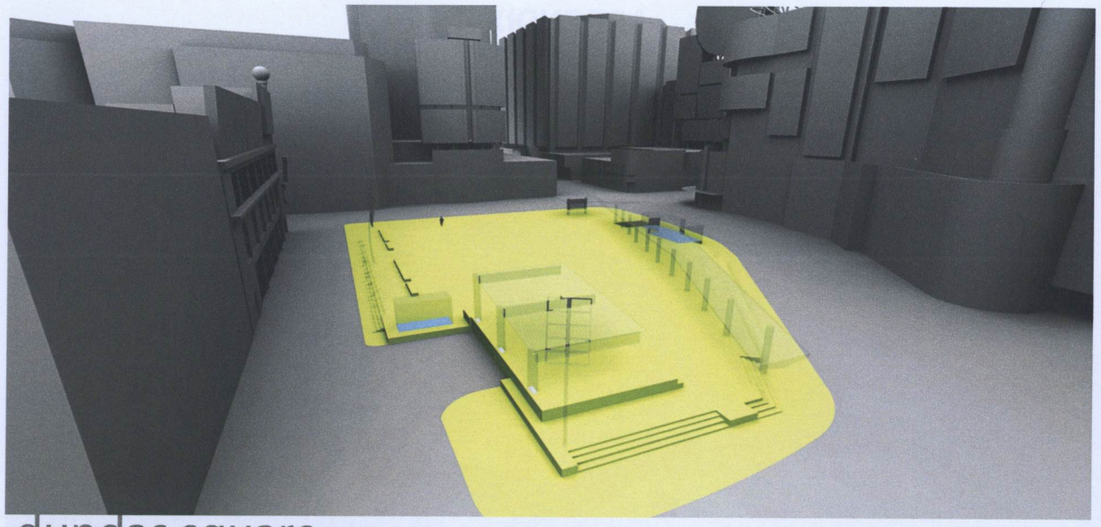
APPENDIX B

Dundas Square Analysis



dundas square
animate surface relationships

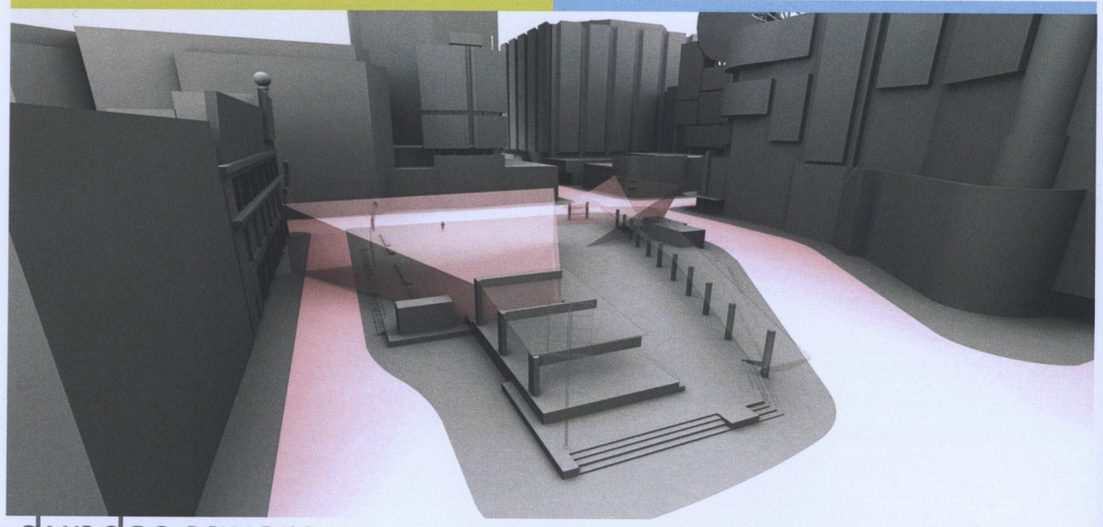




dundas square
habitable surface relationship

public

private



dundas square
soundscapes

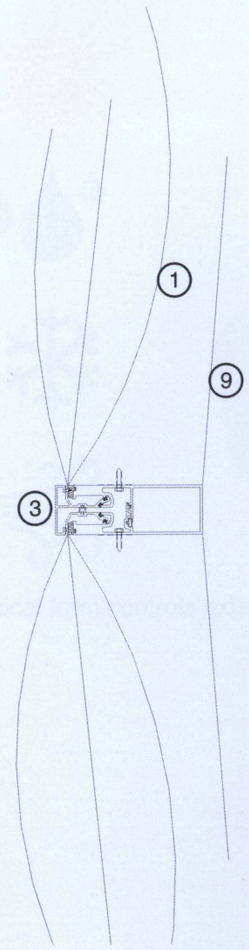
street

