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Reallocating the problem of architecture: From projective processes to language revision

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Abstract

In this article we aim to analyze changes in projective processes in architecture, linked with the mediation of the practice through digital drawing. The analysis takes into account both specific features of new tools and the way they influence use, ideas and language. The text is split into three parts. In the first one, "Use and criticize", we show how computer has been used in projective process since the appearance of programs such as CAD, highlighting the features of new tools that have shown itselves, at the same time, useful and innovative for architecture, as well as object of criticism. In the second part, "From projective process to use: collaborative and interactive actions", we outline changes in projective process itself and in ideas on how architecture should be like, including the relationship between architecture and users; we point collaboration levels that are estimated and required by new creation tools, and also by the new relationship established between art and knowledge. Finally, in the third part, "Processes and ideas", we take our final considerations through general ideas about these changes.

Keywords: architecture practice; digital drawing; collaboration project; creative processes.

Use and criticize

The introduction of computer dates back to the second half of XX century; but, it is only in the second quarter of that century, with the occurrence of personal computer, that its use has spread in architecture offices. From the mid-nineteen eighties to the mid-nineteen nineties it was limited to computational software like CAD[1] and to constructive drawings and 3D views execution. Later, other software were introduced[2], although the CAD-like software use is the most common. As Schmitt wrote about this period:

> 'At the moment, the computer is mainly used to translate and improve existing ways of thinking, and to build faster and more efficiently. Its potential as an external knowledge base for architecture has not been recognized' (Schmitt, 1999, p.11).

The easiness reached on building 3D digital models has stimulated criticisms to the consequences of this practice to the language. Some saw in this a stimulus to the retaking of the emphasis in the role of projective process control perspective, which seemed to lead to "a backward step" in the projecting ways, to the retaking of ~~the~~ ways started with the discovery of the artificial perspective in the Italian Renaissance and which predominated until the XIX century. According to Steele (2001, p.36), among some of the studies developed in the 1990s about the role of the perspective in the visualization and the realization of the abstract space is "Architectural Representation and the Perspective Hinge" by Alberto Pérez-Gomez and Louise Pelletier, which investigates since the perspective of "natural occurrence" until its artificial rebuilding from Renaissance and identifies, associated to this kind of representation, a potential danger in the digital drawing which would be consisted of:

> '[…] the culmination of the objective mentality of modernity, and, therefore, innately "*perspectivescal*". Indeed, it assumes the interiorization of the invisible articulation which provided perspective while operating in the axonometric of the XIX century; aspect which, in the face of the computer technology, presents itself as more natural, due to the fact that it is a very powerful tool to restrain and control. The tyranny of the computer-aided drawing and its graphic systems can result as enormous, for its essentially mathematical basis is unbreakable, rigidly establishes a homogenous space and is substantially uncapable of combining diverse references' (Pérez-Gomez and Pelletier, *apud* Steele, 2001, p.36, our translation).

This text, observed Steele (2001, p.36, our translation), is prior to some more recent experiments, particularly with the "fluidity of some of the digital avant-garde expressions" and despite of this, Pérez-Gomes and Pelletier had already indicated a way for using the

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[1] CAAD (Computer-Aided Architectural Design), whose more generic term is CAD (Computer-Aided Design or Computer-Aided Drafting), designates here a set of computer software whose marketing began in the 1980s with the advent of personal computer (Schmitt, 1999, p.7).

[2] Steele (2001, p.72) provides a wide list with some of many software packages that were available for architect when the text was published and, since then, this list has varied greatly.

technological potential for the practice of criticism. For that, to overcome the excessive confidence in the tridimensional spatial representations ~~it~~ is considered a crucial condition.

Along with that, the use of software like CAD for creation was also target of criticisms. According to Steele, John Frazer considered they were more prepared for repetitive tasks and for standard configurations, being unable to produce new formulas, in a way that:

> 'When unconsciously used, they tend to dull the critical abilities, which, in "normal" circumstances would allow the designer observe, already from the first steps of the process, that he had not properly *conceived* the concept. These types of software distort the drawing process in order to make it adaptable for its systemic limitations; forcing the bound to a final result and guiding to the resolution of a problem, on a feedback process, to their more easily quantifiable aspects' (Steele, 2001, p.36, our translation).

Consonant with the critic, Frazer believes that new architectonic drawing processes are unbinding their own foundations and defend a challenging way of proceeding by the computer rather than reinforcing it. The need of a critical review on the projecting ways has characterized itself as a kind of research ideal limelight about the relations between the architecture practice and the computers and their software. But, even before this ideal became conscious for everybody, changes in the way of working, as well as the results, become evident.

