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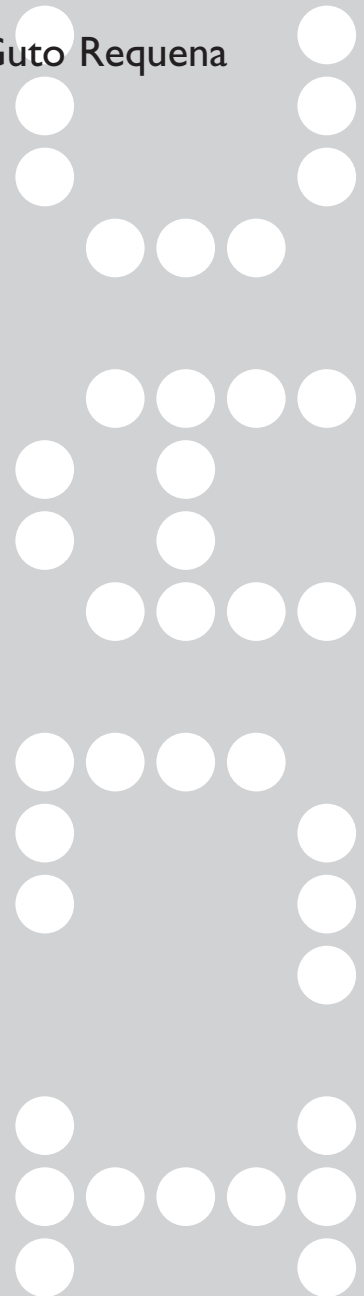
RESUMO

This paper presents some architectural housing projects designed by architects in different parts of the world, considering concepts originated from the virtuality domain. Some designers propose the beginning of an interaction between the user and its dwelling that attempts to overcome the functionalist slant of so-called residential automation. After examining different approaches and proposals, ten points are presented as items for an agenda of debates. The brief and introductory analysis proposed hereby is part of undergoing studies at the Nomads.usp Center for Interactive-Living Studies (www.eesc.usp.br/nomads), of the University of Sao Paulo, Brazil.

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1. INTRODUCTION

Some architects in several countries of the world have tried to explore in their work and thoughts concepts emerging from the realm of Virtuality. Conceptually, the results have been somewhat different, as it would be natural to expect from such a world-wide effort, frequently influenced by local cultural factors. Such inconsistencies, however, are its greatest fortune. A quick glance at the production of many of these practitioners allows the perception of completely varied design processes, a product of at times solid and prolonged, and sometimes recent, successful professional histories. When the program chosen refers to living spaces, close examinations have shown that a large part of such production contains formal innovations without reassessing, however, the functions of domestic spaces.

In fact, in Brazil as in several Western countries, information and communications technologies - ICT - have altered lifestyles and spawned contemporary tendencies, but the spatial configuration of home interiors is still based on the "social/intimate/services areas" tripartition and compartmentalized room layouts, in keeping with nineteenth-century European models. The forms of controlled dialogues, encouraged by the new equipments offered in the market that facilitate new modes of distance communications, are contributing to the emergence of hitherto unknown sociability patterns and reformulating demands in terms of the design of domestic interiors.

The computerization of domestic everyday life is undoubtedly one of the keys for the analysis of current society's way of life. A growing number of computer equipment infiltrates the lives of people from different social classes. To our amazement, if we pay close attention, the computerization of everyday life is not only a privilege of the rich. The spread of the mobile phone among the economically less-privileged classes is a good example. The history of different media, such as the radio, television and the telephone itself, reasserts the presence of a tendency towards lower costs and resulting spread of electronic equipment, as they become gradually accessible to larger segments of the population. Personal computers are also cheaper and tend to become part of the domestic interior of a growing number of families. Interpersonal communications as well as the access to sources of information are increasingly mediated by the electronic devices that transmit distant information and the relationship between these devices and their users is supported by an increasing amount of interactivity.

