Architecture and the Virtual

Towards a new Materiality?

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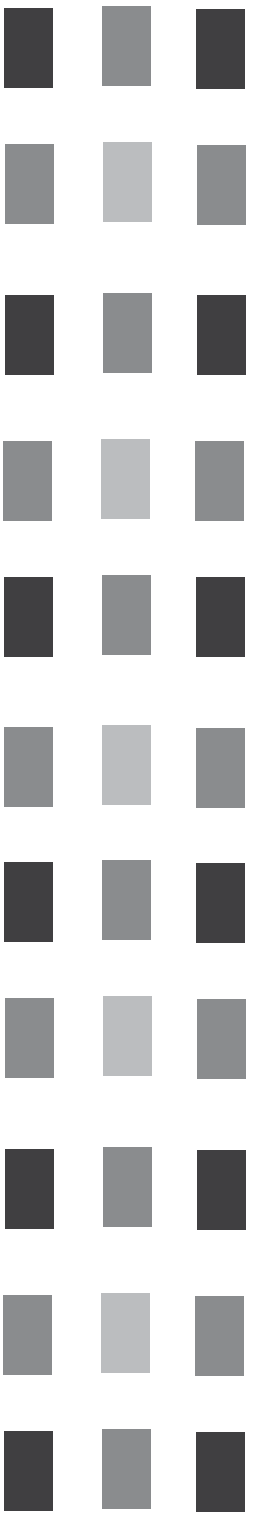

Introduction

The development of digital design is often presented as a threat to one of architecture's essential dimensions: its involvement with the concrete aspects of construction and other building technologies, its materiality in a word. Such is for example the concern expressed by Kenneth Frampton in his recent writings.[1] This concern is easily understandable, given the highly formalist nature of many digital architects' production. Computer-based design appears often to neglect the material dimension of architecture, its intimate relation with properties like weight, thrust and resistance. On a computer screen, forms seem to float freely, without any other constraints than those that are imparted by the program and by the designer's imagination. There is for sure something deeply unsettling in this apparent freedom that seems to jeopardize our most fundamental assumptions regarding the nature of the architectural discipline.

However, should one take the present stage of computer-based design as a permanent one? Some features of the digital scene tend to suggest a negative answer. Actually, far from being jeopardized by the generalization of the computer and the development of virtual worlds, materiality could very well remain a fundamental feature of architectural design. One may furthermore wonder whether the use the computer with its web extensions represents such a departure from the traditional practice of architecture. In many respects, bi-dimensional hand-produced drawings are no more material than computer-based ones.

In this paper, I would like to begin precisely with the general question of architectural design and representation before turning to the changes brought by the computer. Among the leads I would like to follow is the idea that materiality, like almost everything around us, is to a large extent a cultural construction. Physical experience itself is partly shaped by culture, by technological culture in particular. Indeed, our motility, our everyday gestures are indebted to our machines and their specific requirements.

Architectural Representation as a Matrix

When we deal with computer productions, from images to web-based worlds, the term virtual comes almost immediately to the forefront. The accusation of dematerialization usually goes with an explicit opposition between virtual reality and true reality.

Without entering into a philosophical debate in which one usually refers to Henri Bergson or Gilles Deleuze, one may observe that such an opposition is hard to sustain in a domain like architecture. An architectural project is indeed a virtual object. It is all the more virtual that it anticipates not a single built realization but an entire range of them. There is no architectural design without some margin of indetermination that allows for different paths to be followed. One of them, only, will usually be taken.

Despite all the attempts made at a better and better codification of design procedures in order to anticipate as closely as possible the built outcome of conception, this relative indetermination of the architectural project is probably one of its most fundamental features. It enables it to "speak", so to say, or rather to be a matrix of possible narratives regarding the kind of built reality it anticipates. Without this narrative dimension, the project would be a mere technical blueprint.

