Proceedings of the IMProVe 2011
International conference on Innovative Methods in Product Design
June 15th – 17th, 2011, Venice, Italy

"Let's take a look to the project"

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Article Information

Keywords:
Geometry
Representation
Photomontage
Space

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Abstract

Purpose:
The purpose of the research is the evaluation of new tools for the representation of the architectural project and the impact they have for teaching students (architects and engineers).

Method, Result, Discussion & Conclusion:
Through the comparison of operational methods of architecture firms and the latest developments, in the market, for the architecture, we can understand and underline the importance of geometry not only as way to communicate the mere shape of a buildinga, but also as an opportunity to comprehend and to communicate each architecture that, as such, is made of space. So the understanding of space becomes fundamental and foundational training to the project of architecture, which certainly includes other factors, but that makes it possible through its own space component..

1 Introduction

Each scientific discipline has made use of images, graphs or diagrams to make their arguments more immediate and understandable. Images of three-dimensional representations appear for the first time in a copy of Euclid's *Elements*, translated and edited during the XVIth century by Henry Billingsley[1] (Fig. 1). Images here, along with two-dimensional trait, are stuck directly on the pages, shapes, folding so that, once opened, they form three-dimensional figures in a sort of pop-up *ante litteram*[2].
Today, computer-generated images have imprinted an effective turn to scientific understanding. For disciplines such as Architecture or Engineering, where use of the machine is replaced, even in the concept phase, by the prefigurative capacity of the hand, directly connected to the brain, drawing anticipates conception. The computer tools, in turn, contributed significantly to the organization of the design process, a process that translates into architecture, or at least in a building, included in reality, in a city or a territory, more or less anthropic.
Two issues should be stressed: one is the correct foreshadowing of the design process and its result, the Architecture precisely, the other is the importance of training space to imagine, represent and communicate the Architecture itself. Although trivial issues, they are essential since architecture is configured by the space.

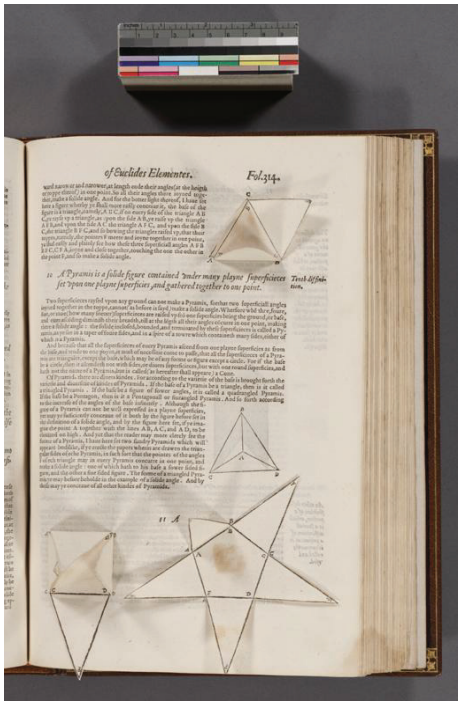

Fig. 1 Pop-up ante-litteram: copy of Euclid's* Elements*, translated and edited during the 1500 by Henry Billingsley.

1.1 Photomontages and reality

The title of this paper uses an expression typical both in the workplace, when showing a draft to the customer, and in Academia, when we show a draft to the techer or the supervisor. In this case, the expression is of course used in a provocative way, because it contains an "aspect" of the project and of architecture that is "visual". This is why in most design teams (from the smallest to those of "archistar") extremely realistic and, therefore, appealing representations are used. In a peculiar characteristic of

[1] *This book is* The Elements of Geometrie of the most auncient Philosopher Euclide of Megara Faithfully (now first) translated into the Englishe toung by Henry Billinsley*, Londra 1570, printed by the famous english typographer John Day (o Dee).*
[2] *The pop-up is a special book to the opening of which come out a real three-dimensional scenes.*

