

Coding Architecture: Digital Urbanities in New Media Art

Introduction

The notion of architecture as the setting or the spatial arrangement of the human habitat has of recently been addressed in terms of its meaning and the actual phenomena it refers to. Having once being perceived as the objective manifestation of the human embodied reality and its material disposition and surroundings, it now goes through alternative definition stages and re-thinking, as the definition and understanding of the human habitat itself gets challenged with the advent of new media technologies. As long as the human body still remains tightly connected to the objective material reality in which it takes actual volumed space, and where the actual disposition of this space is arranged according to its pragmatic and aesthetic notions covering a wide range of bodily affectations, the emergence of new media and technologically mediated worlds they generate, has created a whole new setting of realities (most commonly referred to as virtual realities) which can according to their setup and staging be equally understood as habitats. Even though the actual physical body does not get uploaded to these eco-systems, the respective bodily simulation within those does take a similar kind of volumed presence, which impacts and dictates the actual scenery and the scenography of the designed space as habitat around it.

Therefore, questions arise whether the notion of architecture can be transposed to these virtual realities, and if it can and if it does, what are the rules and the legislations by which we should be borrowing from the traditional concepts of architecture that could help us build these world as optimally and usably as we can? And even more importantly, which are the ones we should leave behind and forget them, in order not to limit us in conquering these new worlds and grasping the potentials and possibilities of the limitless virtuality? The spatial arrangement of these newly emerging eco-systems is still ultimately necessary even in the computed and synthetic processual and fluid environments, as our bodies and minds have still not evolved far enough and we are still not fully posthuman in order to be able to grasp different spatial manifestations to those we are accustomed to in our daily lives.

Let us just think even of the most challenging and innovative virtual realities. They still cling very much to the shapes, models, forms and structures of habitation and spatial orientation we are familiar with. Most often, these forms simply get recycled, mashed and mixed with one another in a form of an architectural collage. Let us also remember the architectural setup of the film *Blade Runner* (Scott 1982), where the architecture of the old Pyramids and the ancient East gets superimposed by the post-industrial building quarters, additionally re-interpreted with the futuristic vision of one utterly urbanized spatial organization, but still fighting its materiality with tall, but light gothic-like constructions, being built in glass and huge open spaces. These sorts of architectural visions have been dictating even the set-up and the design of the virtual realities of

today, heavily relying on the shapes and structures commonly known to humankind. Jeffrey Shaw's interactive installation "The Legible City", for example, invites a completely new corporeal sensation of the city to be built on the interpretative effort of the human mind, but still the blocks of text are shaped like buildings and the navigation and motion still take place in the street-like designed spaces, understanding all the pragmatic rules of left and right, not even calculating with the possible movements of up or down.

How long will these bodily experiences that we have inherited from the past and from our corporeal interactions with the material objects which account for the quality of our living and the haptic sensations respectively, influence the way we design the computable space? And especially, will the notion of the city as an organized spatial node with its relevant infrastructure survive in thusly defined surroundings?

Even though computable spaces still rely on the existing and inherited urban spaces, they on the other hand offer unimaginable flexibility, fluidity and liberty in terms of forms organization, their spatial/temporal distance and interconnectivity. Each and every spatial node within the computable reality can be in the same temporal dimension connected with any other, coexisting with it, or even in spite of it. Human virtual existence within one, does not necessarily exclude simultaneous existence within another, or hundreds of others. Still, my understanding is that, even though at the first glimpse the possibilities are really vast and almost limitless, the very embodiment of the human mind requires an anchoring point in order to steer its activities and the perception of the space, affectation and movement. The processing of movement performed even by human mind is heavily influenced by the grasping of human body, it being the governor and main activator of all the actions. The biological processes moving our bodies and making them operate in any of the directions given, thusly impact the way we feel and react even to virtual stimuli.