Returning to the question of materiality, one could summarize the situation by saying that design has of course to do with the realities of the built environment, but its relation to it is ambiguous. There again, what is evoked is rather a range of material effects than a precise, unequivocal single material reality.

The ambiguity of architectural design reflects on architectural representation. As convincing as they may appear, the modes of representation used to convey architectural intentions do not correspond fully to the experience of the built reality. If we put aside architectural drawings, we never see buildings in plan and elevation, to say nothing of the cross-section. The same applies of course to the modernist axonometric view that presupposes an observer situated ad infinitum. Generalizing from this last example, one would be tempted to affirm that architectural representation, just as the cartographic one, presupposes an observer located in an impossible place.

Architectural representation is actually always submitted to contrary tendencies, the quest for verisimilitude and the desire to preserve margins of indeterminacy. Actually, the necessity to balance between these two conflicting ideals might very well account for one of the most surprising features of architectural drawings. The more specific the physical effect aimed at, the more abstract becomes often the representation, as if the fundamental tension I just referred translated into an equilibrium between materiality and abstraction. From the Renaissance on, the drawings representing architectural profiles can illustrate that point. For the Vitruvian inspired architect, nothing was more material than the play of light on the various moldings of a building. Yet, their representation in profile was often surprisingly distant from the effects aimed at.

In such a frame, does the use of the computer imply a clear departure from the traditional practice of architecture? At this stage, the digitalization of design may very well appear as a mere technological advance, a supplementary power offered to

the designer, a power that does not affect the nature of its production.

This is of course not entirely true, for the computer breaks with the immediacy of the human gesture. Between the hand and the graphic representation, a layer of hard and software introduces itself. The machine and its programs are synonymous with a thickness that traditional tools did not have.

One could of course object that this thickness might eventually disappear with the development of more and more advanced interfaces that would make the use of the computer almost transparent. Digital gloves and tactile screens are full of promises, just like camera and laser-controlled feedback systems between manual and digital modeling. The Media Lab at MIT has made itself a specialty of these devices. But for all that the mediation of the machine and its software will not be abolished. The difference between hand- and computer-produced designs is not without analogy with the contrast between a walk and a car ride. What is at stake in both cases is the opposition between man and a couple formed by a man and a machine. Should one infer from that opposition that digital architecture implies a cyborg-like author?[2] This proposition is suggested by various contemporary reflections. Their influence can be traced in many architectural publications.[3]

A different Materiality

If we leave aside the cyborg theme, the analogy with the car is still revealing. Its is quite common to oppose the richness of walk to the impoverishment implied by the automobile, as if, there again, materiality was at stake through the contrast between the plenitude of real physical experience versus the abstraction fostered by a technologically determined environment.

Fortunately, after almost a century of car use, we know that an opposition of this type does not fully apply to the automobile experience. Instead of being synonymous with a dematerialization of the world we inhabit, the automobile has transformed our notion of materiality.

It is not of course in my intention to enter here into a detailed discussion of these transformations. I would just like to insist on some major points.

First, in a car, we don't perceive exactly the same objects as when we walk. Seen from a freeway, a building is generally different from the vision we have when we stroll by. Above all, at the speed of the automobile, objects regroup in order to form new perceptual entities. Our contemporary urban skylines are for instance typical products of the automobile age.

The automobile experience is also synonymous with a series of sensations, from the accelerations and decelerations to the feeling provoked by the wind. Some of these sensations are intimately linked to the use of the engine. We have become so accustomed to acceleration that we tend to forget that the sensations it creates were unattainable in former non-mechanized societies.