Research at Nomads.usp, the Center for Interactive Living Studies, of the University of Sao Paulo, Brazil, has been analyzing the influence of ICT in domestic space and exploring what is being labeled as "hybrid spatialities". Nomads.usp has been attempting to understand, analyze and establish criteria that aim to reappraise the design of today's dwelling spaces, in view of their recent history and the ongoing transformations of households, their

current behavioral trends and the insertion of ICT in domestic spaces and contemporary culture.

Nomads.usp has been producing combined work on habitation and design subjects, connecting them to different areas of knowledge and reviewing continuously the limits of the study itself. From this endeavor results a wider view of the theme, understanding habitation as a both concrete and virtual territory where multiple aspects of the urban inhabitant's daily life take place, where actions and spatialities combine and interact, and communication processes of different types happen. From those processes derives a large diversity of ways of how habitation is configured, stressing its undoubtedly plural character. By the contribution of virtual elements, its concrete spatiality is densified, producing hybrid spatialities ruled by their recent own dynamics. They are actually the raw material for today's Architecture and Design, and take place at the very center of Nomads.usp's research activities. Such work envisages the places where everyday life happens as spaces of continuous communication, mediated or not by remote broadcasting systems.

2. HABITATION AS AN INTERFACE OF COMMUNICATION

Several architects currently have in common a great familiarity with new digital tools, combining in their proposals elements flowing from both the virtual universe and the concrete world, exploring innovative visual, architectural and artistic languages and empirically developing the notion of hybrid spaces. For those architects, computers are not only tools for the presentation of designs, but rather a medium whereby the architectural idea is associated to so-called digital thinking, as defined, among others, by Pierre Lévy [1] and Manuel Castells [2]. The new technologies are now used in various stages of design: from the initial sketches up to the so-called 3D visualization, in the use of electronic scale models and videos and in the execution of the design itself, which frequently requires robotic machines for the production of building elements and for transportation, for example. From the design of those professionals emerges a new habitation that incorporates ICT, either in its functioning, its conception or its relation with virtual spaces, through a fluent exchange of dialogue with different areas that results in a transdisciplinary production of objects, furniture, fashion design, installations and manifestos, as well as music, videos and internet sites.

Within that small group, some have proposed innovative artistic dialogues related to the new paradigms of digital culture, such as Greg Lynn, Kas Oosterhuis, Didier Fiuza Faustino, Stephen Perrella, Lars Spuybroek, Peter Zellner, Neil Denari, as well as the firms of Diller & Scofidio, *Softroom, Asymptote, Future Systems, Kolatan/Mac Donald Studio, IaN+, FOA, dECOï, Electronic Shadows, Ma0/emmeazero*, among others.

Some of them start their creative process directly in a digital environment, while others prefer a mixed process that simultaneously resort to the virtual and the concrete, using modelling software, rapid prototype machines, designs on paper, scale models, videos, etc.. It is clear that most of these professionals consider that the use of computers expands the limits of representation: the ICT aid their formulation of architectural thought and the reasoning in their design, this being its greatest advantage.

Their curriculums reveal that most of them actively participate in the academic world. Almost all are faculty members of universities and some have written texts of the results of their work, participate in lectures and workshops in universities of several countries, engaged in academic research at different levels. Many hold graduate academic degrees, some obtained in departments outside the field of architecture and urbanism, such as philosophy, engineering, physics, fine arts, history and computer sciences. This interdisciplinary approach is not only clearly reflected in several of their projects, but also in the creative process itself. Their curriculums also reveal that they have traveled and lived in various parts of the world and, thus, are open to different cultures. They seem interested in reconstructing the notion of geographic place and, if we prefer, even national territories.

3. INTERFACE-HOUSE, INTERACTIVITY AND HYBRIDISMS

With the introduction of personal computers in domestic environments during the mid-eighties, an enormous change in the production and transmission of messages began to take place: used to be a recipient, the user was turning into a sender of messages by reaching to the possibilities of interaction offered by the equipment. In recent years, a new user of architectural spaces is emerging, learning to communicate with screens, being exposed to sensors and digital cameras. Aided by increasingly complex computer equipment, an increasing number of persons seem to become engaged in the production, edition and transmission of messages, previously done by third parties, capable of being distributed by a simple *blog/flog* or creating potentially commercial complex products, as shown by Couchot [3].

