Avant-garde techniques in contemporary design

New tools or new languages for the project?

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Abstract. In this paper it is argued that new digital techniques join together several skills; from CAD (Computer Aided Design), to CAE (Computer Aided Engineering), till CAM (Computer Aided Manufacturing). That assemblage of methods involves a change in the way to achieve a project. The idea comes out as result of connected actions within software-hardware tools. According to this analysis the implementation of gradients (e.g. movement, time, direction) have a significant role in shaping a multi-disciplinary approach to design; supported by simulation as way to verify and control solutions. Such innovations can settle a new way to design, in terms of vocabulary, grammar and syntax? How can we develop useful tools to express the "new visible" of avant-garde techniques?

Keywords. Avant-garde techniques, simulation, complexity, new visible, immaterial, parametric design.

1. Avant-garde techniques

Technology has always had a big role in transformation of methods through which we project and, by extension, about meanings attributes to design. Also if technical progress has frequently been in contradiction to emerging idea of architecture, in the last 40 years the widespread diffusion of digital instruments, has opened new challenges facing the designers. Furthermore, the revolution of "conceptual" sense, ascribed to meanings and modus operandi of design, moves in step with a free-form modelling of surfaces. Both this evolutions are joined to establish a vocabulary of new visible. Some topics of this vocabulary need to be theorized, in a smart and analytical way.

The first topic concern the propagation of scientific knowledge. Luigi Moretti, an eminent Italian architect, affirmed: "...we can conceive design disciplines as not influenced from an arbitrary and empirical accademia but, through appropriate design tools, able to formulate logical chains apt to individualize architectural forms and a unitary connection; in dependence by a complex of various functions that they have to give solution..." (Luigi Moretti, 1972). Drawing inspiration from that concept it should set up a knowledge bricolage-based (as affirm Giuseppe O. Longo), where "...design is local, contingent, able to re-adapt to new circumstances ensuing from the use of improvised methods and instruments..." (Giuseppe O. Longo, 2001). A sort of unusual and creative employment of avant-garde techniques.

The second topic involve the perception of new visible: the concept of permeable space. Permeable is not only a physical quality; with this term, we intend complex, indeterminate, efficient in the use of resources. A series of immaterial quality are referred to the field of sensitive. Environment loses his rigidity and transforms itself incessantly. Solicitations are multiplied, borders are uncertain and vanished. In this way a character of place is mainly entrusted to feelings.
Besides permeable space join elements of movement, density and modification. Permeable becomes an expressive topic more than a state of matter.

Now we arrive at the third topic, that of the animate language. Significance of animate language, in this analysis, should be considered from the core of "mediatic jungle". All expressive languages, and among others also the project, are strongly influenced from digital technologies. Animate language is based on a conceptual expansion of design discipline, in an evolutionary sense. Design tools, integrated in a dynamic vision of relationship between instrument and designer, overcome traditional ordering device and neutral "cartesian" space to produce a more advanced system of relations. How might such topics (almost theoretical) support technical responses we can see in a practical application, as associative CAD.

1.1 Parametric and associative design

Parametric CAD allows designers to embed, in the project, a wide typology of information, during the process of drawing. Specifically, developing a project it become similar to built a database of "actions". That actions, stored in the historical "path finder" of project, can be easily handled and modified. The feature to connect several information, thereby allowing the reworking and revision of design process, makes parametric CAD different from traditional one. However, the original domain from which originates parametric CAD is that of industrial design (i.e. mechanical design). Needless to say that a transposition of established techniques in a new area (e.g. from industrial design to architecture), requires quite a few time and efforts. Also because techniques always demands an appropriate system of action.

Anyhow the more important consequence of this development seems to be an architectural design (in general a design), based upon simulation approach rather than geometric definition of space. In few words we can point out three references:

• modification of the shape of space through topological principles, embedded in design strategy;
• inclusion, in the project, of a more and more scientific level of control;
• vivid descriptions of immaterial part of reality, in comparison with that material one.

In practice that progress in software technology enable to experiment and work, as designer, through a simulation set. So simulation become one of the most powerful design tools.

2. Simulation

If simulation may be a new kind of science could be a question that not concern us directly. However production of technological artifacts and techniques of foresight must deals with new management praxis. Also in relation to achieve a better result in terms of quality. In this meaning someone affirm that simulation is a new kind of science. How does it work? Simulation creates a parallel reality, similar to "true" reality. If two realities corresponds each other there is a validation of theory on which the simulation has been created. Today, near theories and experiments, a system based on simulation can help us to formulate hypothesis. All those possibilities originate from the incorporation of new technologies in the core of scientific methods. This new way to consider the reality where we live avoid false dichotomy between traditional methods and new technologies.