Steele (2001, p.89, our translation) points that those changes were not always planned by the architect and appear even when the idea was merely to transport to a pre-established idea, as in the Hollywood-Orange project, of the RoTo Architects company, which did not introduce *Power CAD* and *Form-Z* software-like products in the project "until the client's demands were properly organized by conventional diagrams or conceptual sketches". On the transference from the conceptual sketches to the digital environment, however, the context information became better and better, and as Steele opines, although the company believes in an aseptically use of the digital tool in the context demarcation, changes could be perceived in the series of schematic mock ups, which seems to denounce the importance of the medium used to reset the form along the process.

Nonetheless, under certain aspects, a digital drawing does not differ greatly from a traditionally made drawing, it soon was realized that not only enables, but also offers the creative stimuli for the project development. It was also noticed that, even in the onward phases of the project, the electronic models allow easy corrections or aimed intentional or random alterations. These perceptions led to the acknowledgement that the placing of the completely independent creation process from its environment is very difficult to be pinpointed, and thus, the tool is not neutral.

The architects who place themselves closer to the task of critically exploring the digital environment within the projective practice began to search in the new work environment

exactly what can be offered differently from the clipboard. The aptitude of the computer to reproduce the clipboard practices faster and more precisely leaves to be seen as its main value and hope is being deposited in the digital environment potentialities to transpose the usual drawing ways, of seeing and perceiving architecture. However, these are unknown, and in the discovering process, it is not always possible to know how to proceed. Paraphrasing Galofaro (1999, p.39), in this moment, architects still don't know, or don't know enough how creativity for the project will develop in the new context of the modeling universe.

When facing uncertainty, the procedure is partly based on what we already know, and partly on intuition. And after the first experiments come the first generalizations. In Pongratz and Perbellini (2000), a new generation of architects are mentioned who develope their research "with" and "about" the use of digital technologies in architecture, of whom have in common the fact that they were introduced in the profession when the computer had already been used as work tool; therefore, they "were computer born architects". Pongratz and Perbellini (2000), organized the text according to two main tendencies for architecture: the De-formation and the In-formation[3]. The de-formation focuses directly on research which experiments with formal variations mediated by the use of digital drawing in architecture, involving the flexibility of the digital environment for space generation. On the other hand, the In-formation tendency, gathers the research which will focus the relationship of architecture and the "digital life"[4], and/or the "culture of information".

Since the turn of the XX century to the XXI, both the digital tools changed considerably as the designers understand how the digital tools may work, or how they want them to work. According to this, the creation, representation and interpretation processes of what is produced changes.

From projective process to use: collaborative and interactive actions

According to Schmitt (1999, p.13), the biggest criticism to the use of the computer is that which sees it as an instrument that substitutes human work. He analyses the criticism to architecture offices' computerization was less eminent than the one about the introduction of the computer in the central area of architecture – the design process (1999, p.39). This criticism, says him, will predominate until we are able to give the computer its proper place in society.

In the field of experimentation the architects soon understood they should concentrate in the idea generation which feeds the machines and in the process control by which this idea

[3] According to Antonio Saggio (Pongratz and Perbellini, 2000, p.7), these denominations follow and indication of Jeffrey Kipnis, 1993.

[4] Reference to the title of the work of Nicholas Negroponte (2002).

evolves. Once they are able to find ways to endow the architectonic space with originality and control the process, they can even "live with" the machine and, more than this, they can allow that part of the process be automated, enjoy the benefits of the interaction between the human mind and the machine calculation capacity. In other words, they can realize, despite that computers are not able to control the process, nor reason creatively[5], they have great power to potentiate the calculus ability and the drawing variation, given its mathematical basis, in such way that this interaction between man and computer results in a kind of "hybrid mind", where the high calculation capacity stimulates the creative imagination and increases its resources.

When using computers, we commonly enjoy interfaces, which translate the language of the machines to our visual languages and others already known. This induces the perception that, although we use a different machine, we can still keep on thinking and acting in the same way. Nonetheless these machines are hybrid ones: externally, they are monitors and make elements of the language available were already used in creative processes prior to their existence, internally, they are numerical processors and work with the machine language, alien to most people.