The city architecture of the future, thusly I find, will need to be a compromise between limitless anarchy of choice and the settled and organized perception of the bodily inhabitation. It will use the speed and the closeness of connections, but it may still be rather pragmatic in keeping a certain hierarchy of the organized and ordered motion through space, which will still need to be trafficked and have its own game rules. What I would like to do in this paper is challenge and question these rules, see where their limits lay, where they can be pushed to, in order to allow better and more usable organization and experience of computable space as well as where the traditional note of architecture would be of use. I should like to do this through experimenting and analyzing different art practices and projects, which stand at the forefront and are the avant-garde of the potential architectures of the future.

Architecture in/of Cyberspace

The term “cyberspace” was first introduced in the novel *Neuromancer* by William Gibson who described it as:

“A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding...” (Gibson [1984] 2004:67)

In the third novel of his *Sprawl* trilogy *Mona Lisa Overdrive*, Gibson further describes cyberspace as “colorless wall of sensory static”, “cluttered vastness” and “the bright grid of the matrix ranged around her like an infinite cage.” (Gibson [1988] 2012:56) It is an omnipotent, dynamic, shape-shifting space without substance or matter, and yet, it possesses certain qualities of physicality emerging from human-computer interactions. Cyberspace as a kind of non-place or meta-place is a combination of technologies and the creative potential of the imagination, the place of globally networked infrastructure of cultural, economic, political, social and technological interconnectedness. Although the term originated from science fiction, it has become a dominant signifier of complex phenomena taking place within technologically mediated interactions in the postmodern condition of society today. Moreover, the cyberspace as conceived by Gibson in *Neuromancer* as well as by other cyberpunk writers who also contributed to visualizing structure, contents, functions and potentialities of cyberspace topology, quickly became an inspiration for visual artists, designers, programmers, architects and filmmakers who embedded thusly imagined digital spaces into their works, making them an integral part of not only our collective imagination, but also of our daily experience.

The dominant interface to access and experience digital spaces is the screen on our computers or mobile devices, while the full body immersion relies on interfaces such as VR (Virtual Reality) systems, AR (Augmented Reality) systems and various gestural or so called natural interfaces. Even though cyberspace appears to be a limitless void, its creation relies heavily on topology, architecture, contemporary art, geometry, etc., so that it could be apprehended by human parameters of orientation. As such, cyberspace is perceived and experienced in terms of places and territories. However, according to Lev Manovich (2002), the difference is that for the first time the space has become a medium *per se* that can be stored, transmitted, deleted, compressed, programmed and merged with other spaces. It is interactive in nature and it gives users the ability not only to navigate within the space but to navigate the space itself. To explore digital architectures behind the screen means to enter an environment responsive to user’s movements. The feedback loop provides the user with a sense of control, mobility and creativity on experiential level: “The navigable space thus is a subjective space, its architecture responding to the subject’s movement and emotion. (...) The space can literally change, becoming a mirror of the user’s subjectivity.” (Manovich 2002:231) Navigation through such a space is controlled

by the user's gaze, but the gaze that has itself become modified and mediated through human-computer interfaces. In other words, through the process of adaptation to computer-generated forms of visualization and movement, the human eye has suddenly become distant from its embodied and spatio-temporal orientation specific to physical reality. Due to the biological lack of vision that corresponds to electronic data spheres, cyberspace is over and over again reconstituted on the basis of biological and physical attributes, so that it could be bearable for human perception or in Heideggerian terms, for being or dwelling-in-the-world.

The creation of cyberspace largely relies on the existing topology of urban spaces, but in cyberspace, these are endlessly multiplied and thus the distinction between the center and periphery, urban and rural, near and far, and here and there, no longer withstands. Such a heterogeneous space, devoid of inert, crude matter, monumentality and stillness, can be identified as an extension of the urban sector located at the multiple intersections of postmodern and science fiction, the space in a state of perpetual flux, emergence, becoming and processuality. It has no center, no beginning, no end, and no reference points or coordinates, but still, there is a kind of inherent processual logic allowing the navigation of its multi-nodal structures in spatial categories. Reflecting on the potentials of media technologies in the context of architecture and urbanism, Paul Virilio stated that with the advent of the "machines' luminous emissions, (...) constructed space occurs within an electronic topology where the framing of perspective and the gridwork weft of numerical images renovate the division of urban property." (Virilio 1991:13) He also pointed out that the digital space as a field of a new kind of representation is not only about design and navigation of spatiality, but that the "urban architecture has to work with the opening of a new 'technological space-time'." (Virilio 1991:13) In other words, the instantaneousness of motion in unbounded and overexposed digital landscapes introduces 'time' as yet another key element in the newly emerging architectural forms, but the time in this context has no relationship to chronological and historical time that passes but is rather established as instantaneously exposed computer time constructing a permanent present and timeless intensity. With the screen as an interface, everything is already there, accessible to view and interact with at all times:

"From here on, the appearance of surfaces and superficies conceals a secret transparency, a thickness without thickness, a volume without volume, an imperceptible quantity." (Virilio 1991:17)

When the places become interchangeable at will, the perception of space then changes accordingly - from the one of a settler, a resident, to that of an interlocutor in perpetual motion. The concreteness and materiality of urban structures can no longer guarantee the permanence of architectural structures and urban planes, since these are now transformed into more fluid and flexible structures through the proliferation and multiplication of digitally coded urban spaces, strongly affecting our perception of the environment.

To some extent, Virilio's theoretical concepts are embedded in the works of Marcos Novak, Professor at the Department of Architecture and Urban Design at UCLA and the founding director of the Laboratory for Immersive Environments and the Advanced Design Research Program at the School of Architecture, University of Texas, Austin. Working with the new aesthetic forms to digitally design virtual and hybrid environments, Novak is constantly extending our presence to nonlocal realities and at the same time, his works as such challenge and defy the Cartesian logic embedded in our understanding of space. Discussing the transformation of the role of the City with the advent of new technologies as architectonic tools, Virilio writes:

“Deprived of objective boundaries, the architectonic element begins to drift and float in an electronic ether, devoid of spatial dimension, but inscribed in the singular temporality of an instantaneous diffusion.” (Virilio 1991:13)

Similarly, Marcos Novak believes that "cyberspace itself is architecture but it also contains architecture." (Novak 1991:249) He uses the term “trans-architecture” or “liquid architecture” to mark a transition from purely traditional architectural rigid forms to new architectural structures and practices emerging from the convergence of technology, science and art:

“Liquid architecture is an architecture that breathes, pulses, leaps as one form and lands as another. Liquid architecture is an architecture whose form is contingent on the interests of the beholder; it is an architecture that opens to welcome me and closes to defend me; it is an architecture without doors and hallways, where the next room is always where I need it to be and what I need it to be. Liquid architecture makes liquid cities, cities that change at the shift of a value, where visitors with different backgrounds see different landmarks, where neighborhoods vary with ideas held in common, and evolve as the ideas mature or dissolve.” (Novak 1991:251-2)

In a series of art projects including “Dancing with the Virtual Dervish: Worlds in Progress” (1994), “Trans TerraForm” (1995), “Transarchitectures and Transmodernity”, “Sensor Space” and “Transmitting Architecture” (1997/98), and “Turbulent Topologies” (2008), to mention a few, as well as in his written works, Marcos Novak employs generative algorithms to create architectural structures for virtual domain, the structures that are “composed” and “grown” as open-ended as well as “unbuildable in the physical world.” (Novak n.d.) Time becomes an active element in liquid architecture, and transmissible illusions seem to be as real as physical constraints. These ethereal architectures can be perceived and experienced on human scale through the immersion into digital imagery. More importantly, the very existence of these spaces evolves only through interaction with a user. Through feedback loop, it is the movements of the user that generate the fluid, metamorphic environments, each of them unique and unrepeatable because each user makes different navigational and exploratory decisions. In synthetic space-time, this makes the duration of the evolving architectural narrative purely retinal and therefore

most personal and most intimate of all images that ever existed, for their materialization takes place within the user's brain via visual apparatus as the medium. In this way, the user becomes a constitutive, inseparable part of the liquid architectural spaces. Through such an interplay, the distinction between the observer and observed disappears and the medium and message become one.

