

ZOOM-IN, ZOOM-OUT: Architectural scale and digital technology

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This paper aims at contributing to the study of the relationship between technology, knowledge and representation. It is based on previous studies on architecture, art and technology in modernity and its development, as well as on studies about scale in architectural design. In despite of the fact that scale can be technically considered indifferent for computer-aided design, I intend to discuss how digital tools intercede in the process of clipping that selecting a specific scale eventually implies sustaining that, for architectural design, the concept of scale has to do both with representation and with knowledge of reality.

I. INTRODUCTION

In 1920, Paul Klee told a story about a man in a boat in ancient times to explain the following: ancient people would have represented this scene precisely according to which they could see, i.e., using the available graphic means, they would record the human and the boat figures as faithfully as possible, and would be contented with that. On the other hand, the “modern man”, according to Klee, when strolling on the deck of a steam ship, experiences his own movement, the movement of the ship, the sense of the tide, the rotation of Earth, its orbit around the sun, and all the orbits of moons and planets around it. Therefore, this modern man, when trying to graphically record the same scene, would need to represent things that he knew were part of the scene, but were somehow outside it [1].

Klee had these thoughts in the year zero of a decade that consolidated the visual revolution undertaken by modern avant-garde in art and architecture, an irreversible fact, immersed in a context transformed by unprecedented technological developments, and still deeply involved in the long task of assimilating the machine. In this context, founded on new technical tools, the rational and scientific mentality displaced traditional knowledge and ways to represent real settings, exposing an insurmountable difference between a phenomenal world, experienced by the mediation of the senses, and an objective world, founded by reason. Based on new technical conditions of vision, from the microscope to aerial photograph, daily life became an extraordinary universe. Senses did not seem as reliable as before, and therefore could no longer aspire to be a sufficient condition to understand reality; when nothing is absolute, the understanding of the world also becomes provisional, circumstantial.

The story proposed by Klee leads to a reflection on the relationship between technology and representation as a still open issue. The experience of modernity as vertigo, in which the human subject plunges from the infinitely large into the infinitely small, seems to be today intensified by the development of digital technologies. In a world completely mapped by satellite, the *zoom-in* and *zoom-out* tools of Google Earth unquestionably update the heart of the matter raised by Klee.

This article aims at contributing to this discussion, which involves the study of the relationships among technology, knowledge, and representation. It is founded on previous studies on architecture, art, and technology in modern times and their unfolding [2], as well as on studies on the issue of scale in architectural design [3], which were developed in the research group Design Theory and Practice (PROPAR, UFRGS). A theoretical-critical approach is proposed. The method implies a discussion of the issue of scale as expressed in architectural theory, aiming at updating this concept at the theoretical level, in the landmark of a digital culture.

In architectural theory, the idea of scale as an organization of a *system of levels*, which hierarchically articulates several dimensions of the physical

reality, is quite consensual. Implicitly, the entire design theory and practice is based on a position as to system of levels. The notion of that, despite including common characteristics, design procedures are not necessarily the same, whatever the scale, is also not questioned [4]. Several authors agree that *dimension* exerts a determined specification power on *operations of change*, which obviously are included in design practices, from object design to building and city design. The choice of the intervention scale implies the adoption of a determined standpoint to which instruments to observe, represent, and interpret reality correspond, as well as a set of reading and building disciplinary techniques [5]. Although the definition of scale could be technically considered as indifferent in digital design, I intend to discuss how digital tools interact in the process of *clipping* reality as implied by scale selection, and to support that, during the design process, drawing is, at the same time, a representation tool, and an instrument for knowing reality.