In our mechanized environment, between the exhilaration of speed and the perspective of accident, we have both an impression of power and a feeling of vulnerability. James Graham Ballard's famous novel, *Crash*, is centered on this new status of the human body, both empowered and vulnerable, making nothing of miles and being always on the verge of being bruised.[4]

Our very notion of space is altered through the redefinition of perceptual entities, sensations like acceleration, and the change in the existential status of our entire body, that we experience while riding a car. Roadmaps reflect this altered spatiality just as the various signs that help us to orient ourselves when we drive. The most important feature of this situation is perhaps the subtle changes that the use of the automobile infuses in our everyday experience of space. Walking has definitely not the same status at the age of the automobile than in prior times. The driving experience is always there as a limit that define other modes of apprehension of space.

In brief, the automobile has not diminished our physical perception of the world. It has altered it. It has displaced the content and boundaries of materiality.

Using now the automobile as a metaphor, it is tempting to interpret the computer as a new vehicle that induces another displacement of physical experience and materiality. The computer-assisted architect is perhaps like a driver or a passenger embarked in a journey that generates a new type of experience. What are the salient features of this experience? One should of course avoid taking the metaphor too literally. But the automobile analogy is not without interest to approach the digital world and its consequences regarding what we call materiality.

Just like the automobile, the computer presents us with new objects. Whereas the architect used to manipulate static forms, he can now play with geometric flows. Surface and volumes topological deformations acquire a kind of evidence that traditional means of representation did not allow. Other phenomena become also so easy to manipulate that they appear as quasi objects for the designer. Effects of light and texture are among them. The computer enables to intensify or dim light, to vary its parameters, to play in a similar way with degrees of roughness and smoothness, to an extent that makes them almost tactile.

In this process, some dimensions become all of a sudden problematic. In the case of the automo-

bile, the emergence of new pertinent objects is accompanied by the loss of the ordinary sense of distance. With digital architecture, it is scale that appears no longer evident. What is the true scale of the forms that appears on computers screens? Despite photomontages showing people in front of digital projects, it is often difficult to answer this question. Computer imagery is actually in profound accordance with a world in which information and complexity are to be found at every level, a world organized according to fractal instead of traditional geometry.

This world requires a new visual practice based on the capacity to follow the complex maze of interactions between the global and the very local, the general definition of the project and the sometimes minute, sometimes dramatic changes brought by parametric variations. This sensibility is there again not without analogy with the heightened sensory experience of somebody driving at full speed on an uneven surface where the tiniest obstacle can be full of dramatic consequences. Computers immerge us into a fluid, eminently variable world that gives a special intensity to some of our sensations.

Once more, the automobile is only a metaphor that shouldn't be taken too literally. Contrary to the linear track followed by the automobile, the digital world that unfolds under the eyes of the designer is multi dimensional. It flows theoretically in all directions; it is theoretically also fully reversible.

These characteristics are not easily compatible with the necessity for the design process to follow a series of steps, from the preliminary sketches to the ultimate technical specifications, steps that involve usually some kind of interactions with partners, from the architect's collaborators to the engineers and builders in charge of specific technological developments. In other words, computer-aided design cannot be a labyrinthine exploration of the almost infinite possibilities offered by the machine. When form can vary endlessly, choices have to be made; decisions have to be enforced in order to break with the theoretically reversible nature of digital manipulation.

The importance of these choices implies a new attitude based on the strategic evaluation of the potential of evolution of design at critical stages of development. It has been often noted that computer foster a scenario-based kind of reflection. Besides the use of scenarios, diagrams may help the designer to orient himself among the various paths of evolution that digital media make possible.

Diagrams are often presented as pure mental schemes. This approach is not consistent with the true nature of diagrams, namely the fact that they are inseparable from courses of action. They possess a physicality of their own, just as the seemingly abstract notations that choreographers use to note the steps of a ballet. For the better and for the worse, there is by the way a striking parallel to be made between the contemporary, often Dutch-inspired, diagrammatic production in architecture and the diagrams that geopolitics has produced from the beginning of this century. In both cases, what seems at stake is the apprehension of a world populated with targets and objectives, a mobile and fluid world, which requires continuous action.