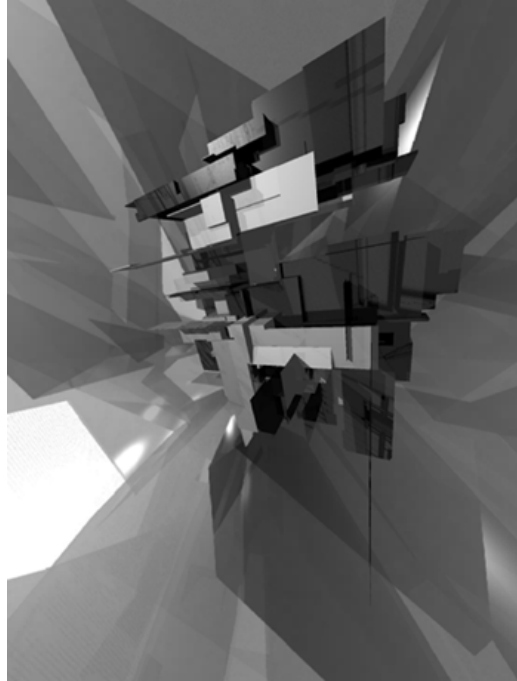


Photo 1. Marcos Novak, *Voice3=4Maze.Blue* (model of “liquid architectures”)

In liquid, distributive and transmissible architectures, all constants are replaced with variables, resulting in no limitations in spatial design. In this sense, architecture and urbanism are confronted with issues that distort and challenge the traditional understanding of the practice. Ubiquitous urban networking on technologically mediated interactive level as well as overexposure of the cities through the medium of the screen – from mobile phones to large-scale spectacular public displays - require new strategies in generating architecture that “must reflect our current understanding of physics and cosmology, [and] must utilize our most current concepts and methods of knowing the world.” (Novak 1996) Therefore, one of the key challenges of architecture today is to bridge the gap between the liquidity of pure information and rigidity and inertness of the existing architectural design. Within artistic discourse, artists and architects collaborate on projects that integrate virtual infrastructures into public urban spaces, thus augmenting both theory and practice of architecture and urbanism by introducing transmissible, relational, responsive, informational, dynamic and vibrant architectures.

Merging of Code and Matter

The advent of cyberspace and especially of World Wide Web has raised many questions and discussions about the relation of real and virtual spaces. N. Katherine Hayles (1999a), Scott Bukatman (1993) and many other authors emphasize the duality which lies at the core of the definition of virtuality, consisting of materiality on one side and abstract information on the other, but these two realms are no longer to be observed as Cartesian opposites since they have become deeply intertwined and constitutive of one another. Referring to N. Katherine Hayles' concept of "virtual creatures" which she analyses on the basis of what they *are*, what they *do*, and what they *mean* (Hayles 1999b), David Bell interrogates the three aspects of virtuality as very often overlapping material, symbolic and experiential stories of cyberspace. Materiality of cyberspace consists of hardware as a global computer network connected via communication infrastructures which enable interaction between remote actors. In other words, cyberspace represents the sum of all hardware branching and networking on material level. On symbolic level though, it is abstract, i.e. digitally coded, and can be defined as an imaginary space behind the screen where people build new worlds and new selves within those worlds. Finally, the experiential level embodies the ways in which we experience cyberspace through mediation and interaction of material and symbolic elements penetrating and transforming our sense of lived reality. In the words of Philip K. Dick, "After all, an illusion, no matter how convincing, remained nothing more than an illusion. At least objectively. But subjectively – quite the opposite entirely." (Dick 1997:306) It is on a subjective experiential level that more and more we are witnessing the boundary collapse between "virtual" and "real" existence and spaces through the interplay of material and symbolic manifestations of digital datascares.