Derrick de Kerckhove [4] believes that this intimacy of people with computers would result in a quasi-biotechnological relation with them, affecting their *conscious and unconscious strategies for processing information*. De Kerckhove thinks that media function as an interface between the language, the body and the world, and that certain media function as *industries of consciousness*, commercially manipulating *not only our attention, but also the content of our thoughts and wishes*.

It is indeed possible that recent forms of relations with time and space found in the midstream of cyberculture enable contemporary human beings

to benefit from a new cognition and a new subjectivity. Cyberspace supports intellectual technologies that augment, reveal and alter numerous human cognitive functions. Pierre Lévy refers to the examples of *memory (data bases, hyperdocuments, all type of digital files), imagination (simulations), perception (digital sensors, telepresence, virtual realities), reasoning (artificial intelligence, modeling complex phenomena).* [1]

In that respect, Couchot observes that the transition from analogical to numerical techniques was accompanied by successive radical ruptures that directly affected our perception of time and space. He concludes by asserting that the new conditions of access to information offered by numerical interactivity privilege an enriched and strongly synesthetic visual experience, in detriment of a sequential, linear one. *The sensorial is increasingly solicited through the various modes of perception and tends to find a certain convergence in a new type of perceptual matrix* [3]. In a society witnessing the possibility of machines beaming and receiving auditive, haptic and proprioceptive information, the body is augmented by new possibilities of action on the machine.

Some designers actively participate in this discussion and propose the beginning of an interaction between the user and its dwelling that attempts to overcome the functionalist slant of so-called residential automation. In several architectural projects, equipment such as TV and computer monitors are eliminated and are replaced by image displays in large surfaces, thus allowing that the walls themselves become interfaces of access to cyberspace. In such cases, architects employ new materials, as for example AMLCD (Active Matrix Liquid Crystal Display) - a liquid-crystal screen capable of readapting itself while creating images inside, while at the same time it can turn into a panel with various degrees of transparency and color. More than just a giant screen, this device can function as an internal or external partition wall, while allowing watching a film or read e-mail messages, or even simulate diferent textures and patterns.

Proposals that incorporate AMLCD are part of a group of experiments that explore the concept of dwelling as an interface, a mediation in itself, and no longer a space with furniture, equipments and, frequently, gadgets. Habitation then becomes a space in constant communication with the world. If communications experienced such profound changes due to the advent of the Internet, domestic space in the digital era also houses new behaviors, including the need for a renewed dialogue with the outside world.

4. SOME READINGS

Some architects are considering the possibility of dwellings capable of reacting to certain stimuli either from the dwellers or from the environment. In their proposals, dwellings would spatially respond to such stimuli and eventually change its physical layout, a kind of improvement and

reinvention of the modern idea of spatial flexibility. System inputs would be provided by the dwellers through sensor readings of temperatures, height, tones of voice and movement, among other events. Many of these architects adopt principles of interactivity from artistic media, where these possibilities of stimuli and responses between the spectator and the work of art have been explored.

In their proposals, research on interactivity in places where people are not only observers questions the definition of user itself: which categories would allow an understanding of this new subject of the architectural oeuvre, who seems capable of providing content that can change its essence, while interacting with it? The innate desire to touch, change, feel and adapt a part of the surrounding world assumes another dimension when mediated by ICT. This is the stimulus portrayed by what is usually called digital culture, which is different from mass culture, where the message is produced by a few and received by many, in a well-known one-way path between the sender and the recipient. More than just providing a two-way flow between sender and recipient, digital culture presupposes possible changes in the source as a result of interactivity with the sender. Instead of a closed system, where information constitutes a set of data generating messages, that process becomes an open system, as conceived by an architect who no longer anticipates possible activities in the designed spaces, dealing instead with the concept of enthropy, as proposed by Wiener [5], through which the system organizes itself.