However, it happens that the use of the computer limited to the available interfaces was understood, in certain areas, as submissive to rules which limit creation. According to Machado (2002), the art mediated by computers proposes the use of digital machines in artistic processes should deviate it from its programmed productivity. In the path of reinventing the mediums, it is also worth to explore the different ways rather than the usual employment of the functions of the available software, regarding the association between artists and professionals with knowledge of the machine or, even when, the artist learns some languages, in order to avoid being at the mercy of the commercial software.

In a generalization of this ideal of exploring creative potentialities beyond the ones offered by the available software, or not to submit to the "ready-made", artists, designers, and architects decided to take action on the machine languages. Today, in even more frequent cases, it is required that they can deal with two sides: the machine languages and the culture languages. In these fields, it happens something similar to what had been observed by Steve Johnson with the interface design: "There is no artist who works with interface communication mediums who is not, somehow, an engineer" (Johnson, 2001, p.11, our translation).

The two languages are always present and complement each other in the computer, where, to every apparent analogical interface corresponds a digital code. Paraphrasing Johnson (2001, p.12), the planners should deal as much with the device possibilities as to the bounds with the

[5] About this, reader may consul an article of W. Nöth, that investigates the relation between men and machines, problematizing the question of creative process.

ancien régime of the analogical culture; as much the technology in its raw state as within the elaborations developed by art.

Traditionally in architecture history, when experimenting with new ways of proceeding, the collaboration between art and technique is required and rediscovered. Something like this was acknowledged and proposed by the founders of the Bauhaus school (1919-1933) in Germany, which was born from the idea of cooperation between art and craftsmanship, later elaborated as cooperation between art and industry for the production of objects of use. In the Bauhaus new architecture text compromised with the review of the practice of architecture, Gropius (1977, p.118) explains from the principle that the architect should be inspired by the organic formation processes of nature, and one should be as much of an artist as a technician.

Parallel and related to the complementarity of these artists and planners' involvement demand with both the technological and artistic issues, was observed that when so ever, the collaboration among individuals is required and, and oftentimes among individuals, who potentiate the dialogues among art, science and technology. The perception that the architect work should have as its basis a team work is not new, either: in Gropius (1977, p.95) text, we find the following passage: "Students should be educated for team work […]. This will prepare them for the vital function of one day leading an army of collaborators that take part in the idealization and execution of a building project".

A well observed phenomenon in the computer-mediated design processes is the knowledge transference from one area to another. The multidisciplinary teams have more power to deal with ideas coming from different areas and potentiate the collaboration among them. Such collaborations occur, among others, through the use in projects of models originated from, for instance, physical, biological and psychological sciences, among others.

In broad sense, and in all ages, men generate models to represent their knowledge, being of reality phenomena, being of merely envisaged situations or the appearance and the way things work. Nowadays, once inserted in the digital environment, and from the numerical basis of computers, these ones are endowed with all sorts of possible variations; they can be used to simulate situations from the world where they come from and, on the other hand, to simulate variations of this world. Thanks to transcodification processes, these models can be used beyond the extent of their origin areas and applied without the necessary correspondence to the reality of the object-phenomenon of the model. Some of these - predominantly the functional ones, have already achieved such degree of generality in the applications in different areas that can be said of transdisciplinary importance, such as the genetic and evolutive models.

Model building is inherent to our knowledge process and several areas build models on phenomena which are observed under the particular optics of each one. Great importance is placed on the role of the models in the use of the digital environment. According to Ervin

(2001), both the realistic visualization as the abstraction are required in the models and the level of one or another depends on the type of model one is working with. Furthermore, according to this author, besides the levels of abstraction, the main theme of the discussion on digital modeling has been the distinction between "how it looks" and "how it performs"; in some cases appearance is enough for the objectives, in others, dynamics is required. Schmitt (1999, p.21) notes that, due to the capacity of abstraction of the models, they are "a much-needed support for complex spatiality design because such complex compositions can hardly be entirely recognized with other means".

Science models and others, associated with the morphological deformations, are used, for instance, by Peter Eisenman. In his project for the *Library in Place des Nations*, in Geneva, the inspiration comes from a human memory operation model, which offers for the project a diagrammatic structure that simulates the neurological activity operation. Diagrams of the cerebral functions with different frequencies among them (of synaptic activity, below the synaptic umbra and memory consolidation) are overlaid ones among others, and so they are on a local diagram, as part of the architectonic form process generation (Galofaro, 1999).

The evolution of an idea on the processes utilized by Eisenman, such as the ones described by Galofaro (1999), highlights both the semiotic procedure of generation, analysis conveyance of an idea by the planner, and this collaborative relationship, machines and models coming from various sources, besides the traditional freehand drawing. In similar processes as the ones described above, Eisennman makes use of models as a way to achieve shapes which breakup with the perceptive references built by the architectonic tradition, through various references (diagrams), which are mixed, generating something which is "in between".