subway

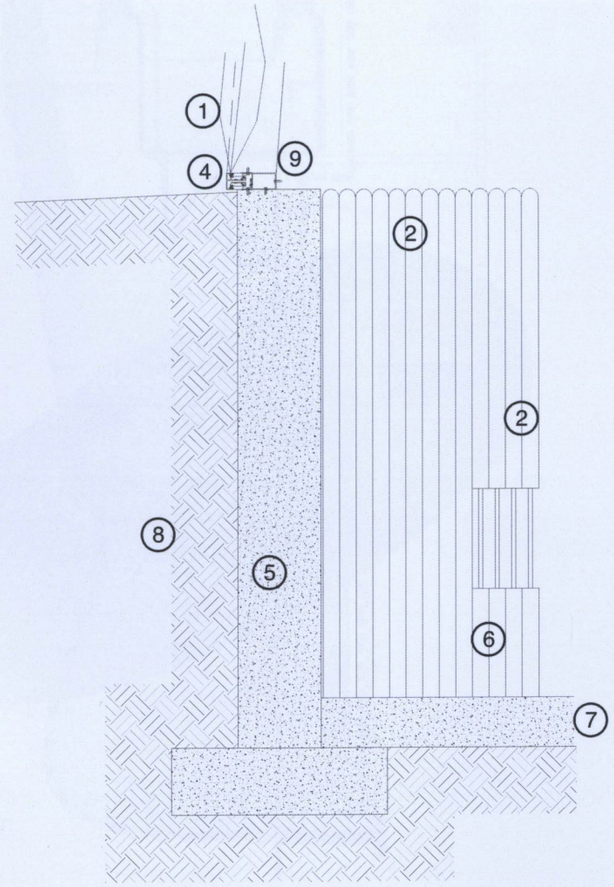
stage/amplification systems

APPENDIX C

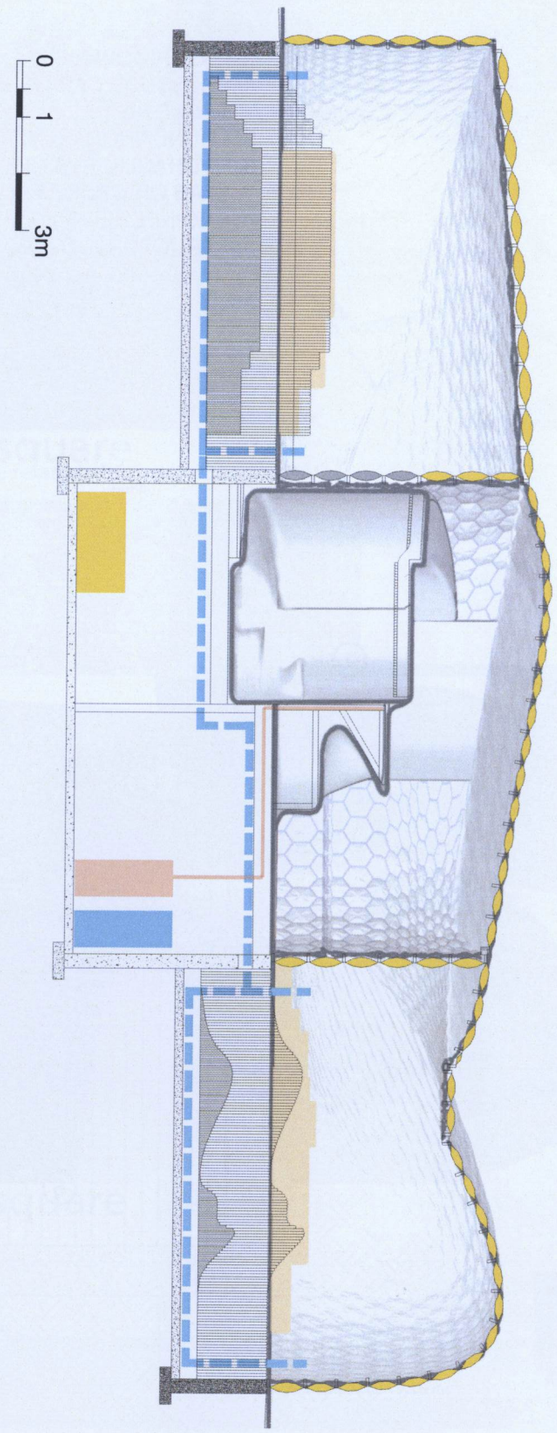
Structural Details



1. ETFE
2. FLOOR DOWELS
3. PRESSURE CAP
4. GASKET
5. FOUNDATION WALL
6. HYDRAULIC SYSTEM
7. SLAB ON GRADE
8. ENGINEERED FILL
9. STRUCTURAL STEEL FRAME

