

# Extending Architecture through Electronic Media

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## Abstract

This paper proposes a philosophy of design in the light of media technology. It will proceed from our perceived and cognitive understanding of space, to the nature of digital / physical spaces, and, finally, their consequences for the design's role in the world. These issues, epistemology, ontology and ethics, are taken from classical divisions of philosophy. The terms design and architecture are used interchangeably to encourage readers to apply this philosophy to their own creative and cultural activities.

## Defining Architecture

Most architects contend that architecture means the design and specification of buildings. But the term has a variety of interpretations – even among architects themselves [Blau, 1984]. The popular press – and by extension the public – assigns the term to everything from fashion to politics. In the computer industry alone “architecture” has variously referred to hardware engineering, software design, corporate networks, and standards of computer interoperability. Quite apart from the building trade architecture in such cases refers to coordination of processes, the coherent structuring of activities and resources.

For the sake of argument, let us adopt this more popular/general definition of architecture to contrast it with its professional meaning. We note immediately that the objective has changed. While the professional definition aims at material construction, the general usage may aim variously at material (digital instruments, 3-piece suits) or abstract results (software, government policy). Or combinations of both (computers and their networks). The difference also lies in the degree to which the term is aimed at a goal, teleologically. In its popular use architecture stresses people (as in “the architect of this policy”) or processes (projecting, coordinating, “architecting”) more than physical products. While in general usage, an architect is a director and coordinator, in the profession he is the designer of spaces – if not actual buildings.

Louis Kahn, one of the twentieth century's premier architects, wrote that there is no architecture – buildings are an act of architecture (1). Buildings may be understood to be an architectural medium. It follows that there may be more than one “act” that architecture can perform. Even if we limit our discussion to the design of useful space, the architecture Kahn describes can be performed through various means and media.

## Epistemology: Space and Embodied Information

But if architectural space is more than buildings, what is it exactly? Before answering this we had better define space – or more precisely – our experience of space. Space itself has long been a subject of philosophical debate and we won't summarize it here. However, a critical landmark in its history was the determination by Kant (and subsequent others) that we are complicit in creating our reality – our view of the world [Kant,1996]. Our “view of the world” includes the totality of sounds, mental images, and the products of perception and cognition.

We take in the world through sight, sound, touch, taste and smell. Our other senses include balance, proprioception, kinesics and a range of subtle sensitivities. External stimuli are converted to electro-chemical signals at the body's perimeter. From there the signals travel through the body "long before" we are actually conscious of them. There is actually a well-determined gap of 1/2 second between a stimulus and our awareness of it [Norretranders, 1991]. Much of the mind's effort during this time is put to editing and sorting these signals, interpreting and relating them for our use. We create space – our holistic "view of the world" – to manage awareness, relate and contrast our embodied information [Kosslyn, 1996].

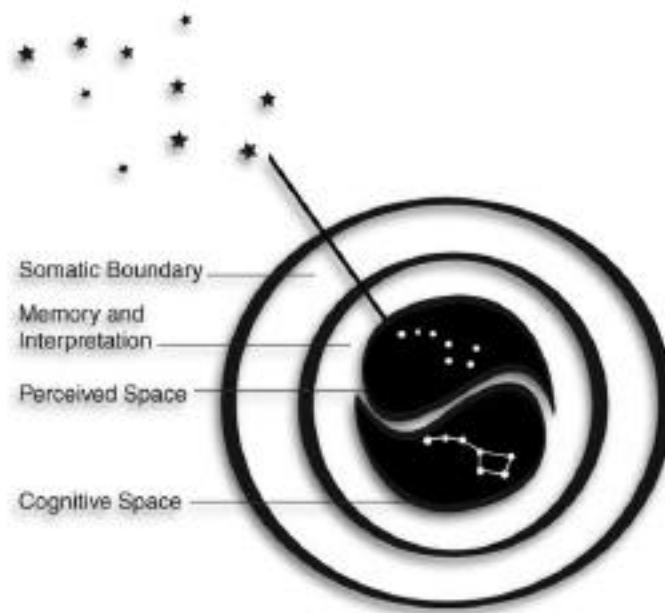


Figure 1. Thought processes make the space.

Signals from the external world pass through our bodies and senses (somatic boundary) and are ultimately interpreted through mental and physical processes as perceived and cognitive spaces. This diagram shows raw signals (from starlight) passing through the somatic boundary (senses and body) and processed by memory and interpretation. This process results in our perception of space (stars). The signals may be co-processed through cognition, resulting in the space of our imagination (constellation).