Modernity, design teams prefer to show how the final building will look like (its shadows, its reflectance, its texture, the impact on the landscape). Also in the ideation stage and at every step and option of planning, we are seeing representations in which the "render is king", preferring thus the most perceptive and exterior connotation of architecture.
The attitude is obviously favored by a continuous refinement of modeling and rendering software, often with a profusion of huge efforts, such as controllable, verifiable views, re-creation of the context: stuff like those are demonstration of "how" the disembodied idea of designer could appear. Moreover the tools specific to the graphic illustration are becoming, at the time, design tools. As result, each picture becomes often a mixture of a variety of techniques including laser scanning and related mapping, stereophotography (or stereoscopic photography), rendering, in addition to any conventional draft developed according to the canonical representation systems. The final product is, in every way and always, a representation, and the alleged realism is not always helpful.
In fact, the drawing can produce a much better idea of the project, even that of the realized building itself. The purpose of a representation, as known, is not to get a realistic result: we do not ask, looking at a drawing, if the result is realistic. Rather we wonder "what is" this image. In fact, a realistic representation "renders" the complexity of architecture, but the tendency to create mimetic representations, representations of buildings real or imagined, makes one wonder.
There are continuous attempts to create a double of reality, which recall the Map of the Empire cited by Borges [1]: a huge map of the surveied territory, perfectly overlapping with it. There are many experiments in this direction. For example, the creation of a solid model made of an urban structure, the work of Didier Madoc-Jones and Robert Graves, dates back to 1986, within a collaboration with Skidmore, Owings & Merrell (SOM): 3D views of London's County Hall - made by photographing the city with a 35 mm camera and by setting camera angles, whose coordinates were added to the Ordnance Survey Data - were used to "superimpose" the architectural models, displayed in wireframe, in a sort of abstract montage. And, after several years, the company GMJ (Graves - Madoc-Jones), amended the criteria for the implementation of the model, adding technical verifiability to the photomontage, produced for planning applications: the purpose is the production of sophisticated details that combine rendering, lighting and materials to create accurate representations of how a project would appear in a particular context [2].
The group led by Nadi Jahangiri, uses photomontage, proposing the so-called Visually Verified Montages (VVMs) [3]. In a VVMs a 'space-CAD' that accurately reflects the space shown in the picture is created, and then a model of the proposal is settled in that space. The simplest and most precise way to do this is to survey a range of fixed and permanent control points (usually six to 12 per view) in the photo. These points are then located with GPS satellite technology and the Ordnance Survey Active Network, with an accuracy of more or less than ten millimeters. Surveying these existing points and placing them in space, the creation of a complete model of the environment becomes unnecessary, because the photo describes accurately the environment itself.
It is worthmentioning also the so-called Architectural Photomodeling [4], a process which uses software to model directly existing architecture working a series of photographs.

1.2 Photomontage and Geometry

Given this trend, and considering that the market of architecture requires images which imitate reality, and fit the architectural design inside that virtual reality, then it becomes important that the training of students, engineer and architect, the two main figures of the design process, takes care on how to manage programs aimed to the realization of these hyper-realistic images. However it must be stessed that the formation of an architect or engineer, as regards the representation, cannot be limited to the creation of mere images.
The representation assumes an instrumental role in other disciplines. However, since through representation one can manipulate the project and its space, it becomes important to teach to "imagine" the space of the project through digital tools, rather than just to reproduce it in a more or less mimetic way. It is important that, even when teaching a simple photomontage, along with hints about the use of the programs to that end, the theory behind it have to be stressed and put into the right light: to perform a proper montage students have to know the so-called photogrammetry [5], which, as suggested by etymology of the word, used to calculate the metric characteristics of objects by one or more photographs. Those rules seek a series of constructions based on the principles of projective geometry, which govern the formation of images in perspective.
Indeed, since the first Modern, architectural representation has never found an alternative to Geometry. Also the photomontage, in the visual space modeled in a finite depth, typical of the perspective, or in infinite, typical of axonometry, had to use geometric procedures. The "topos" of the photomontage, even when obtained by the superimposition of images (even when it may seem discontinuous), must take into account the geometrical construction of each views. Construction that, in fact, must keep the same viewpoint, as Stan Allen notes: "... the photomontage eye capable of constructing a new reality out of barrage of fragmentary, contradictory and obsolete information that characterizes the modern city ..." [6], just to emphasize the "reconstruction"of a unified space with fragmented images.
So photomontage works closely with the Geometry and, as with any geometric construction, dealing with the visuality, happens on the surface of things. Its expression could be what Norman Bryson defined "screen of signs": "between the subject and the world is inserted the entire sum of discourses which make up visuality, that cultural construct, and makes visuality different from vision, the notion of unmediated visual experience. Between retina and the world is inserted a *screen* of signs, a screen consisting of all the multiple discourses on vision built in the social arena" [7].
The architecture and the history of its codes of representation, are an integral part of this "screen". Although always present, "this screen at time fades to invisibility, and at other times asserts itself as intermediary" [8]. The construction of the photomontage literally "makes-rendered" the presence of this screen. But the architecture, even in the world of postmodern consumer culture, is not just images. There is "no space-architecture", and therefore "no space-geometry". And, indeed, we consider that contemporary architecture - sometimes very complex geometries oriented - strives, first, to create a new depth, modeling and multiplying