When speaking of cyberspace, we usually refer to its symbolic and experiential aspects, often neglecting the material, hardware part due to seductiveness of fluid imagery and intensity of experience when immersed in the worlds behind the screen. But no matter how limitless and omnipotent virtual spaces may be, they are deeply rooted in and dependent upon the hardware that generates them. Our digital selves and our digital cities have transformed from being coded as imaginary (or other than the real) within Web 1.0, to the digital extension or amplification of material world through Web 2.0. It is through social networking, Google maps and street views, check-ins and similar current daily online activities that virtuality has not only become a mirror reflection of material reality, but has amplified it by becoming its constitutive part, its interactive technologically generated layer. Moreover, the virtual-real space divide has dissolved and transformed into technologically augmented urban reality, both abstract and palpable. Cyberspace entails a simulation of the entire planet and every place or spot has its digital manifestation, its digital "other" composed of every bit of information there is, be it a map, historical or political data, demographics, or the finest dining places in a specific area. When every corner of the Earth is only a click away, the screen loses its function of boundary between the real and the virtual. In accessing a digital dimension of the existing physical places and

spaces, the screen becomes a sort of permeable membrane allowing the corresponding interplay of matter and digital data. In other words, the cyberspace as a transformative technology pours into reality and permeates it with invisible networks which are affecting and reshaping the motion of social, political, financial, and cultural flows of interaction and communication.

The presence of invisible landscapes of WiFi networks is visualized and materialized in “Immaterials: WiFi Light Painting”, a short film by Einar Sneve Martinussen, Timo Arnall and Jørn Knutsen. (Martinussen 2011). To measure and visualize the strength of WiFi signal, they build a measuring rod with led lights. When moved through space, the light bar displayed the changes in WiFi signal and the changes were captured with long-exposure photographs showing the cross sections of the signal in urban setting. The project aimed at visually revealing the intangible topography of WiFi signal and the ways in which it is situated throughout the urban landscape. Measurements were made in Grünerløkka area of Oslo and lasted for a few weeks. They show that the strength, consistency and range of networks can tell a lot about the urban environment in which they are set up, as well as about the size and status of the network’s owner: network signals of small households in apartment buildings are stronger but shorter in range than those of parks and universities, for instance. Visualization of the networks shows how city architecture and demographics affect the topology of networks as well as how the network flow varies depending on its location. It is thus the very structure of urban environment along with the daily online activities of users that form the invisible, fluctuating and complex networks as an integral part of the existing urban settings. The “Light Painting WiFi” project shows the technical features and infrastructure of digital technologies, but more importantly, it enables us to experience the intangible as spatial and material phenomena interwoven into the fabric of concrete cityscapes.



Photo 2. Martinussen et al.: *Immaterials: Light Painting WiFi*

The ubiquitous use of new media technologies have brought about a radical shift in our perception of urban space, turning it into what Scott Bukatman refers to as the “terminal space”. (Bukatman 1993) Terminal space consists of both immaterial virtual spaces and decentralized

urban spaces whose coexistence forms a single, unified space of multiple layers of reality. Thus, the notion of space is transformed into simultaneously dispersive and compressed space, superimposed by the spectacle of its transient imagery. The human-computer interface provides terminal experience that constantly modifies and undermines the anthropocentric position in newly emerging spatialities. Through the interplay of digital and material, terminal space as our every-day environment requires some sort of permanent liminal existence and, as such, it plays a significant role in redefining the ontology of human embodiment, identity and subjectivity.

Immersion into terminal space is the topic of Jeffrey Shaw's interactive installation "The Legible City". The installation consists of three parts, i.e. simulations of three cities: Manhattan (1989), Amsterdam (1990) and Karlsruhe (1991). Architecture of the simulation is based on the real maps of these cities, but instead of buildings, Shaw constructs 3D letters which, through navigating the city, evolve into words and sentences taken from the archives documenting daily historical events related to those specific places. Manhattan is composed of several stories in the form of monologues that are spread along the streets in different colors, while Amsterdam and Karlsruhe are differently designed so that the size of the letters and their arrangement correspond to the proportions and location of existing buildings, creating thus a textual, legible city map. The computer-generated image is projected onto a large screen and a smaller screen shows a simple ground plan of a city and the user's position in it. A platform with a bicycle is set in front of the large screen. The handlebar and pedals are equipped with sensors enabling control of speed and direction of city navigation. Cycling as a physical activity in physical reality makes the experience of the virtual become embodied, meaning that the user is simultaneously aware of the body in its physical existence and the body within the projected image on the screen. At the same time, navigating the streets, turns and intersections of textual city, the user goes through a unique experience of "reading" the city much like one explores and moves through hypertextual linking, creating thus a unique narrative which expands and redefines the reception and perception of the cityscapes. Shaw's legible city as "information architecture" (Paul 2008) is specific for revealing those aspects of the city which the city itself does not contain, and these are intangible experiences accumulated over time and related to the specific place where the user is located. Navigation transforms the city of seemingly unrelated letters and words into the city as text, the city as multilinear narrative. Enabled by the physical motion, the user's body extends itself to nonlocal, terminal space, thus experiencing the liminal state of existence between real and virtual on the corporeal level and human scale.