2. THE EMERGENCE OF THE SCREEN AND THE HUMAN FACTOR

Aiming at establishing the state of art of these issues, the present investigation acknowledges a double articulation. On one hand, it aims at articulating itself with a reflection on visual representation in the scope of a culture that is becoming progressively digital, specifically adopting the perspectives pointed out by Timothy Druckrey, which somehow update a line of thought on technical culture previously discussed by Lewis Mumford, Siegfried Giedion, and Marshall McLuhan. On the other hand, using the research activities of the group Design Theory and Practice (PROPAR, UFRGS) as reference, it intends to insist on the need to define design theory as a specific theory within the general theory of architecture [6]. The present study is founded on the ideas of Oliveira, who advocates “*the relevance of design as a particular expression of a way of thinking embodying a cognitive specificity*” [7]. Oliveira points that the specificity of a design theory rests precisely “in the fact that it cannot be dissociated from design practice: it is built *in* the design and *by* the design, in spite of, in order to articulate and argument *on* design, it needs to adventure itself in the discourse field of criticism, but not breaking the operative links with the iconic field of design practice” [7].

According to Moore and Allen, “the architectural space is a special category of free space, which is phenomenally created by the architect when he/she provides a part of the free space with shape and scale.” [8] Although this assertion, which attributes to scale an importance equivalent to shape in design activity, may be considered as consensus among architects, architectural scale is much less studied than shape. Despite being an essential component of a design theory, many more pages have been dedicated to issues of shape than to specific scale matters. In this sense, this article mainly intends to bring a renewed reading on the architectural scale

as a composition, knowledge and representation tool within the scope of a design theory, which must also be subject of continuous construction and critical reconstruction on account of new technologies and how they are appropriated and elaborated by the human subject.

For artists and architects, modernity presented scale as a composition and design problem, for which there are no previous systems of response. At least since Le Corbusier and his interest on dynamic proportions, we know that scale cannot be understood as an expression of an absolute system to manage what is visible. Moreover, during the slow process of relativization and deconstruction of classical tradition, when the theory of proportions started to loose its position, giving way to a direct relationship between technique and nature, between man (microcosm) and the universe (macrocosm) [4], the notion of scale was reconfigured as a concept that no longer could be limited to the concept of proportion. As observed by Tedeschi, in the classical system, scale and proportion were confused; only Viollet-le-Duc "is more perceptive, and recognizes that the confusion is spurious: proportion is merely a specific case of scale, in which the relationship is established within the things we examine" [9].

When writing on a design in Verona, the architect Peter Eisenman opposed the concept of *scaling* to an anthropocentric notion of scale, questioned by the loss of centrality of the notion of man as a measure of all things. "Although architecture is traditionally related to human scale, and the size of man is still the same", he explained, "the idea of man as a measure of all things is indefensible" [10]. Scaling, as defined by Eisenman, is a process that responds to this new circumstance of man, in which there is no original value or single and privileged reference, but each scale change alludes to specific and intrinsic characteristics. Therefore, scaling works with discontinuity, recurrence, and self-reference relationships. Albeit the author does not mention the impact of new digital and information technologies on these cultural and artistic processes in his text, some correspondences are evident. It is clear that these issues indirectly also include characteristics attributed by several authors to the contemporary model, according to which a predominantly industrial culture is being restructured into an electronic culture.

Authors attempting to interpret this new digital culture have already stressed that historical and esthetic consequences of information technology are not restricted to the recent digital era. As technology is included in the interests that shape modernity, Timothy Druckrey explains how the post-war turn towards information systems corresponds to an inflection point in its understanding and representation. If questions of space dominated the discourses of modernity, issues relative to *presence and duration* now tend to indicate a more complex situation. This situation is identified, according to Druckrey, with the progressive immersion in the tele-culture mediatic landscape, generating a communication practice

“whose boundaries are mapped in virtual, transitory networks, whose hold on matter is ephemeral, whose position in space is tenuous, and whose agency is measured in acts of implication rather than mere coincidences of location” [11].

The “*emergence of the screen*”, as a novel fact, would then be one of the crucial points in the reconstitution of esthetic and communication experiences since the second half of the 20th century.

When studying these new circumstances, Druckrey asserts that the passage from a mechanic culture to an electronic culture, despite driven by inventions and procedures clearly located in the technological field, entails more than the development of a set of techniques: it is a change in the essence of the dynamics of human culture, representation, and experience [11]. In this sense, it escapes from which is perhaps the main trap in which most thinking on technology - be it critical or optimistic as to its consequences - has fallen: to buy with no restrictions the idea of technological determinism.