surfaces; on the other hand, the architecture is closing in itself satisfaction in the world of signs and surfaces that is configuring, encouraging at the same time the "abuse" of Information-based technics and the use of Object-Oriented Software.
Indeed, it must be emphasized that the intimate relationship of architecture with its techniques of representation is neither neutral nor mechanical. Moreover, the architect has no other choice but to use Geometry: Elementary Geometry or Euclidean, Projective Geometry, Topology. These Geometries can also become central to the work, and architectural design can also be regarded as a pure work of representation.

2 Conclusion

The intimate connection between Architecture and Geometry can be recognized even more evidently in education: what is, today, the role of Geometry, along with its development? What is foundational and fundamental to the formation of an engineer or an architect?
On the one hand, each of the three groups of properties, which characterize respectively elementary geometry, projective geometry and topology, each plays a specific role in architecture, in representation, in project and, particularly, in training. Geometric training *tout court* must deal with space, must be taught to imagine it, has to prepare its prefiguration, and then, eventually, make it feasible. Then the teaching of geometry regains a fundamental role in this sense, updating it.
In addition, we recognize the importance of the use of computers for teaching geometric space: we must be carefull that, as in the drawing, so in the reality - virtual[3] -, generated by the computer, one may incurr into counterproductive attitudes. Considering the means of representation as simply means of reproduction or imitation of reality, one would not recognize the enormous analytical and cognitive power, its role as instrument of knowledge, whose purpose is to shape reality. It follows as a consequence the most interesting quality for any "medium" of knowledge, that does not consist in its ability to imitate, but rather in the simulation and interpretation, that is, allowing the creation of new possible worlds: the end of the digital machine (as well as drawing) therefore lies in its creative potential.
A training process - through the illustration and explanation of the above types of geometric properties (with exercises presented ad hoc) - should be structured in such ways:

- study of metrical properties that sets the material limits of the construction enabling and controlling the size of spaces and their formal definition, not exhausting the sense or the meanings: in our case, then the photogrammetric restitution (Fig. 2) allows to structure the existing and to design the architecture to be replaced (Fig. 3), through formal and structural study of surfaces and their mutual intersections[4];

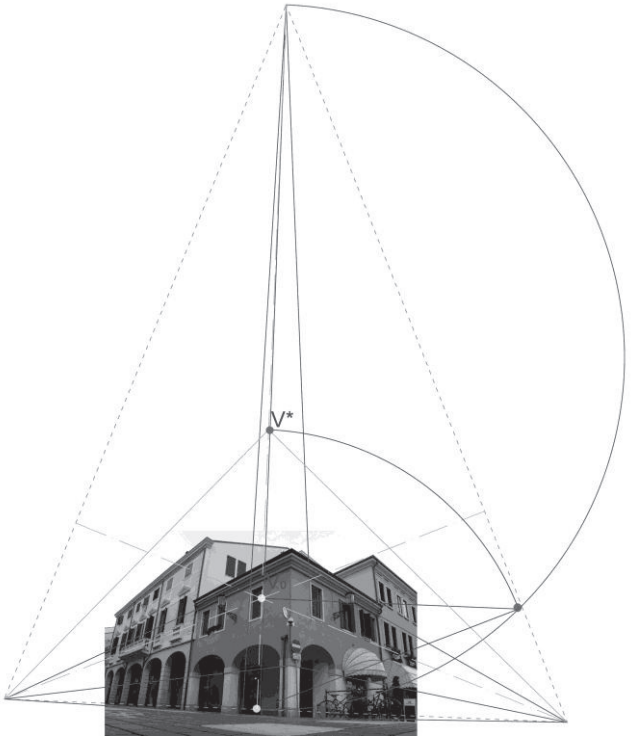

Fig. 2 Photorestitution.