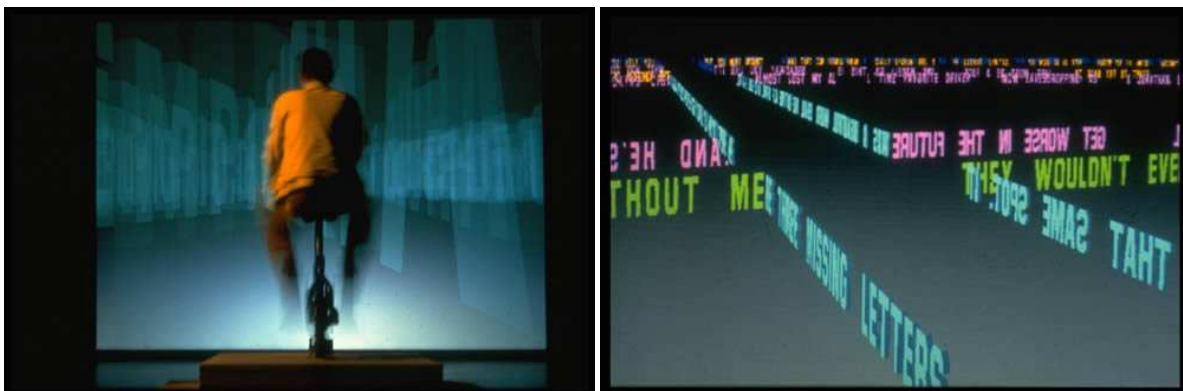


Photo 4a and 4b. Jeffrey Shaw, *The Legible City*

A somewhat different approach to the study of architecture in real and virtual space can be found in Rafael Lozano-Hemmer's series of projects called "Relational Architecture". This concept is very close to Novak's concepts of liquid and transarchitecture, i.e. architecture that transgress the real-virtual divide. It is an architecture that embodies and merges essentialist dualisms of space and time, public and private, real and virtual, and dissolves the boundary between them. It changes through interaction thus forming a new versatile, liquid continuum of "fourth dimension" in which fluidity and transparency of datascares allow the realization of the physical. (Paul 2008) In other words, the physical architecture and information architecture converge into new architectural hybrids of the future. Lozano-Hemmer's project Relational Architecture #4 entitled "Vectorial Elevation" is one of his most well known projects which not only erases the boundaries between the real and virtual, but also allows the participants to affect and change the cityscape via the Internet and thus leave a trace of self in the city's skyline. The project lasted in the period from 1999 to 2010 and took place in several different cities: Mexico City, Mexico (1999-2000), Vitoria-Gasteiz, Spain (2002), Lyon, France (2003), Dublin, Ireland (2004), and Vancouver, Canada (2010).