As the technique historians Leo Marx and Merrit Roe Smith explain, the phrase “technological determinism” describes the human trend to confer technologies the power to drive history. This idea takes different shades, and thus equally supports pro-technology attitudes, which see technical development as the realization of modernity social progress ideals, and attitudes criticizing the rational and technical project of modernity, which is described as a confirmation of totalitarian nightmares [12]. McLuhan’s work is an example of the first case, and as extensively demonstrated by Andreas Huyssen, the French thinking on technology and mass culture culminating in Baudrillard’s criticism illustrates the second case [13].

When suggesting that the central issues of electronic culture cannot be reduced to an image reception issue, as they are included in the essence of the concepts of cognition, identity, and biology, Druckrey reinforces a line of reflection on technology, as previously supported by Lewis Mumford and Siegfried Giedion, which tends to see technology not as an autonomous agent of transformation, but as part of the history of human actions, i.e., related to a complex matrix of historical, social, political, and cultural relations. The consideration of the human factor is supported by this perspective. If the issue of scale in architectural design and representation is an issue of design, as we intend to show here, it depends on a certain class of interaction between man and technology, in which the latter could be indeed subordinated to a critical project.

3. ARCHITECTURAL SCALE

The word scale, from Latin *scala*, in the general sense refers to systems or orders of relative values. Physical scales indicate a functional correspondence that can be expressed by an analytical relationship between a magnitude and an arbitrary variable, which can be experimentally

determined. In music, scales can be ascending or descending, whereas metric scales repeat a certain “degree” as module [14]. Similarly, whenever the word scale is used in architecture, some kind of correspondence or comparison is established. The meaning of scale in architecture, despite being linked to the physical dimension of thing, it never is merely a synonym of size. When architect Alison Smithson, for instance, said that scale had to do with size, and in fact specifically with “the effect of size”, she was acknowledging precisely this relational aspect, which characterizes architectural scale [15].

In order to relate architectural scale with the general notion of scale, George Allen pertinently asserts that its distinctive trait is precisely not being confined to a single set of relations. A scale is an “elaborate and complex system of codes, according to which things, due to their size, can be at once related to another set, among themselves, and to people” [8]. When establishing relationships among sizes, or relative sizes of things, scaling is a design tool that allows building sense among systems bearing distinct natures. Scale can thus be understood as an articulation among variable scopes, limited only by what can be designed.

The relation between shape and scale is discussed by Vittorio Gregotti in his book *Territory of Architecture*. The meaning of shapes is conditioned by dimensional limits, as “a stream is not a river; a mound is not a mountain, a pyramidal paperweight made of marble is not the pyramid of Cheops,” explains Gregotti [5]. This is in agreement with Christian Norberg-Schulz, who asserts that the properties of a determined formal structure vary when its physical dimensions are considerably changed [16]. According to these authors, the validity of every formal system assumes a certain scale, albeit this validity margin may vary between systems. The understanding of scale is mainly solved by organizing a system of levels, according to which the several scopes are hierarchically articulated. Norberg-Schulz discusses an existential space structured on different schemes developed at each level, and their mutual influences [16]. Gregotti identifies three dimensional of intervention: the geographic level, referring to territory; the topographic level, referring to surroundings, and the object level [5].

Moreover, the level in which the design intervention will be inscribed is not indifferent. Dimension, as Gregotti explains, exerts a specification power on *modification operations*, as design operation must be understood, because they imply in the transformation of a previously established context. The development of the design depends on a position as to the system of levels. It is our concept of shape, asserts Gregotti, that “falls apart when facing the problem of scale intervention, and tends to create different structuring techniques.” [5]. This occurs because the choice of an intervention scale implies in adopting an “optics that sections”, to which correspond observation, representation, and interpretation instruments, as well as a set of reading and construction techniques, which will be partially conditioned

by the spatial dimension of the operation. This implicitly means that a position on the system of levels must be at the foundation of every design theory and practice, and that it can be found in each single contribution to this culture.