At a more general level, the computer has been often presented as an extension of the mind, a super memory or an enhanced tool for logical exploration. Such was for instance the way the French anthropologist Leroi-Gourhan approached it in *Le Geste et la Parole*, a spectacular evocation of human progress through the use of technological tools, from the Neolithic period to the twentieth century, from the first trimmed and polished stones to the early computers.[5] For Leroi-Gourhan, human progress was marked by the gradual externalization of functions through tools. It all began with stone knives and axes that extended the capacity of the hand. The final stage was the externalization of mental functions like memory with the computer.

It is indubitable that the computer has definitely something to do with the extension of the mind. But the computer also alters our perception of objects; it extends the realm of our sensations. With the new interfaces that are developing today, it will soon affect our motor schemes. It is already striking to observe how the mere use of a mouse has created new kinds of gestures. Among teenagers, for the better and the worse, the development of videogames has fostered even more specific kinds of reflexes.

Our very perception of space will in its turn be affected by these very physical changes. In films like *Johnny Mnemonic*, *The Matrix* or the recent *Minority Report*, cinema has envisaged repeatedly the changes in the perception of ordinary space that should be brought by the development of sophisticated interfaces between the ordinary space and the digital one. The notion of enhanced or increased reality does convey the idea of a different materiality made possible by the hybridization of the physical and the digital. This hybridization is not yet fully there, but some features of the displacement of materiality can be already observed.

As I said, the visual codes are changing at a surprising speed. We no longer marvel, for instance, at the capacity of the digital media to allow for effects like zooming in and out, and we tend to perceive our ordinary three-dimensional world in the same terms. Zooming is of course inti-

mately linked to the crisis of the traditional notion of scale.

In the age of the computer, the physics of solids and DNA manipulations, materiality is more and more defined at the intersection of two seemingly opposed categories, the totally abstract, based on signals and codes, on the one hand, the ultra concrete, involving an acute and almost pathological perception of material phenomena and properties such as light and texture as they are revealed by zooming-like practices. This short-circuit between the abstract and the ultra-material is, I think, quite representative of the new world of sensations and movements that we are entering today.

In the architectural domain, the coexistence of reflections of a diagrammatic nature with a renewed interest in some of the most concrete aspects of materials is typical of this situation. At an urban level, the GPS is also representative of this immediate contact between abstraction and concreteness. Using a GPS, we are both plugged into a global, abstract geodesic grid, and confronted with our immediate surroundings. Just as the computer is beginning to affect the design of buildings, the digital environment will eventually modify urban design, if only because old problems like the legibility of the urban sequences are now redefined by tools like the GPS.

But how are the intuitions of the architect or the urban designer conveyed to the public that is supposed to inhabit his projects? In other words, can the new materiality aimed at by computer-aided designers concern a larger public who is probably unaware of the reflections developed people like Greg Lynn, Jesse Reiser and others? With its blobs and other strange geometrical forms, their architectural production seems often far away from the common definition of architecture. At the level of the city, the same gap seems to separate the world of computerized urban simulations from the ordinary perceptions of the people.

A digital Environment

Two reasons at least may be invoked in favor of an optimistic type of answer. The first one lies in the way computer permeates everyone's life. The alteration of materiality they tend to promote is thus a general phenomenon. We are all about to inhabit both the ordinary and the virtual worlds. Hence Toyo Ito's famous statement that architects should indeed design for subjects imparted with two bodies, a real and a virtual one. "We of the modern age are provided with two types of bodies, writes Ito. The real body which is linked with the real world by means of fluids running inside, and the virtual body linked with the world by the flow of electrons."[6] Actually, these two bodies are not separated. They are part of what constitutes today's physical presence. The Sendai Mediatheque that was designed by Ito to epitomize this contemporary physical status is revealingly both densely material, reminiscent of heavy-duty naval construction with its massive steel plates, and at the same time fluid, translucent, like a precious electronic device.