Telematic technologies are acquiring a sort of omnipresence, radically and almost imperceptibly mixing with the cultural environment by becoming micro (invisible) and becoming esthetic (beautiful), as Lemos [6] suggests, and their limits of action can no longer be discerned. Termed as *augmented reality* by Couchot [3], our physical environment, thus, becomes clotted with sensors, cameras, video projectors and intelligent modules that communicate and are interconnected to serve people. There is a tendency to no longer relate to a computer through a bidimensional graphical interface, but instead execute several tasks in the physical environment enhanced with ICT, providing on demand various creative and informative resources. Therefore, Couchot points out the impossibility of using a digital environment without, at a certain level, promoting the existence of hybrid realities:

> "hybridize between the forms and the types (of images, sounds, texts, gestures, behavior), hybridize between the image, the object and the subject, hybridize between subjects, hybridize inside the subject itself, between the I and the We, hibridize between the author and the recipient, between the I and the other, hybridize between the real and the virtual." [3]

It is from that context, therefore, that several architects have drawn to experiment and innovate and, in some cases, have allowed the dweller to

also become co-responsible of the spatial results. Co-responsible of the product, not of the design, as this is composed precisely by the definition of the rules (by the designer) that will establish a dialogue with the dweller. The terms *flexibility* and *interaction* thus find an even more eloquent use in the conception of dwellings where not only walls and furniture may be moved, but that include active participation by the dweller in the initial and daily layout. The user of this space will probably get used to customize the surrounding layout and interfere in its spatial organization, as an agent of a kind of participatory design process reinvented through the mediation of technology.

The analysis of the architecture emerging from this environment seeks to understand the possible changes in daily domestic life, in the city and in contemporary society. The current tendencies of the relationship between architecture, design and digital technologies clearly predict the exploration, conception and use of interactive worlds in the daily life of a changed household. Its habits, demographic profile, aspirations and world vision have changed. There is no reason why its living space should remain unaltered and stable.

5. TEN URGENT THOUGHTS

5.1. First: A necessary systematization

Only a small group of architects, such as Lars Spuybroek [7], Greg Lynn [8], Kas Oosterhuis [9], Sulan Kolatan [10], Mark Goulthorp [11], Ricardo Scofidio e Elizabeth Diller [12], Lise Anne Couture and Hani Rashid [13], among others, write about their design and production process, formulating the basis for an understanding of the ways ICT can change the creative process in architecture and design. In contrast with this stance, a large majority of creative practitioners who propose hybrid spatialities do not write about their processes or products, do not systematize their understanding, and do not express processes or stances for discussions and dialogue among peers. Certainly, these architects and designers do not base their work only on intuition, but rather are nurtured by bibliographies and previous experiences reported throughout the years by professionals who share them and contribute to the development of new architectural undertakings.

5.2. Second: False flexibility

Frequently, many of these design projects promise flexibility based on the simplistic functionalist perspective of moving walls and objects. The adaptation of physical surroundings to daily activities still seems to be the goal of architects that curiously assert that their designed surroundings are no longer only physical, but hybrid. Theoretically, interactive spaces would be capable of embracing new sociable relationships, awakening creativity, ludic

forms and sensorial experiences in dwellers which will make the domestic environment a laboratory of creative experiences on the basis of these multiple flexible possibilities. Instead, many architects' production is imbued with the reductionist premises of the residential automation market, limiting their own research of new, flexible spatial solutions, unconcerned with broadening the idea of architectural place that the ICT certainly make possible.

5.3. Third: The cyber-envelope and its anachronistic content

Several architects who explore ICT in the spaces they design base their proposals on principles established more than a century ago. As we know, nineteenth-century European academic ideas exaggerated the renascentist relation between form and function, rigidly organizing habitation places with functionally isolated rooms, built in prestigious, sheltered and serviced areas, with circulation hierarchies between masters and servants and apparent signs of such internal organization in building façades. Accepted and generalized by modernist architects of the early twentieth century, such principles were applied to the daily lives of entire populations in various parts of the world by real estate markets that benefit from the most simplistic aspects of the formula: emptied of their original meaning, the dismemberment of structure and partitions and the absence of ornaments currently serve to justifiy production where architecture seems absent.

