OF DIGITAL EGGS AND THE CHICKEN'S METAMORPHOSIS

Or: How Digital Representation Influences the Built Reality

BOB MARTENS
Vienna University of Technology, Vienna, Austria
b.martens@tuwien.ac.at

Abstract. In this contribution we explore the relationship between the use of digital representations and the reception of architectural design. We will try to show that visual simulation, typically preceding the actual built reality, can have a lasting impact on the built reality that follows in its wake. Beyond the chicken-and-egg issue, we focus on the potential and the restrictions of ongoing developments based on a wide variety of contemporary architectural design features.

1. Image and reality: the "directed" viewer

"A picture says more than a thousand words" is a saying that many attribute to Confucius. Actually, the adage is only attributed to the Chinese philosopher to give it more weight and importance. After all, Chinese proverbs are reputed to be particularly profound. Regardless of the authorship issue, it must be said that images of our reality hold an attraction for the viewer that should not be underestimated. Initially these images were elementary symbols and signs, then grew into naturalistic illustrations of our world and subsequently led to more and more abstract reflections on what humans perceive and experience in their physical reality. The representations of the digital age are now available almost effortlessly at any time and place. Even if the value of image representation has lost significantly in this respect, the impact of images is stronger than ever. Images are omnipresent. Images have permutated into a strategic toolkit serving targeted purposes of control and direction, very often in the name of consumerism. It has long been impossible to separate clearly the genuine from the fake, the authentic from the imitation. Contemporary technology allows for revisions and transformations with pixel scale precision. Not only pictures of human beings are "touched up" in the name of perfection, notably in advertising, but visual manipulation has long extended to our entire physical reality. No wonder that digital representation in architecture is also subject to a considerable degree of reworking and transformation. After all the "new" age almost forces us to use its tools.

Figure 1. The digital image as a strategic toolkit.

2. Visualization as an information task

Generating images of architecture is usually called *visualization*, which basically aims at the entirety of visual perception processes. The term itself is derived from the Latin verb "videre" which means "to see". Although visualization can be understood as a mere "making visible" of an object, it is subject to the same conditions as any other artificially created image. For, to create such visualization one always needs to select the desired visual stimuli and subsequently prioritize certain bits of information and neglect others.

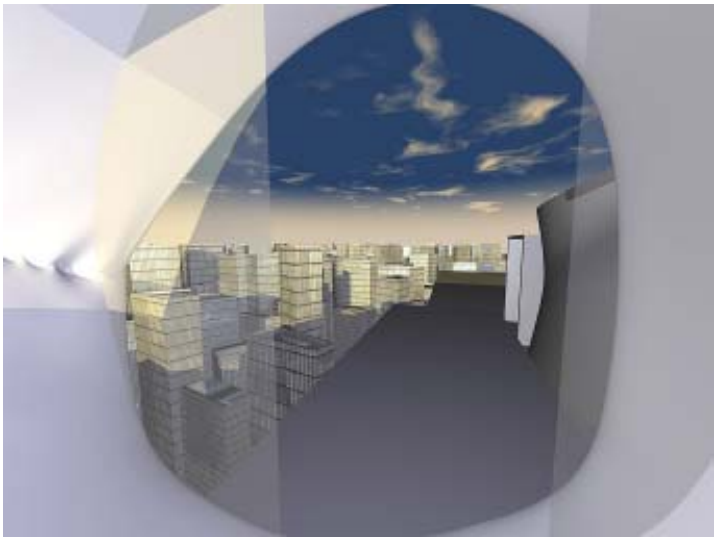

Figure 2. Visualization: The "making visible" of an object.

Visualization therefore involves some manipulation[1] in the sense of selecting which information to reveal and which to suppress. Visual simulation requires a kind of filter or level of abstraction, because only the actual physical structure can offer the totality of information.

Analogue and digital representations must, almost by definition, be understood as an interpretation of the ensuing original structure. Since the development of more complex architectural structures involves these representations, i.e. drawings and models used to analyze and check assumptions made, it seems very obvious that visual representation has an immediate impact on physical reality, i.e. the resulting physical architectural structure. Two-dimensional fa ade studies and visualizations of the ground plan and various sections serve as a basis for deciding on the final design of the three-dimensional structure.