I mentioned earlier videogames and their impact on a whole generation the behavior of which has been shaped by bizarre figures running and jumping on gameboy and computer screens. This generation has developed physical and mental attitudes that call for a different kind of space, a space that can be deciphered through systems of clues and series of unfolding scenarios instead of traditional mapping. For this generation, no serious gap must be feared between digital-oriented architecture and its spatial expectations.

Another reason to be confident in the widespread effect of the new materiality that architects are looking for through the use of the computer lies in the fact that contrary to the automobile, the computer is not an isolated machine of the kind that the French philosopher George Simondon called a technological individual,[7] or a super prosthesis adding to man's physical capacity. The computer is only a part of a global digital world that includes entire worldwide networks as well as millions of personal digital assistants. In other words, instead of facing a technological individual, or a prosthesis, we are confronted with a phenomenon that is better apprehended in terms of environment. We are more and more immerged in this environment.

Regarding the question of materiality, this environment provides numerous new opportunities like the possibility to design materials, to shape their properties and appearance, instead of using them in a passive manner. At the Harvard Design School, this theme has been recently explored by a group of professors and students led by Toshiko Mori.[8]

Computer-aided material production seems to abolish the distance between representation and materiality I started from. But this is actually an illusion provoked by the oblivion of the series of interfaces necessary to bridge the distance between architectural representation and material by design.

The true novelty of the whole affair might very well lie ultimately in the generalization of design, as a practice regarding not only buildings and their various technological systems, but also materials and beyond them nature as an engineered reality. In many contemporary landscape projects, nature is no longer an external resource to be drawn upon. It appears more and more as something the

productions of which can be shaped by adequate design. In this technological nature, materiality is permeated by design. The true novelty is not a growing gap between design and materiality but rather their intimate interaction that might challenge eventually the traditional professional identity of the architect or the engineer.

There is undoubtedly a new political responsibility at stake with this potential generalization of design procedures. As Toshiko Mori puts it, "Architects and other citizens must actively make choices about where build, what to build, how to build, and with what to build." One should probably add to the list "when not to build", in a world where the environment and sustainable development have become crucial issues. The real problem of today's architectural scene is in my opinion not so much its possible dematerialization than its lack of clearly defined political and social priorities. The growing success of a designer like Shigeru Ban and his sustainable structures might very well lie, by the way, in the articulation he proposes between a concern for materiality and structural innovation and a political and social agenda a little clearer than usual.

Materiality — and this will be my conclusion — instead of representing an endangered dimension of architectural design will remain a pervasive concern. But this concern is now synonymous with a new responsibility. Its content is changing, and its meaning is yet undecided. One of the tasks of architecture might very well be to throw some light on its present potential.

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Notes:

1 See among others Kenneth Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*, Cambridge, Massachusetts 1995.

2 f. D. Haraway, *Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s*, in *Socialist review*, vol. 15, n° 2, 1985, pp. 65–107; D. Haraway, *Simians, Cyborgs and Women: The Reinvention of Nature*, New York 1991; P. Edwards, *The Closed world. Computers and the Politics of Discourse in Cold War America*, Cambridge, Massachusetts 1996.

3 We have explored for instance that perspective in A. Picon, *La Ville Territoire des Cyborgs*, Besançon, Editions de l'Imprimeur, 1998.

4 J. G. Ballard, *Crash*, London 1973.

5 A. Leroi-Gourhan, *Le Geste et la Parole. I. Technique et Langage. II. La Mémoire et les Rythmes,* Paris 1964–1965, new edition Paris 1991.

6 T. Ito, *Tarzans in the Media Forest*, in *2G,* n°2, 1997, pp. 121–144, p. 132 in particular.

7 G. Simondon, *Du Mode d'Existence des Objets Techniques*, Paris 1969.

8 T. Mori (ed.), *Immaterial/Ultramaterial. Architecture, Design and Materials*, Harvard Design School, George Braziller, 2002.