## Extended Senses

We have technologically extended our senses to observe objects too small or distant to see directly. The list of such devices is large – ranging from radio and television to digital technologies and computer networks. We are increasingly dependent on such technologies to sustain our social and cultural reality. They are part of being human in our time.

Through our technology, radio signals and digital information can be translated into palpable textures, light, or sounds. The signals we process psychosomatically in the manner we have discussed and as shown in Figure 2.

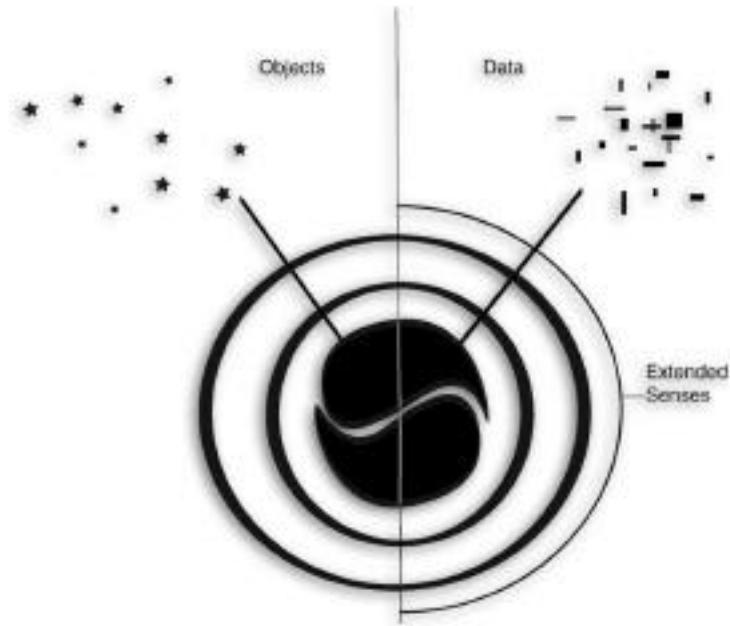


Figure 2. The same thought processes make space even when the senses are extended through the use of technology.

Our senses can be extended to perceived more signals than our bodily senses allow, through the use of technology such as radio, microscopes, telescopes, etc. Computers are another way of extending senses as they can process vast quantities of abstract data and turn it into displays. This diagram shows data passing through our extended senses that can be perceived through the same processes as described in Figure 1. Note that the line between objects and data represents a continuum between extremes rather than a clear division.

But it's misleading to think that our world is derived from discrete sources, mediated and direct. Nearly all perceivable objects have attributes that must be mediated to be seen: the microscopic cell structure of your hand, the magnetic fields of the stars that we see at night. For we only perceive a small portion of the world around us. However, its entities exist both within and beyond our perception – their invisible aspects intrinsic to the whole.

Architects design space and orchestrate spatial experience. Yet we see that space is a product of consciousness, and that our perceived space is derived from a mix of direct and mediated stimulation. An expanded definition of architecture – closer to its common use – would include processes that create mediated spaces as well as those that result in buildings. In the following pages we will consider the resources and processes that support this re-definition of architecture.

### **Coexistence of Material and Mediated Artifacts**

Any complex entity comprises multiple parts. This pertains to machines and buildings as well as to literature and artworks. In similar fashion comparatively simple command add up to elaborate software structures. Software architects create programs from bits of code just as professional architects create buildings of steel and glass.

We perceive complex entities directly or mediate them through our extended senses. In addition, they can co-exist as both material and mediated artifacts. As we have seen, the

distinction between the sensed and mediated worlds is moot. We may choose to view a building directly, or – with an electron microscope – see its intrinsic molecular make-up. The experience differs though the source is the same. An artifact's existence is independent of our sensory capacity. *We simply determine how we want to experience it.*

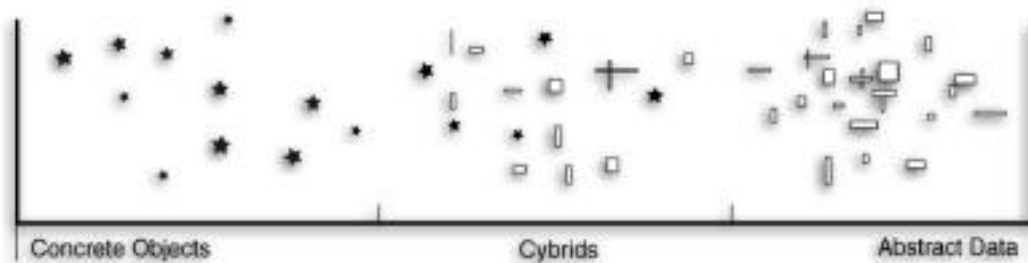


Figure 3. Cybrids – a link on the continuum between concrete objects and abstract data.