Several architects who propose a dialogue between architecture and digital culture in their design projects, by designing supposedly interactive buildings with innovative and frequently daring forms, get confused by accepting nineteenth-century principles, without even being apparently aware of it. The result is buildings whose esthetic appearance supposedly originate in a "cyber" imagination, but whose content is revealed as resulting from rigid planning of isolated and programmed spaces. This attitude may be understood as a result of professional training pressed between the modernist academic education of many faculty members and the interest of young architects to produce what is increasingly present in journals that are in step with the concepts of digital culture.

5.4. Fourth: Residential automation, for what?

In its current commercial version, residential automation is limited, in most cases, to the solution of merely functional problems, as opening and closing windows and doors, controlling the intensity of artificial lighting, activating devices through various sensors, giving a priority to the exploitation of the technical potential of systems to the detriment of thoughtful analyses of their real impact on domestic daily lives and interiors. Many equipments and devices currently offered in the market do not reveal a clear relationship with the way of life of their potential users, nor with their aspirations. Evidence of this is the fact that, in view of the high cost of their

implementation and maintenance, purchases of these equipments for residential automation have not experienced growth similar to that of other electronic equipment available in the market.

However, if, on the one hand, their functions appear to be disconnected from the reality of those they intend to serve, on the other, control and integrating systems are in a sufficient stage of development to be used in other applications created with the help of professionals in different areas, not only from the technical area. A dwelling in which those systems are used should be conceived by architects and designers as a dwelling capable of interacting with its dwellers in multiple ways and with stimuli defined by them. It should help to expand their universe through the use of information, itself becoming a communications interface between the physical and the virtual worlds.

5.5. Fifth: An expanded living experience

Among the behavioral changes in the contemporary urban population, triggered by the insertion of ICT in daily lives, is the experience of important aspects of life in the virtual territory of the Internet. Actually, the popular spread of the network and the expansion and diversification of available tools and websites freely available online allow that, even unnoticed, part of the dwelling experience of people is increasingly taking place in virtual space. From the formation of sociability ties to the access to public services, from commercial transactions to the performance of various tasks, a growing number of activities turn this electronic place into a necessary and socially accepted extension of physical spaces.

The development of cyberspace allows participation in groups whose members live in geographically distant cities, rooted in different cultures, speaking in different languages, while building notions of symbolic territorialities among them. Popularly known as communities, these associations formed through the telematic networks reveal that the ICT cannot only perform the role commonly attributed to them - vectors of alienation and social disintegration, but also, on the contrary, foster the sharing of ideas, sentiments of solidarity and socially cohesive ties. This condition leads us to perceive the emergence of an enlarged living experience, as the classical frontiers of the psychic subject are expanded, as living in virtual places now accompanies living in clothes, buildings and cities. Habitation designers must urgently take into account such an expanded living experience and its implications in daily life.

5.6. Sixth: What we say in congresses

An apparently growing number of academic congresses in various parts of the planet has brought together researchers and scholars in areas related to the design of space and objects, with the goal of expanding knowledge about the relationships between those areas and ICT through academic

exchanges. Although the topics usually announce concerns closely linked to the creation and implementation of innovative processes, one leaves most of these congresses with the impression that the relationship between architecture, design and ICT is mainly a technical issue (e.g., the use of software especially developed for certain tasks), a financial issue (e.g., the capacity of teaching and research institutions to acquire expensive hardware and integrating systems) or a productive issue (e.g., the proper combination of software and equipments capable of contributing to increases in productivity in offices, construction firms and industries).