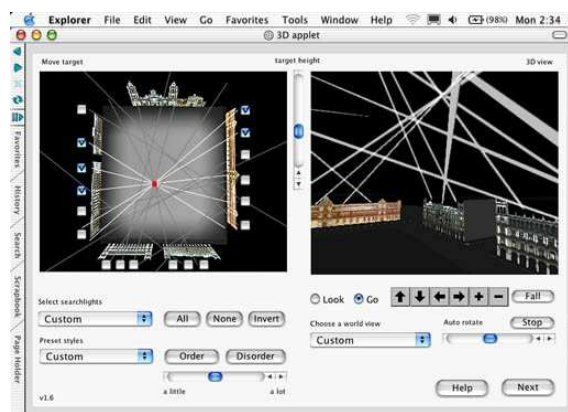


Photo 4a and 4b. Rafael Lozano-Hemmer, *Vectorial Elevation*

The project was originally designed to celebrate the arrival of the year 2000 in Mexico City's Zócalo Square and Internet users could design light sculptures over the city, with eighteen searchlights installed around the square which could be seen within a 15 kilometers radius. The searchlights were controlled by an online 3D simulation program and visualized by digital cameras. Each participant would get a personalized webpage produced with images of their design along with personal information and the message they inscribe in their light sculpture. Then, each design was sent to the queue waiting for its materialization. In Mexico, the project attracted 800,000 participants from 89 countries over the course of its two-week duration. (Lozano-Hemmer 1999) In the years that followed, the project's realization was based on the same principle in each of the above mentioned cities, but due to different architecture of the cities on the one hand and a large number of participants each making a unique design on the other, the constantly changing visual narrative of the city was thus created making not only Debordian "spectacle" of light-image sculptures but also representing a trace of telepresent

participation in physical public space, a trace of the disembodied and fluid penetrating the corporeality, monumentality and stillness of the city.

Throughout history, the city was the site of accumulation of political, economic, cultural, social and material resources - the city as the center, the city as a fortress isolated from its immediate environment. Today, cities function somewhat like the hubs in the network of pulsating flow of material and abstract resources as well as of human resources, or as William Gibson notices, “cities literally consist mainly of the people who inhabit them on a given day”, be it through physical or telepresence, so it is in this sense that they can be seen as a "meta-cities". (Shattuck and Stix 2011) The architecture of cyberspace is one of the most representative indicators of how the material and abstract have become so intertwined and dependent on one another that they now coexist in all the niches of modern society and urban spaces it inhabits. Rhisomatic interconnectivity and networking is now significantly changing the traditional notion of architecture. Materialization of fluid information architectures is more and more experimented with and conducted on the human scale as in the work of Dr. Rachel Armstrong who works on “living” or “vibrant architecture” consisting of programming protocells as architectural metabolic material which could “communicate” with the environment through the exchange of energy and interactions between chemical and physical properties. (Armstrong 2013) Slightly different experiments but still based on the principles of liquid, transformative architectures, are the experiments conducted by Skylar Tibbits et al. at MIT’s Self-Assembly Lab, where they create 4D printed self-assembling and self-folding technologies developed for the large-scale structures in the physical environment that can change over time. (Tibbits 2013) Human-scale projects of this kind can also be seen, or rather, experienced in the environments of “responsive architecture” created by Philip Beesley. Combining art and architecture with artificial intelligence, synthetic biology, and interactive technology Beesley’s installations are not only visually breathtaking but as gracefully responsive as virtually navigated spaces to the movements of a visitor, thusly creating fully embodied experience of liquid, processual, lively and responsive architectures. (Beesley 2010)



Photo 5. Philip Beesley with Rachel Armstrong: Hylozoic Ground

Bio-tech architectural experiments as conducted by the above mentioned architectural researchers demonstrate how the two traditions, new and old, can learn from each other and

support each other by letting the emerging materiality of virtual structures directly transform the physical connection between natural materials and urban constructs. In this manner, something that the modern theories may find antagonistic, new media artworks such as Shaw's "Legible City", Lozano-Hemmer's "Vectorial Elevations", or Beesley's "Hylozoic Ground", do not only reconcile but lead to interdependent essential harmony necessary for the emerging forms of architecture.