The line that separated data from objects in Figure 2 represents a continuum rather than a division. Today there are situations where data and concrete objects work together to create new spatial entities, herein called “cybrids.” A cybrid is a hybrid of physical and electronic spaces.

Digital technology blurs the distinction between the sensory and mediated world further. The computer is a symbiosis of hardware and software. We can touch the mouse and keyboard, but we can't see the software. Hardware is palpable, software is not. Yet one is inoperable without the other. The computer, then, is a hybrid of complex entities. Each has its own level of existence, ontologically, with respect to the user, although they are mutually dependent on each other. Such dependencies between material and electronic entities have great implications for the arts, industrial design and architecture. I have written elsewhere on this relationship – particularly between physical and cyberspaces in design – and use the term cybrid to denote it [Anders, 1998].

### **Ontology: The Nature of Space**

Examples of cybrids already exist in many forms. Buildings with sophisticated security and fire protection systems effectively have a digital model of the building as their detection interface. In others, whose building systems are controlled by electronic signals, a digital model is sometimes used as the building control. The tight coupling between physical building and its digital double is clearest in such examples. The spatial relationship to the source may be more than representational. A building element may be overlaid with a model that reveals associated information [Feiner et al, 1993]. Such a mediated reality would be extrinsic to the physical artifact, and would be apparent only to a suitably-equipped building operator.

There is a strong case to be made for spatial representation of spatial systems. Cognitive scientist Donald Norman has argued that such emulation helps in operating software as well as conventional tools [Norman, 1993]. As building operation systems become increasingly sophisticated, it's likely that they will come to more closely resemble their source or target for control.



Figure 4. Cybrids are the interactive union of physical and electronic spaces and objects.

Incorporating the concept into our definitions of space results in 3 different types of spatial entities; only the second two are examples of cybrids. The first, not a cybrid, shows a complete separation between the physical and electronic environments – a typical example would be an office with a computer network. The second is a partial cybrid entity – an example being an office with a teleconferencing facility. The last would be a complete overlap, i.e. the entity would exist almost entirely in both physical and cyberspaces. A typical example would be a building security or operating systems that could be accessed both physically and electronically.

But it's important here to distinguish between conventional, automated controls for buildings and the cybrid concept. Cybrids promote human/environment interaction, spatially coupling the operating model (simulation) with the source (building). Whereas closed, cybernetic systems operate semi-autonomously with no need for symbolic representation, cybrids are extensions of their users and exist through symbolic/spatial mediation. They are an entrée for users into the cybernetic loop, augmenting their awareness through the automated environment.

Other forms of cybrid operate without direct coupling, or at most a partial overlay of simulation. Teleconferencing rooms within an office suite exemplify mediated space (that of the remote participants) grafted onto a present, physical space. This is a visual version of a more conventional illusion. We feel near to the voice on the telephone despite the fact that our conversation partner is far away. The illusion in concert with the actual comprises a cybrid, even if it is limited to a phone booth.

Other increasingly attenuated couplings include desktops on a CRT with the actual desk supporting the computer, computer networks and the offices they serve, corporate Web sites and their host institutions. In many of these cases the physical environments and their spatial emulations have little to do with one another beyond serving the same users. Cybrids are unions of physical environments (or objects) with electronic emulations of space (Fig. 5). Their coupling may vary between direct correspondence (building security/operational model), situational correspondence (conference room) and mere coexistence (computer networks within a suite of offices).

While it is tempting to understand cybrids simply as intersections of symbolic and physical spaces, the observer is the key element. As noted, mediated and direct experience of space are both constructs of the mind. By extension any union of external spaces must first be assimilated into the observer's spatial construct. This mental space overlaps – even comprises! – both physical and symbolic spaces. Although this appears obvious, it points to a merging of mental, perceived, symbolic and physical artifacts in a matrix of consciousness. This has great implications for how we use space to think and communicate with others.