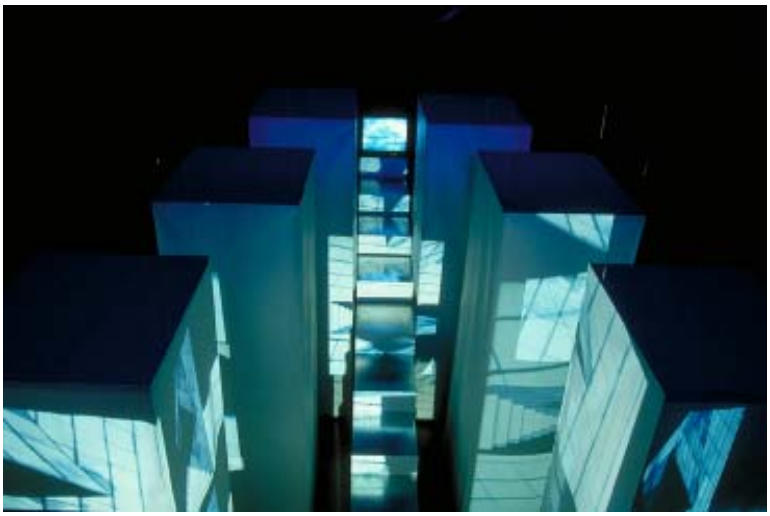

Figure 3. 2D-images in a 3D-environment (location: full-scale lab).

The appearance of visualization indubitably follows certain rules. Whether we consider rhythm or formal characteristics, the human eye is always drawn to aspects to which very little or no value is attributed in the real-world structure. In the real world we are, after all, unable to experience the ground plan or the fa ade as an isolated two-dimensional phenomenon. Hence, the final form of a three-dimensional structure is based on decisions which are predominantly derived from a two-dimensional representation (and the third dimension as an underlying assumption in the back of our mind). There is no fundamental difference if one uses three-dimensional models. They, too, are usually created on the basis of two-dimensional representations and ultimately serve mainly to facilitate understanding of the design. This is also due to the fact that we have at present only limited options for manipulating a three-dimensional model.

So far we have only dealt with the static image, but we also need to consider the topic of image sequences. The animation of architectural scenes will lead to a wider range of considerations, since a so-called animated view can present different states of a structure. One option is to create a scene in which the objects remain static but where the viewer can move around. Another option is for the objects in the scene to change their appearance or position.

[1] The term *manipulation* (Lat. for handling, slight of hand) describes a form of influence. In a purely technical context the term is rather neutral in value.

Figure 4. The visualization of movement (location: full-scale lab).

In addition, animated scenes can either allow for passive viewing (film) or facilitate a certain degree of interactivity, as is the case with QTVR-movies. Again, there are inbuilt limitations to flexibility, since the entire navigation process has to be planned meticulously.

So, even if architectural designers today have a broad range of spatial simulation and visualization instruments at their disposal, the decisions on the design of three-dimensional structures are still based on two-dimensional representation - even if the digital world seems to open up new vistas.

3. Visual simulation vs. realization

Despite the previously mentioned limitations, digital tools open up a whole panorama of new perspectives and greatly facilitate working in three dimensions. An increasingly complex pool of three-dimensional bodies and a growing collection of transformational parameters allow for an almost effortless generation of even the most complex three-dimensional geometries. What is more, these geometries come complete with all the necessary data and can thus be passed on and ultimately translated into architectural reality. A stretched, compressed and twisted cube can travel almost directly from the generating software to the manufacturing workshop and ultimately to the construction site. The aspect of immediacy which is absent in the architecture of the industrial age appears to have come back within reach. The fact remains, however, that three-dimensional space, viz. the three-dimensional object, is still experienced in two dimensions during its initial development. Even if on the computer screen we can rotate the 3D structure around any conceivable axis, our eyes are still fixed on two dimensions. Design variants such as ground plan and cross-sections still have their traditional role and serve as essential analytical elements.