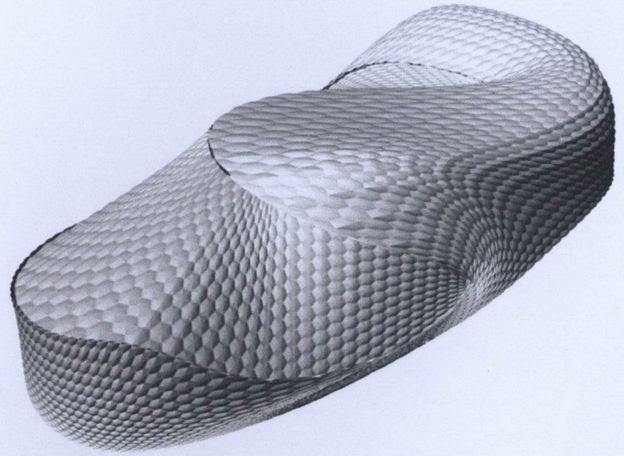


House Section

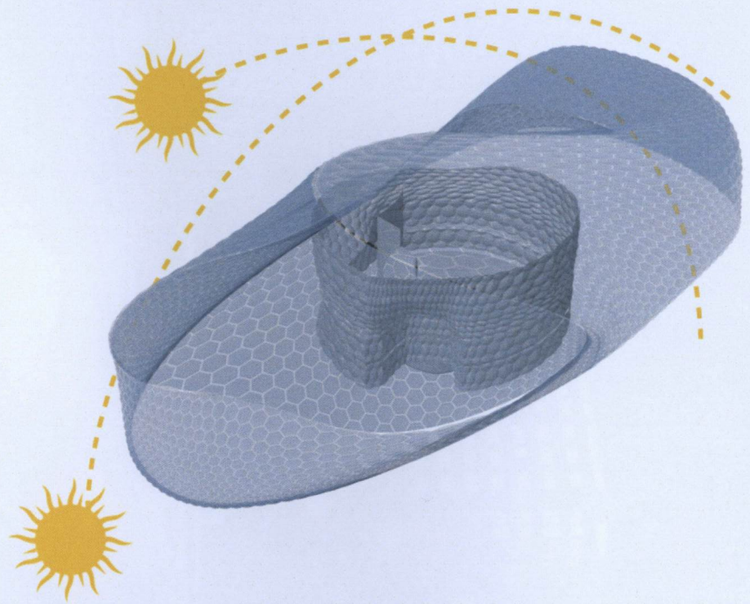


APPENDIX D

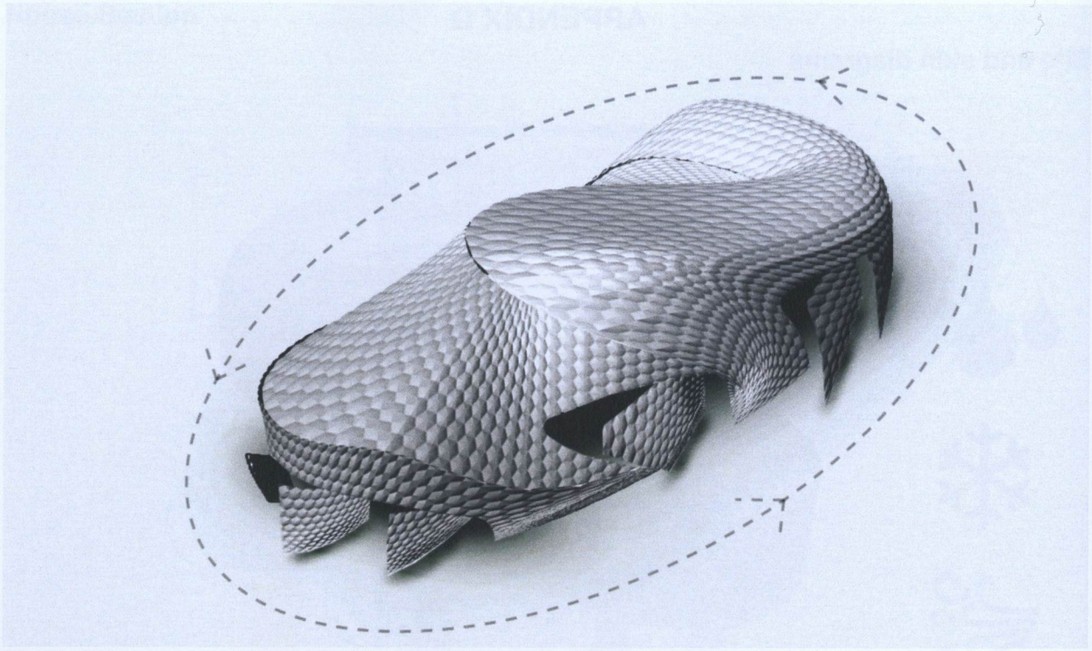
Site and skin diagrams



Physical form controls external influences.



Physical form defines orientation.



Physical form promotes public interaction and circulation.

APPENDIX E

Mobilization manifesto

REFERENCE LIST

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TERMS

Digital Space

The artificial creation and governance of physically unoccupiable spaces/environments that are used for information communication. Their qualities include immaterial, boundless, placeless, global and intangible. Some examples include electromagnetism and Infrared (IR) technology.

Physical Space

The natural organization of materials that are physically occupiable and grounded and time and locality. Its qualities include sensual emersion, and biologic. Some examples include buildings, people, land, water, and air.

Hybrid Space

Physically occupied realms of artificial spatial governance. They are physical representations of network communication. Hybrid space has the ability to extend our perceptions of space and matter into connected spaces that neglect the rules that we historically associate with physical space.