Another type of collaboration coming from external areas to architecture, more precisely from evolutive models, is reported by Steele about the program developed by John Frazer in the *Architectural Association* of London:

> 'Frazer has been involved with the search of a genetic algorithm which enables the computer to simulate natural evolution, creating virtual architectonic models that can answer distinctively according to the surroundings they are in' (Steele, 2001, p.38, our translation).

Due to criticisms to software like CAD, instead of reconfiguring one of these pre-existent programs, Frazer decided to build a personalized computer programmed to allow simulate biological systems. The genetic models, according to Frazer, "are the rules to generate shapes, more than the shapes themselves" (*apud* Steele, 2001, p.38, our translation); he assumes a "catalyser" architect and an architecture which becomes "artificial, subjected as in the natural world, to the principles of morphogenetic actions, genetic codification, copy and selection" (Frazer *apud* Steele, 2001, p.38, our translation).

Karl Chu's researches (2000) can also be found in this domain; they are directed to the use of cellular automata and genetic algorithms as design for spaces which work as dynamic behavior

systems, with infinite potential of self-organization and self-modification. In ideal terms they are committed to a metaphysical vision of mathematical logic, and by extension, of the computable, for which the machine is seen as embodying the "spirit of universal information", able to generate the artificial life spatial shapes that should put the problem of the architectonic space back for us.

The aims of the evolutive models are complementary to the ones which value interactivity today: as living organisms evolve in relation to their environments, the objects of today are also conceived as having to develop similar ability. Among the architecture environment elements are the weather conditions, thus some buildings conceived in a way to change interactively with them; but the main target of the changes in this sense is a step up in the degree of interaction between the buildings and the man.

The interactive relations between building and man are explored by Greg Lynn, who conceives architecture as able to cope with the cultural and social contemporary differences, as well as the contradictions and incoherences of the buildings and the context, using as strategy a "smoothing" of these forces, with the objective of incorporating those differences (Pongratz and Perbellini, 2000, p.39). These variations can come from the context. External conditions such as pedestrian movements, environmental conditions (wind, sun), are also able to influence the design. His design method combines the fusion process of external influence with the prototype internal malleability.

In the strategies used for the Embryological House design, for instance, Lynn uses the resources developed by the topology branch of mathematics and the speed which computers produce morphological modifications to generate different types of deformation caused by diverse agents and controlled by sets of points related to a surfaces net, in such way that, small individual variations influence the overall shape, without losing continuity (Pongratz and Perbellini, 2000).

Besides, the Embryological House is a project committed to a proposal of domestic space which associates the standardization idea with a variable environment according to the users' needs, produced industrially and based on a project which is not defined finished, but as a series of elements that can be multi combined, in many ways: the user's way, not one, but several variations of the Embryological House can be generated inside the potentiality limit of the project.

The idea of standardization, variation and user's participation are not totally new. Fábio Duarte refers to the fact that the ideas published in the first issue of the Archigram magazine drew attention to "[...] emergence of products 'do it yourself' which soon came about proposing transformations in the people's own dwelling [...]" (1999, p.97, our translation). Still according to this author, these ideas were in continuity with former discussions, with Le Corbusier and Jean Prouve, as well as Buckminster Fuller and the Japanese metabolists.

A design procedure that occupies the designers today and is related to the use of models and the possibilities of the digital environment is the parametric design. It is a design process that requires the designer to think about their design issues, searching for patterns that, then, will be considered in the building of the models themselves. Such models are generical and can be used (adapted) to solve specific problems which are identified as correlated to the models (Woodbury, 2010). Based on the models, at each problem the designer is then able to explore a set of solutions in a very fast way.

Here, it is also required the designer to act upon the machine language and not merely on the culture language. According to Woodbury (2010), the one who uses parametric design is an amateur programmer. Associated to it, whether it is required to think more about behavior than on appearance, although concerns about appearance and functioning are never isolated from each other. Any change in one part modifies the whole. And from any change in the functioning results in a change of the appearance, everything is in continuity.

Equivalently, the designer's mind and the machine capacity should be in relation of continuity and acting together. In case of parametric models, for instance, it is up to the designer conceive, generate the models and decide on how to apply, it is up to the machine maintain the models and calculate the potentially unlimited problem-solving possibilities; it is up to the designers establish parameters to limit and select them, since it would not be possible to test all the possibilities to achieve a solution. All along the process the previously known culture references and the considerations about appearance, besides prior knowledge and a certain degree of intuition should be required.