- study of the projective properties, following the requirements of perception and representation, that allows to understand the development in space: Figure 4 proposes the actual spatial configuration (thanks to the perspective geometrical restitution), matrix of the result on the photographic surface; replacing in the virtual space 3D of computer fundamental entities (both internal to the photo - what is taken - and external - the observer and its position relative to the frame), we obtain proficient results in the handling of spatial problems, on which the student is invited to reflect;

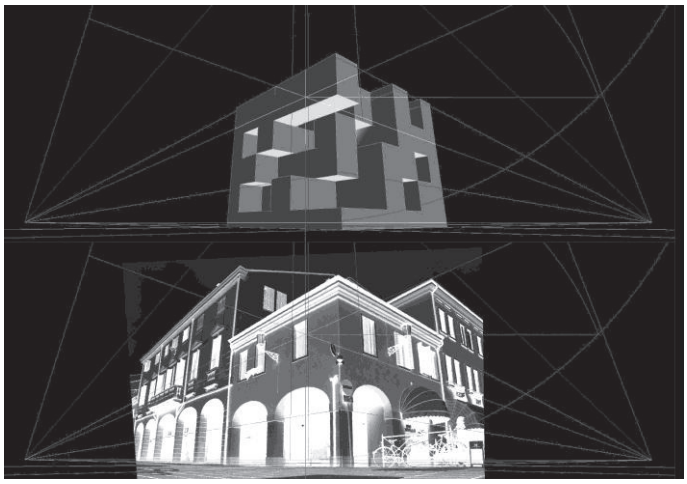

Fig. 3 Photorestitution.

- Finally, the study of those topological properties which constitute as essential priority and guide to determine the system of relations and connections, thus governing the structure configuration of the spaces themselves.

This last aspect of Geometry is that it is no longer considered as the sum of rigid formulas and theorems, but

[3] *The contradiction – from a linguistic point of view – can be crossed by the computer itself, that became the borderline between real and virtual: the screen is a window (Alberti docet) from which we see the virtual reality.*
[4] *The editing of virtual space on a 3D modeling is allowed, as we know, by commands as "orbit", that permit dinamic visualization of the object.*

rather as a set of laws governing the constitution of each innermost constitution of each structure and each spaces (Fig. 4), therefore it plays a specific and not a secondary role, not only in the presentation but also in constructing architecture and, thus, in the development of intellectual and graphic design. In this way, in the "montage of Photomontage" can be summarized to those relational qualities, that architecture establishes within itself and with the surrounding: we can finally "take a look to the project", sure to understand the configurative essence of its space.

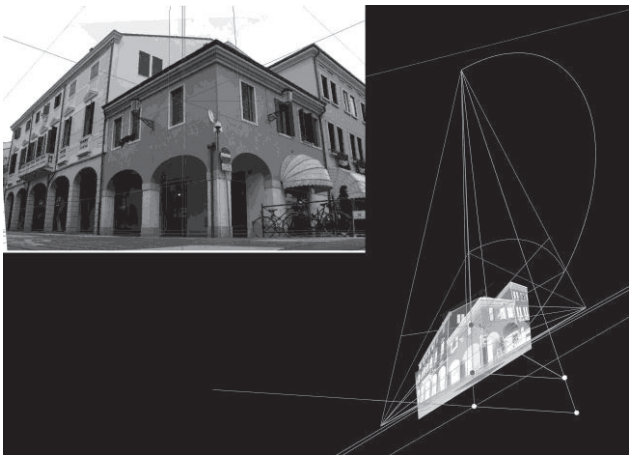

Fig. 4 The observer position.

Fig. 4 The Photomontage.

Acknowledgement

The drawings were made during the Laboratory of representation by the student R. Righetti.

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