4. ARCHITECTURAL SCALE AND DIGITAL TECHNOLOGY

If scale definition is technically indifferent for digital drawing, digital tools are not necessarily indifferent to this process of clipping reality implied by the selection of scale. When Manuel Castells asserted that, during the passage to a new informational paradigm, we left "Gutenberg's galaxy" behind to enter "McLuhan's galaxy", he acknowledged that one of the characteristics of digital technology is the speed that tends to suppress time and space differences due to the instantaneous, integrating, and simultaneous character of these technologies, as suggested by McLuhan in the 1960s [17]. In this case, as to understanding architectural scales, we could ask ourselves if digital technologies would not be turning the idea of the sequential perception of reality underlying the system of levels, as formulated in the texts on the theory of architecture, into a problem. However, although the simultaneity character of digital theories could apparently abandon hierarchical and linear organizations, the problem of scale as an "optics that sections" in the sense advocated by Gregotti, remains au courant in our daily professional and teaching activities.

In the scope of architecture teaching, particularly, there are several studies on the use of digital technologies as teaching tools in design disciplines, often reporting experiences in which the school and the professor have a digital lab available to integrate digital practice to the learning process in architecture. In fact, it is not an overstatement to implicitly assume that the computer currently participates in all design classrooms, even though not always physically present. It participates because sometime during their training - and this moment is apparently happening increasingly earlier -, the students will experience the change from hand drawing to computer-aided design.

The issue I want to raise is related to scale understood in a broad sense, that is, both as a drawing resource and as an instrument to understand reality. According to this standpoint, the issue of digital technologies can be re-discussed: on one hand, one can understand that computer-aided design does not have a definite scale (I can change it with a few commands), but on the other hand, the possibilities of digital representation indeed pose other problems relative to the choice of scale, which can be raised in relation to the amplification of the awareness we have of our design procedures and representation.

Architects and students that commonly use the computer would say that scale in digital representation has to do mainly with the amount of

information one intends to include in the drawing, taking into account the scale used for printing, or the specific conditions of other dissemination media; in other words, taking into account the *frame* chosen to visualize the drawing.

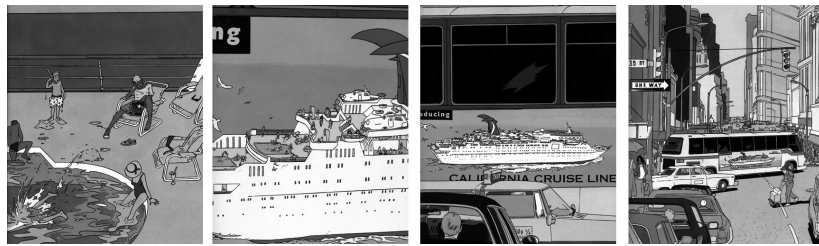
The problem seems to be that the choice of this frame, understood as a section, does not just allow suppressing or including more or less details in the drawing according to the chosen graphic scale and the amount of information included corresponding to that supported by the printer or other media; but also that, in addition, this section perpetuated by the frame - and therefore, by the choice of scale - has implications on which part of my universe of study, understood here as design context, I intend to consider.

To explain this argument, the children's story *Zoom*, by the Hungarian writer Istvan Banyai, will be used as an example [18]. Banyai's book is an image book. It does not contain any texts, besides the title, but the illustrations are organized according to a determined narrative order, allowing the story to be told through the images. This is neither special nor new, except for the way Banyai determines this narrative order, i.e., *how the images are related to each other*. In the story *Zoom*, as suggested by the title, the script is developed not only through images, but especially by successive scale changes, such as clippings of the presented scene, which significantly transform our perception of these images.