Very seldom are the moments when the essence of architecture is examined in the light of the influence of the new technologies, or even when strategies for the inclusion of those considerations in the teaching of architecture are the main subject of discussion. Apparently, that part of the academic world is not willing to recognize its responsibility in the systematization of experiences and proposals presented by architects and designers around the world who, in view of the contingencies of their professional practice, do not dispose of the time or the funds to develop research on the subject. Thus, the gap remains and just becomes deeper.

5.7. Seventh: Really free software

An examination of the proposals of those architects makes us aware of the need of computer software specifically developed for different stages of the design project. The financial obstacles faced by architectural firms around the world to cover the costs of software licenses, generally protected by laws that insure a monopoly of the big software houses, is well known. Critics of these practices argue, with reason, that they could be defeated by strengthening the role of the international community of free software developers, formed by unpaid technical personnel moved by convictions and ideals.

However, a great distance separates the small architectural and design firm, which generally engages more frequently in experiments and research on new architectural possibilities, and developers under the pressure of demands and not always interested in the problems presented to them. Technical issues also require a specific technical knowledge that architects and designers do not have. Although highly desirable, the freedom of free software in this area is still very relative.

5.8. Eighth: The search for a housing industry

In many parts of the world, the so-called construction industry, and specially the housing industry, is backward and archaic in terms of the numerous technological innovations of the last decades. It is a branch of the economy whose practices are strongly rooted in the past, in contrast with others, such as the automobile industry. In fact, during the last decades, cars have become lighter, cheaper, faster, diversified in terms of fuel sources and

increasingly customized by the consumer, while it acknowledges new demands and adapts to new and unexpected situations, emphasizing that design must follow closely industrial production.

In the case of architecture, various practitioners seek uncommon forms in the area of surface modeling, using sophisticated computer software, but encounter obstacles in searching for building processes capable of executing the construction of designed buildings. File-to-factory programs bring those actions closer by turning them into a single stage. The designer can thereby proceed from the initial sketches to the executive design within the same computer platform, using it to inform the machines that will industrially produce the final building components. However, even though they help forms conception to be released from the fetters of archaic building practices, file-to-factory systems require the presence of a mature and developed industrial complex and skilled labor, two conditions that are still rarely found in most countries. Partnerships between industry, universities and architecture offices may benefit everyone, to the extent that they stand on their own feet to make their proposals feasible. But it is equally essential that these ideas be relevant to the local and regional realities, to effectively expand their potential, and that they also engage in dialogue with similar international concerns and developments, in order to avoid isolation and contribute to the sharing of knowledge.

5.9. Ninth: Reconstructing a sensorial system

The human body and subjectivity are implicitly questioned in all the debates, design proposals and reflections that attempt to relate ICT and behavior. If the human being that traverse virtual worlds have, by definition, a corporal condition, and this turns any human-virtual environments interaction a hybrid reality, the multi-directional mode of information exchange, a marked characteristic of the digital era, raises the question of its subjectivity. The subject is no longer in a stable time and place, from where he weighs his thoughts, but rather multiplied, disperse and in constant reassessment of its identity.

This body, which is the greatest concern of architecture and design, is physically mixed with ICT, constantly corrected and expanded with all kinds of prostheses that aid human deficiencies, potentiate the senses and change its relationship with physical space and, finally, with the world. Through the use of telematic networks, an attempt is made to equip individuals with autonomy in their relation with physical spaces. From the spread of wireless Internet connection zones in urban centers to the development of equipment for convergence in a single portable object, new behaviors remind us that we are encountering an increase in the effectiveness of distance communications associated to mobility and an exacerbation of individualities, unknown until recently.

Through the growing miniaturization of components, a huge integration between organic tissue and machines may be expected in the near future, as

Lemos [6] believes. Care should be taken in the spatial interpretation of the cravings of these new corporal conditions, but it is also urgent that architects and designers accept mobile communications at a corporal scale as one of the important events of our time which will have an enormous influence on their fields of action.