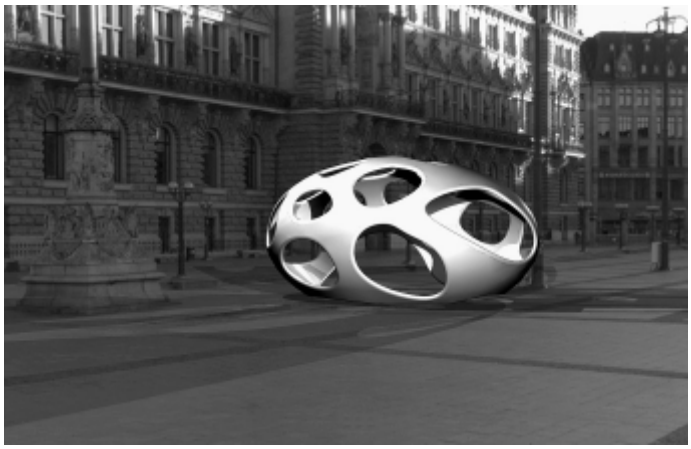

Figure 5. "New" geometries in terms of architecture.

Contemporary media and technology offer instruments which allow us, at least mentally, to penetrate into worlds which were still firmly closed to us in the age of analogue representation. In the digital world, a panorama of free forms spreads out at our feet.

Figure 6/7. A blob-like architecture in a digital and a physical representation.

The "blobs" now seem within reach. Almost any student is now able to create bi-directional curvature with easy-to-use systems and the orthogonality of the built world around us begins to seem outdated and obsolete as appropriate software solutions become available. A glance at the "materiality" of the corresponding virtual architectural designs reveals a seemingly infinite range from transparent to translucent. The appearance of future surfaces can be seamlessly adjusted and transformed from completely transparent to utterly opaque. The world of the plain perforated fa ade seems outdated. Designers now have spatial visions at their disposal such as were never seen before.

Given the wealth of recent options, two main developments seem likely. One the one hand we are now keen actually to translate these novel structures, which have existed only in the virtual sphere until their discovery, into built reality. On the other hand, we will be tempted to forge any number of architectural dreams into image form without paying heed to whether the "laws of reality" would allow their full realization.

3.1. DIGITAL DREAMS VS. FUNCTIONALITY

Sooner or later the novel digital dreams will have to confront the realities of construction. Even if the innovative computer-generated shapes could be realized, a multitude of additional parameters has to be taken into account. Requirements relating to building physics and structural

engineering, as well as the increasingly sophisticated demands of building services will necessarily lead to collisions for which solution strategies must be devised. Hence, the brainchild of the *digital dream factory* needs to be tallied with reality. To this end, first attempts have been made to enrich so-called *virtual building models* with additional data input. In its ideal form such an enhanced model would be called an *integrated building simulation*. It is characteristic of this method to integrate various relevant sub-aspects of planning in the model at an early stage. Realistically assessed, however, we are still confronted with a number of individual, separate software solutions[2], which obviously raises the issue of programme interfaces.

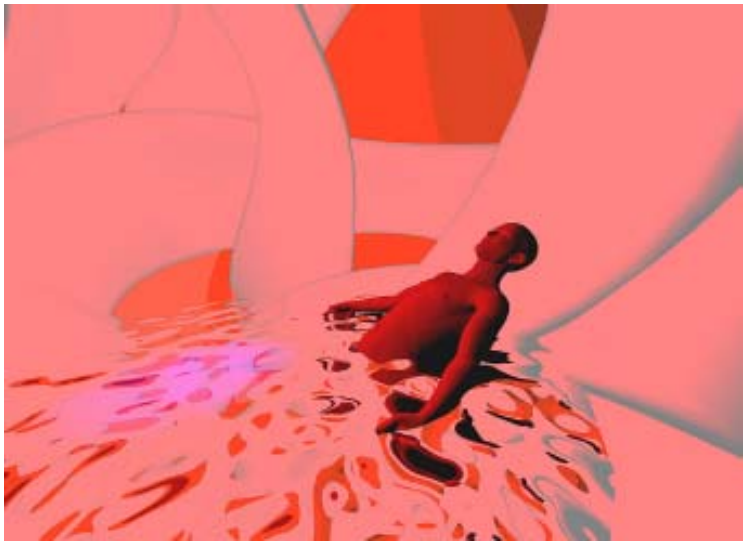

Figure 8. A digital dream?