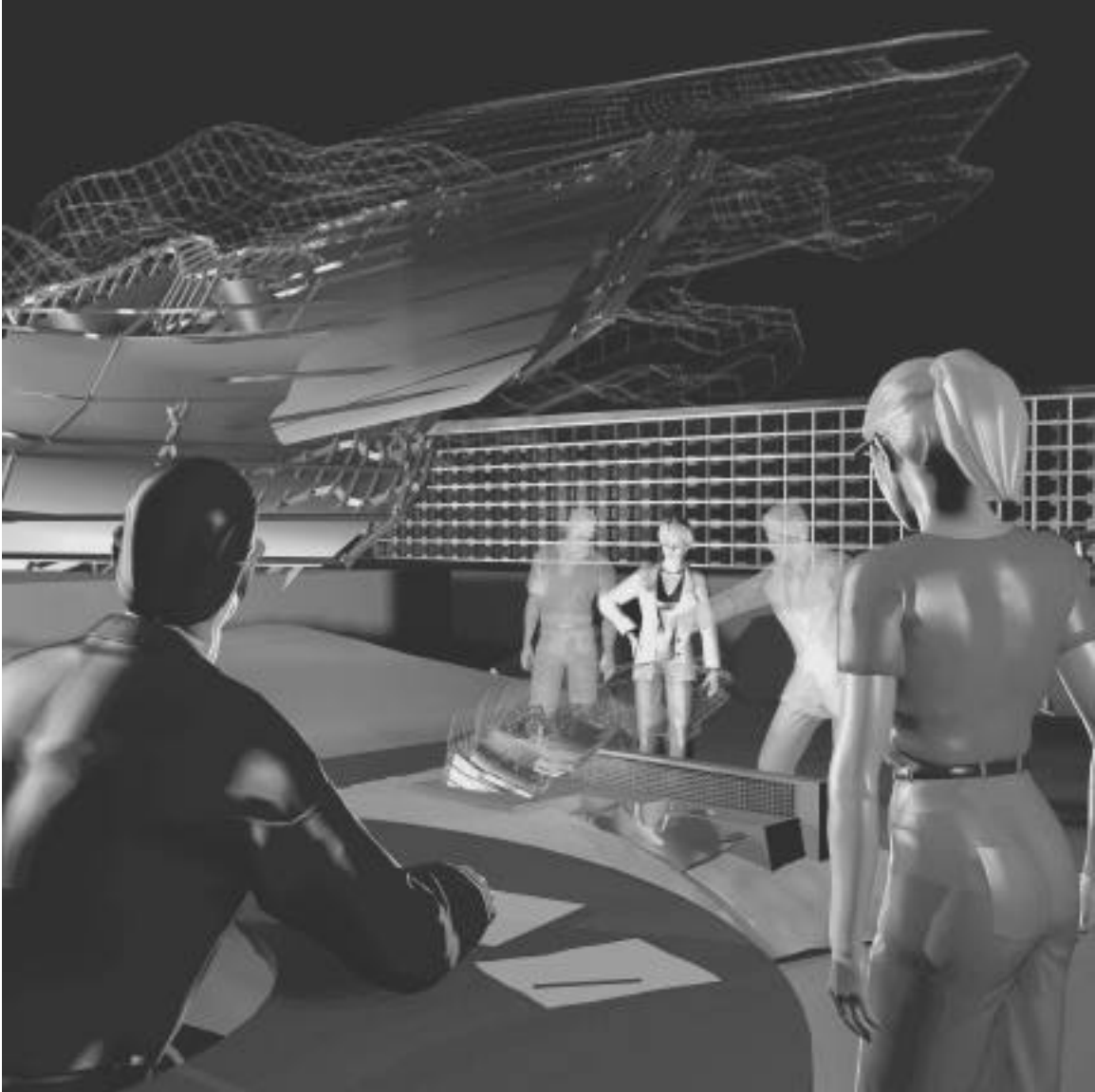


Figure 5. Experiencing the cybrid environment.

This is a rendition of an advanced cybrid. In this image, the people in front of this hypothetical architect's office are observing the architect in discussion with avatars of the remote consultants (background) over a model of a cybrid building. Beyond them, in the distance, is an accessible, full-scale virtual reality model of the project.

### **Ethics: Updating Architectural Processes and Priorities**

To this point we have considered aspects of spatial perception and its relationship to technology. We have also seen how spaces implicit in the use of technology intersect and blend with our everyday perception of space, and buildings in particular.

How might these perspectives influence the practice of architecture and design? To answer this question it is helpful to review the course of a building's design as an oscillation between

physical and symbolic states. To begin with we will stress the process over any particular instantiation of that process – drawing, building or otherwise. These manifestations are here considered to be waystations in the life of a project.