Conclusion

The concept of mediated spaces and also liquid architecture as Novak defines it makes it absolutely necessary to reconfigure the ways in which we understand the representations of shapes, boundaries, of what is void, what open, what closed, what near and what far. The fundamental grounds on which contemporary architecture sits need to be enriched with additional, more fluid terms and representations. Urban landscapes of today have already changed the way we understand presence, commuting or distance. Telepresence has also enabled us to project our bodies into the distant spaces, as screens now as membranes have become portals through which we access the extensions of the reality, the extensions of the worlds our bodies live in. The changing landscapes are being built at the dynamic intersections of these two complementary spaces, the one of hard material, concrete, steel making us aware of the temporary presence of our being, its weights and biological matter, the other fully abstract comprised of well-designed images and representations, void of the matter and rather being in the constant flux, but still ruled by the idea of an anthropocentric setting of the space. The cities of tomorrow or basically the urban habitat of tomorrow will be therefore a network of interconnected nodes fluidly flowing between material objects and immaterial representations, aiming towards achieving the ultimate efficiency of overall exchange of information, sensations and mobility through extended and prosthetic presence.

References

1. Armstrong, R. (2013). *Vibrant Architecture: How 'Vibrant Matter' May Raise the Status of the Material World in Architectural Design Practice and Be Recognised as a Codesigner of Our Living Spaces*. PhD thesis in Architecture, University College London.
2. Beesley, P. (2010). *Hylozoic Ground: Liminal Responsive Architecture*. Cambridge, Ontario: Riverside Architectural Press.
3. Bell, D. (2001). *An Introduction to Cybercultures*. London and New York: Routledge.
4. Bukatman, S. (1993). *Terminal Identity: The Virtual Subject in Postmodern Science Fiction*. Durham and London: Duke University Press.
5. Dick, P.K. (1997). "We Can Remember It for You Wholesale", in *The Philip K. Dick Reader*. New York: Citadel.
6. Gibson, W. ([1984] 2004). *Neuromancer*. New York: Ace Books.
7. Gibson, W. ([1988] 2012). *Mona Lisa Overdrive*. New York: Random House.

8. Hayles, N. K. (1999a). *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago & London: The University of Chicago Press.
9. Hayles, N. K. (1999b). "Simulating Narratives: What Virtual Creatures Can Teach Us", in *Critical Inquiry*, Vol. 26, No. 1: 1-26. Chicago: The University of Chicago Press.
10. Lozano-Hemmer, R. (1999). Available from: <http://www.lozano-hemmer.com/vectorial_elevation.php>. [23 Nov. 2013]
11. Manovich, L. (2002). *The Language of New Media*. Cambridge, MA: The MIT Press.
12. Martinussen, E. S. (2011). "Immaterials: Light painting WiFi". Available from: <<http://yourban.no/2011/02/22/immaterials-light-painting-wifi/>>. [23 Nov. 2013]
13. Novak, M. (1991). "Liquid Architectures in Cyberspace", in *Cyberspace: First Steps*, ed. Benedict, M. Cambridge MA: MIT Press.
14. Novak, M. (n.d.). "Trans Terra Form: Liquid Architectures and the Loss of Inscription". Available from: <<http://www.krcf.org/krcfhome/PRINT/nonlocated/nlonline/nonMarcos.html>>. [23 Nov. 2013]
Novak, M. (1996). "Transmitting Architecture: The Transphysical City". Available from: <<http://www.ctheory.net/articles.aspx?id=76>>. [23 Nov. 2013]
15. Paul, C. (2008). *Digital Art*. London and New York: Thames&Hudson world of art.
16. Scott, R. (1982). *Blade Runner*. USA: The Ladd Company and Warner Bros.
17. Shattuck, A., Stix, G. (2011). "Cities in Fact and Fiction: An Interview with William Gibson", in *Scientific American*. Available from: <<http://www.scientificamerican.com/article.cfm?id=gibson-interview-cities-in-fact-and-fiction>> [23 Nov. 2013]
18. Tibbits, S. (2013). "The Emergence of '4D Printing'" (video file). Available from: <http://www.ted.com/talks/skylar_tibbits_the_emergence_of_4d_printing.html> [23 Nov. 2013]
19. Virilio, P. (1991). "The Overexposed City", in *The Lost Dimension*. New York: Semiotext(e).