3.2. THE MANIPULATED IMAGE VS. REALITY

Visualization of a building before the construction unquestionably aims at convincing someone of the design. Visualization is thus put at the service of promotion. Not unlike certain celebrities who only present a flatteringly made up face to the photographers, designers want to present an architectural design at its best. They are looking for a “killer picture”, one that says more than a thousand words. Such images contain a certain degree of factual information about the structure, but also aspects that the creator wants the viewer to associate with the design - additions that are designed to make the structure look “inspired”, “unique” and “outstanding”. For this purpose the structure is presented and/or interpreted in the best light. Ideally, such an interpretation should reveal and communicate the fundamental underlying idea. As the representation has to bring a finely balanced message across, the role of visualization should not be underestimated. After all, the viewer will pick up the image and delve into the “real world” ostensibly portrayed in the picture. The image opens a gate. It allows one to enter into a world that does not yet exist in reality. Put into a context with additional two-dimensional information and a multitude of other data, the individual fragments are assembled into an overall picture. The complex reality of a structure may or may not end up looking like a luminous, weightless, light and inspired piece of architecture.

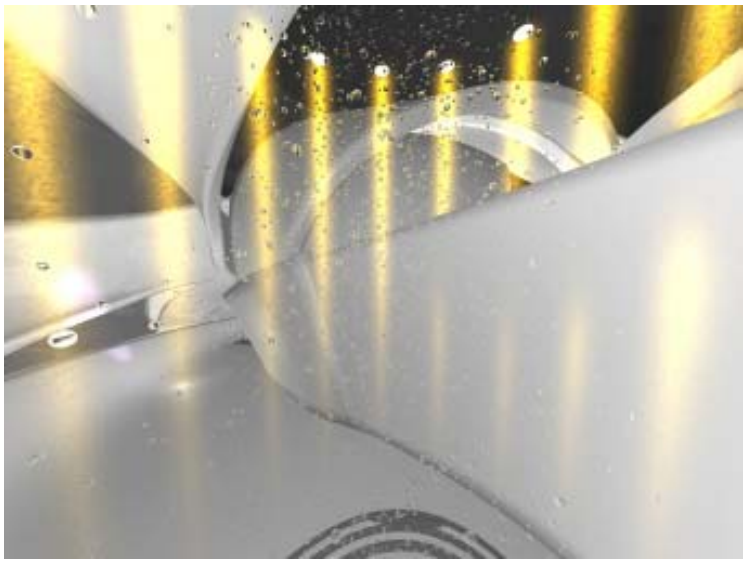

Figure 9. Inspired, unique and outstanding: The "killer picture".

Simulated pictorial worlds definitely have their own rules. But in any case the visual representations say "more than a thousand words" - which is, after all, their raison d' tre. The deceptively authentic looking integration of real pictorial elements into the artificial basic image suggests very strongly to the viewer that the whole thing is real, or that is must be real, given that the surrounding, or imported, elements are authentic. Against this backdrop it seems hard to believe that digital representations would never include deceptive or manipulative content.

4. Outlook

Without doubt, digital means of representation have opened up to us a great diversity of routes. The use of transparency and translucency has already expanded many design options, and even the many-layered structure of the image in the sense of projection and superimposition has long since become a fixed element of architectural thought and action. The novel opportunities call for translation into reality and are waiting to charge the physical world with extended perceptual experiences. Contemporary media support our attempts to delve into new worlds of experience and develop and implement ever "new" forms. Nonetheless the generation of built architecture remains a complex process composed of a large number of requirements and conditions. Visual and non-visual parameters have to be aligned and brought "under one umbrella". Complex simulations and integrated building models will unquestionably help us to meet these challenges and approach architecture as an integrative and coordinating design task.

Figure 10. Extended perceptual experiences in a full-scale lab.

Acknowledgements

The illustrations in this paper stem from students' work at Vienna University of Technology. Representations include work made in a design studio context and full-scale experimentation; cordial thanks go to the students involved for their input.

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