Design is an iterative process that swings alternatively between concept and manifestation. This is part of the social interaction necessary for a project to develop. A designer generates numerous drawings and models for consulting with clients, as well as to assess his progress. In dialog with others the designer gains new insights that, in turn, inform the next set of drawings and models. This feedback loop resembles many design processes in technologies and the fine arts as well – it is characteristic of the social and cognitive act of creating something new.

### **Oscillation in the Design Process**

The following example shows this oscillation throughout the course of a typical architectural project, an office building. For clarity's sake we will begin with the selection of the site for a project. Client and architect determine the site, conduct a survey and collect relevant materials for proceeding. The architect and engineers prepare record documents, drawings and text. Our architect discusses options with her consultants and client – memos and phone calls ensue. Then she prepares sketches outlining the design options for review. Information from the review then informs another, more refined round of design. Products of this work are notes, sketches, renderings – perhaps even a model of the building on its site.

Prior to computers all these models, drawings and records were physically fixed: ink drawings, wood models, pencil sketches on paper. There was a clear distinction between the information underlying a project (program, intentions, data) and the artifacts used to support decisions (drawings and models). Any attempt to revise or update a scheme simply meant making more artifacts.

Once the design is approved, a record of the design is prepared and issued as drawings and text for bidding by contractors. Conversations and exchange of more materials leads to the construction of the building. While many architects see the construction of a building as the end of their involvement, the project lives on for the building's occupant. Beginning with move-in schedules and furnishing layouts, the production of post-construction artifacts includes drawings for building changes, additions and leasing. And, ultimately, demolition. The project spans from the drawing table to the archive. A range of incarnations mark its life over time.

The life of the project is measured by a pendulum swing between concepts and the physical artifacts that manifest them. We may even consider the building itself to be an ephemeral “printout” of the project at a specific point in time.

A re-assessment of the project in the light of current technologies could result in improved economies for all parties and the project overall. These economies may result from improved communication over computer networks on one hand, and on alternative means for presenting – or manifesting – the design for review. These benefits are well-documented and need not concern us here.

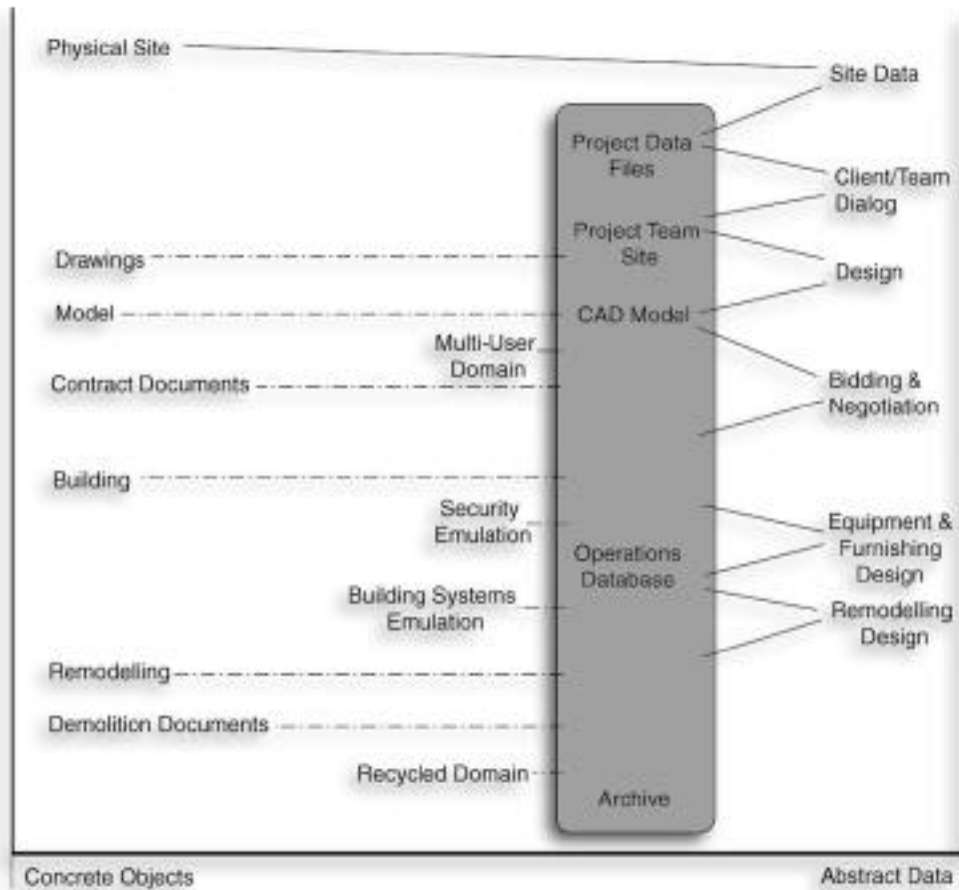


Figure 6. Oscillation in the design process.