Processes and ideas

Not all the ideas to which the new design processes are linked may be put as only caused by the digital environment. In some cases, what this environment makes possible is to give a different solution or new uses for certain ideas which are not so new. The use we make of the model notion is an example of this; through this idea one can talk about new ways to act and seem, about new generalizations and their influence on the things in particular. The idea of having control over parts, and at the same time, keeping relations of continuity with the whole receives new interpretation in design. The interactive relations between us and our environment, among the things in the world were not always like the way they are now, the center of attention for the solutions of the most diverse problems. This and other ideas are part of our critical review about our way of being in the world and "draw" this same world.

In a certain sense, the architecture of our time is placed in a new condition of "rebirth", of "being modern". As in former historical times, it performs a revision on its practice, and does so by valuing a remarkably experimental work, once again establishing a broad dialogue with

culture, especially art and science. The importance of the digital drawing to our time sends us to the perspective for the Renascence; of the digital machines to the mechanical machines further to the modernism. The Renascence artists' attitude to integrate themselves with the humanist culture is associated to the modern attitude of adjusting to the industrialization era; and both are associated to the contemporary attitude of adjusting to the digital information era. As well as the significance of the perspective and the architecture industry are marked by the period of their births, the significance of the digital drawing tends to be marked by our time.

The resources of numerical representation, modularity, automation, variability, transcodification, random access, morphisms and simulations will reshape the creation environment for architecture. It is seduced by the possibilities of complex shape building, of deformation based on the topological space, of converting several types of information in digital information (explore their variations, mixtures, twistings); all of which associated to control forms (even though not absolute, and in many cases, uncertain).

The digital environment, in the extent in which it is explored, leads to the bending of conventional rules for generating spaces through relations of proportion and balance between lines, shapes and volumes. The proportion and balance measures which characterize the spaces mediated by these processes arise more from intuition than from the knowledge of the rules, more of the consequences of the conceptually established parameters rather than the visual control of the drawing. In the spaces which result from these new processes, there is also the separation between interior and exterior which becomes hazier, in name of a more continuous space. Architecture breaks not only with the dissociation between interior and exterior (which characterizes a great deal of historical architecture) but also with the articulation between interior and exterior ruled by function (modernism).

For the new dimensions the digital environment gains, the planner is not only not limited by the "persperctivescal"[6] constructions and under a influence of the supposed power of software to restrict and control as, instead of (as supposed) be directed to solve the problems. According to the software's "systemic limitations", it is placed immersed in an environment which is more presented as a possibility of varied strategies equally possible to generate spaces rather than a director of the way in which one leads the projective project.

For Novak (1996) the virtual environment carries the potentialities of an alternate architecture poetics, for which is not enough, for instance, the mere description of the objects and surfaces. It is concluded that this requires the design of animation and interactivity mechanisms and algorithms for every act of architecture. Such as contemporary art is proposing, this architecture is seen by the author as having an opportunity of breaking up with its dichotomies

[6] Reference to the term used by Perez-Gomez and Pelletier (apud STEELE, 2001, p. 36), to describe a relationship of similarity between mental processes governing of the perspective construction and governing the certain projects development (influenced by the perspective); including, objectivity in respect of the whole with a single point of view.

with science, since these transformations lead architecture to re-establish its relationship with our knowledge advancement.

Art has valued the creation processes more than the finished work and this has been interpreted in various ways. Something equivalent happens to architecture: paraphrasing Galofaro, the "value of architectural object is not the end result, but the itinerary by which it has been generated" (1999, p.47). Architecture, such as art today, finds through the exercise of the new projective processes ways to stretch the idea of the process beyond the projecting act, as it interprets the interactive phenomenon and valuing the collaboration in different levels: between man and machine, the things and their contexts, between knowledges, between planners and, also, between object and user, object and context.

Novak (1996) suggests that mobility should be a dominant characteristic of modern architecture, whose environments, besides the users, should have a mutant nature, as if they were characters with their own movement. It is valued in interactive art and architecture exactly the aperture for variation, not only by the artist/planner's part, (isolated or in collaboration with others), but also by the viewer/users. In this sense, the creative process and the result of the creation are less the culmination of a mentality, but more the culmination of the mentalities of the subjects who create it; the processes and the spaces resulting from them are less determined and more subjected to the logic of the possible.

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