Furthermore we consider that simulation already becoming a territory of exploration for design techniques. We can mean simulation in a lot of different ways; by involving explorations through form, materiality and density. It may be a development of the power of analysis, about the
above, could be an extension of potentials in psychology of creativity. We look to extending such speculations to considering the effects of this method in the field of design. Bringing these considerations in a more wide context and discussing if simulation, as science, would be an useful tool in planning.

2.1 Simulation and science of complexity

It is useful underline as the simulation get up from a new scientific approach, that of science of complexity. In that approach the main tool to know is, probably, simulation. Today scientific tools are distinct from what there were 30 or 40 years ago. We can see that in several advanced scientific research as the mapping of human genome. However, the growing recognition of multiple characteristics of reality, involve a change of perspective. From a practical requirement to simplify and reduce, now the trends are toward complexity. The reductionist approach happens through a bottom-up process, from particular to general. Yet, when in a system prevails a characteristic of organization (i.e. self-organization, so called "critical self-organise state"), instead of a supremacy of singleness characteristic of each component, we are in presence of complexity. The science of complexity uses comprehension processes of phenomena that we can define "top-down". When complex structures overcome a certain threshold, they have jumps in the equilibrium of the system. After all, the world of the "complex" organizes itself in distinct way from many simple worlds. In that place stability is not a result of two identical and contrary balancing forces. In a complex systems equilibrium can be a dynamic state (i.e. steady state), even "critical", but yet constant.

The experience of complexity imply, to the level of cognitive and visual properties of design, a new definition of environment, allowed by new technologies, what we have called new visible.

The new visible is a concept that pertain directly to the way which we always have thought our habitat. It jump out from the sea of “old conventions”, by cohabiting with them; combining information, space and behaviour. It is only a partial, not organized and fragmentary grasp of reality; but today it is fundamental to understand our own environment. Catching a more careful look, we can understand how the new visible involve a reorganization of planning activity and, more generally, a different perception of intellectual work. Mainly more implicated in social and communicative facets of life.

However there are many obstacles to his diffusion; one of the causes can be a complex development of strategies which translates that concept into an operative process. This problem may be solved through the simulation that can decode conceptual notions in operational factors. Also simulation so can be a form of creativity, employing a cognitive approach. Such knowledge approach is unusual for designers. Even if they are accustomed to do simulation hypothesis, they look for a unique and preferred solution. Using simulation, in connection with computer science, they have the opportunity to extend the number of potential solutions, by ameliorating the quality of their project. We can affirm that simulation, in this meaning, allows them to develop a digital creativity, balancing intuition and validation.

2.2 Between material and immaterial technologies

We have described this new territory of investigation, bonding material and immaterial. In this space of “inverse” relationship, between real and its digital double, are offered a maximum number of opportunities to broadening project edges toward new regions; mixes of real and virtual. Catching a glimpse of several projects, carried out in the last years, we notice as “software” and “hardware” represent a cross-platform from
which such diverse products can be launched. Likewise to the Moebius tape, where inside and outside are not divided, digital systems are more and more compatible among them, connected with other applications that taking part of a digital “total device”.

That device may be thought as well as material and immaterial, at the same time. Furthermore this condition present technological innovation as main goal of design. In order to obtain such goal, the digital is to give back consistency to design process, avoiding a “mosaic” of many different technical types of knowledge.

3. Conclusions

“With renewed vision, the modern man will use new tools science lavishes upon him (even before he is ready for them) to enlarge his field of action by diminishing his fetters to exterior controls, especially those of organized authority, publicity or political expediency” (F.L. Wright, 1955). In that phrase we can find a synthesis of a good relationship between scientific evolution and design methods, focused on a more open and free vision of project potentialities. Drawing inspiration from the sentence of F.L. Wright, finally, we can suggest some considerations. Digital technologies have not to be a pre-formatted grammar or an “unique” instrument, for the designer. New techniques can give an hint in that interactive play of project, to perform a “communicative milieu”. This milieu requires a cultural agreement, exactly as internet; the acceptance of a protocol, but not an end of freedom to express. The chief reason for such agreement is found in the useful function of a cross-platform of aided design. In this direction some element to the attention of informatic are:

- the task of conceiving based on simulation;
- every stage of design developed interacting symbiotically with the other stages;
- the focus on how functions are tied to forms;
- the engineering phase as integral part of the project.

However we not may underestimate that the effect of avant-garde techniques in design disciplines in not at all fully materialized; and new potentiality are yet to come. The significant role, performed by that techniques, in shaping a multi-disciplinary approach, begin to construct a new cognitive process in design action. By the way that phenomenon concern, at the same time: visual and industrial design, modelling, architecture, engineering, environmental planning and, in general, all the fields of design creativity. Joined in the adoption of simulation as verification and validation procedure. It is what we have called new visible and his developments, currently, is not completely predictable and deducible. Probably they also regard a different perception of intellectual work; more implicated in social and communicative problems, liaising intuition and validation in digital creativity.

References