5.10. Tenth: Updating the education of architects

It is never too much to repeat that the program content of the courses in architecture and design requires a complete and immediate revamping. In the digital era, as defined by Lévy [1] and Couchot [3], the graduation of architects and designers must take into account the numerous changes in contemporary design practices that increasingly give priority to computer processes in all the stages. It is necessary that the scope of courses stop considering the computer as just a tool of design. It is also necessary to encourage the practice of interdisciplinary cooperation through closer contacts with courses in production engineering, construction materials and computer sciences, for example, enabling future architects to establish an informed dialogue with different fields of knowledge that are currently part of architectural processes.

In addition, a revision is equally urgent of the design references of the faculty, generally restricted to examples of architects whose production is viewed through the classical categories of this discipline, such as volumetric proportions, the relationship between transparency and opacity, or main visual axes. For an interactive architecture, adaptive to different, even though programmed, stimuli, new analytical categories are certainly necessary in order to inform approaches to design according to their potential.

Finally, it is absolutely necessary to understand that, after the early stages of computerization of the planet, calling a discipline "Computation for Architecture" and to restrict its practice to a room called "Computer Laboratory" is, at best, a lack of perception of the passage of time. Already extended to the different sub-areas of architecture and design, the various possibilities of the use of computers permit a wide range of applications that include collaborative design processes by Internet and virtual design studios; the production of Internet content and its use in the process of production and distribution of knowledge; the expansion of design references; the possibility of synchronous contact with geographically distant specialists and, furthermore, the understanding of so-called digital culture and its consequences in these areas; the possible contributions of these professionals in the process of minimizing digital divide and its repercussion in the physical space of socially vulnerable communities; the changes emerging in the production process of objects, buildings and their components; the increase effectiveness of wearable pieces, objects and furniture with integrated media, among numerous others.

6. WHAT THEN?

As explained by John Locke in the 17th century, the way we perceive physical objects in our environment since our childhood can strongly influence the construction of our vision of the world. Adding interaction through digital media to objects seems to open a wide horizon of possibilities in the field of personal experiences. Architects and designers have today an important task: to admit that the very definition of their knowledge fields is changing rapidly, and mostly because of the computerization of their clients' everyday lives. Architects and designers must take responsibility in the ongoing process of revision of architecture and design, which risks to be done without them. Or - worse - in spite of them.

Acknowledgements

References

1. Lévy, P., *Cibercultura*, 34, Sao Paulo, 1999.

2. Castells, M., *A Galáxia da Internet: Reflexões sobre a internet, os negócios e a sociedade*, Jorge Zahar, Rio de Janeiro, 2003.

3. Couchot, E., *A tecnologia na arte: da fotografia à realidade virtual*, UFRGS, Porto Alegre, 2003.

4. Kerckhove, D., A arquitetura da inteligência: interfaces do corpo, da mente e do mundo, in: Domingues, D. org., *Arte e vida no século XXI*, Editora Unesp, Sao Paulo, 2003.

5. Wiener, N. *Cibernética e sociedade: o uso humano dos seres humanos*. Cultrix, São Paulo, 1968.

6. Lemos, A. *Cibercultura: tecnologia e vida social na cultura contemporânea*, Sulina, Porto Alegre, 2004.

7. Spuybroek, L. *Nox: Machining Architecture*. New York: Thames & Hudson, 2004.

8. Lynn, G. *Animate Form*. New York: Princeton Architectural Press, 1999.

9. Oosterhuis, K. *Hyperbodies: Towards an E-motive architecture*. Basel: Birkhäuser, 2003.

10. Kolatan, S. *Generative Convergences*. In Architecture in the Digital Age, organized by KOLAVERIC, B. New York: Taylor & Francis, 2003

11. Gouthorpe, M. *Scott points: Exploring Principles of Digital Creativity*. In Architecture in the Digital Age, organized by Kolaveric, B. New York: Taylor & Francis, 2003.

12. Diller, E., Scofidio, R. *Blur: The Making of Nothing*. New York: Harry N. Abrams, 2002.

13. Couture, L., Rashid, H. *Asymptote: Flux. London*: Phaidon Press, 2002.

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