This shows the continuous oscillation between abstract data and concrete artifacts over the entire life of the project. This is a diagram of how a hybrid project would work in the context of modern information technology. Physical artifacts are temporal incarnations of the project. Envisioning a project in this way lets us encompass all participants, information and artifacts related to the building throughout its life – from conception to demolition. The picture shows the continuous oscillation between abstract data and concrete artifacts throughout the life of the project.

Instead, let's look at the project itself as an information environment, one that is manifested discretely on a range of dimensions and scales. This changes the project from being aimed teleologically at building, to one encompassing all participants, information and artifacts throughout its duration.

A computer-aided design, or CAD, file is a record of design decisions. The database can be represented in a variety of ways: as lines on a screen, a rendered video-projection, an animation, or as printouts in two or three dimensions. A line – or more properly the data from a line – drawn at the earliest stage of a project may persist throughout the project's duration. The



line is part of the conceptual computer model, part of the project's cyberspace, that may be manifested before, during, and after the project is materialized as a building.

In the light of the foregoing discussion the role of the line can be emulated by the project space itself. By "project space" I mean the project's comprehensive environment: the totality of its physical site, the media spaces used in its development, the environments used for meeting, planning and production and spatial resolution of the client's needs. All printouts from this comprehensive information space are derived, lower-dimensional renditions of the project space: paper, models, videos, virtual reality walk-throughs, or buildings.

This would matter little if the project were the design of a bicycle shed. But with complex projects – like an office building – the information space of the of the project team can live on to be reused in the space occupied by the project's tenant. A 3D multi-user environment used to host design-team meetings can be re-utilized as a conferencing facility by the cybrid owners. The reuse, remodeling and retrofitting of such spaces is nearly cost-free compared with the physical alternative. The media and digital spaces created early in the project (like the CAD line) may persist throughout and outline any of the project's future manifestations.

Architects and designers – specialists in spatial design – can extend their services once they grasp the power of the symbols they use. Symbols embodied in the computer take on a validity of their own independent of their referential role. Hovering at the boundary separating information from the physical world, their increasing role in projects dampens the swing between abstraction and materiality.

This dampening results in faster execution of the project, savings to the client and the designer, more versatility in communications and flexibility [Anders, 1999]. Such a change in process can radically affect its products. For example, the physical model of a building could be augmented with alternatives that, while apparently part of the model, are not physical. The project space is discretely manifested in the material world – at any scale.

Another example. Conventionally an architect creates a master plan, say a ten-year plan for the development of a campus. The unbuilt structures exist, but only in the minds of the planners. In a cybrid project, however, the master plan has an autonomy, its buildings may be used long before they are materialized.

In some cases they may never be built – yet still be useful as on-line meeting places, work areas and archives. In this sense the construction of a cyberspace may preclude the need for actual construction. It remains coupled, conceptually, with any manifestation of the project, yet remains symbolic – accessed and manipulated only through our extensions and the Internet.

This can have a profound effect on the ethical practice of architecture. If we accept the role of an architect as a designer of space, and that the symbols used in the architectural process have their own validity, where does the architect best spent his time? Designing material buildings that serve a limited, local population? Or designing spaces that are equally useful, yet can be used by the world – connected through the Internet? Is his time best put to depleting limited resources, encumbering the environment, crowding our cities? Or harnessing our spatial imaginations through technology?

## **Conclusion**

Cybrids offer an alternative to conventional architectural practice that points to less materialistic solutions to client's needs. We have outlined here a philosophy for this emergent form of design, showing its epistemological, ontological and ethical consequences. Although the discussion has stressed architecture, it affects any discipline whose products are symbolic

and spatial and extends to engineering and fine arts as well. Seeing the product of design as an on-going process rather than a fixed object shows the dual nature of artifacts. Cybrids reconcile these natures, material and symbolic, within electronically augmented artifacts that enhance our awareness, our grasp upon the world around us.

## Notes

1. "...there (is) no such thing as Architecture; there (is) the spirit but no presence whatsoever. What does have presence is a work of architecture, which at best must be considered as an offering to Architecture itself..." Louis Kahn lecture at the Aspen Design Conference, 1973. Published in A+U Monographs.

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