From this script, a sequence of pictures is extracted (Figure 1 to Figure 4), where there is a boat, as in Klee's story, and instead of a man, there is a boy. The drawing of this boy in the second picture (Figure 2) shows no more details of his physical appearance than the first drawing (Figure 1). In principle, it does not add to what we already know about the boy: he is blond, he is sitting in a relaxed position by a swimming pool, and he is holding a magazine. However, it offers other elements on the context of the setting: we already knew the boy was by a swimming pool, but now we know this swimming pool is on a deck of a ship. A *zoom-out* operation leads to the third and the fourth pictures, where new exterior elements, not belonging to previous scenes, are progressively included. We will soon discover that the ship where the boy was is part of an advertisement placed on the side of an urban bus - the boy and the ship are drawings of an advertisement. Pictures three and four add to the boy's drawing information which, despite being unnecessary to describe him, essentially changes our understanding of the story, making our previous awareness as to reality of the presented situation completely false.

In Banyai's story, it is the change in scale that allows telling something else, something that was not known before, and that bears the potential of radically changing the meaning of the previous pictures, thereby, the whole story, despite the represented figure remaining the same inside the new picture. If this is true for representation, making the narrative sense change

as the section is amplified, we suggest that this is also true for establishing a design rationale, in the sense of understanding the architectural problem in its multiple dimensions.



◀ Figure 1 to Figure 4: Pictures from the book *Zoom*, by Istvan BANYAI, translated by Gilda Aquino, Brinque Book, São Paulo, 1995.

5. CONCLUSION

This study does not aim at reaching a prescriptive conclusion, generating immediate practical applications. Rather, it hopes to elucidate some aspects of the problem, perhaps refining the necessary tools to advance this discussion, which needs to remain open. In this sense, it is an essay, for which discourse is only an approach, or a “way to decompose the unit and hypothetically recompose the parts,” as asserted Jarauta, “which does not hide its errant dimension” [19].

In practice, the extensive availability of new digital tools, when supported by adequate resources of transference to other media, certainly enables the transit among the multiple scales inserted in design problems. Therefore, there are no doubts as to the obvious advantages of digital graphic resources. On the other hand, the relative easiness to incompletely use these resources may induce to fragmented sections of reality, in the sense that the computer screen also becomes the optics that sections, as well as the step towards printed media may favor a reducing section.

If, as pointed out by Quaroni, it is an illusion to think a design theory still based on the “notion now ambiguous of *composition*, it is also true that architecture has never needed so many clear indications of what *place in relation to* really means, as well as how this can be carried out” [4]. In this sense, we can argue that the discussion of representation and scale in design procedures deserves to acquire higher importance than usually considered.

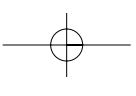

Indeed, the main issue to be highlighted is the meaning of scale as an optics that sections, as proposed by Gregotti, and its implications in the context of a design theory as a notion that is contemporarily updated by the presence of new and broader digital resources, which real consequences are still being studied. It is precisely this ability to place in relation to, inherent to the chosen scale for the drawing, that I aim to stress, including here the multiple choices offered by digital technologies. The choice of a *frame* is not indifferent for our understanding of the reality of intervention,

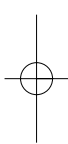
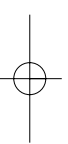
nor for the way we see real design situations, and hence for our awareness of its internal and external relationships.

The consideration of the human factor must be understood according to this sense. Certainly we can not just argue, as Renaissance architects did, that man is the only measure of all things. The notion of scale can no longer be limited to the concept of proportion, as it was in the classical system. But, if we accept the modern understanding of scale as a design problem, for which there are no previous systems of responses, we also admit that it has to be a matter of composition. In a broad sense, to think about how things are related to each other, considering different urban and architectural scales. If the issue of scale is an issue of design, as we intended to stress here, it depends on a certain class of interaction between man and technology. The emergence of the screen [11], in this sense, does not necessarily mean that digital tools are autonomous forces, but certainly implies that we should learn how to handle these tools in a complex matrix. *Zoom-in* and *zoom-out* tuning, which now becomes a design task, still must be carried out by men.

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