Networks and Architecture: Creation, Dissolution, and Evolution

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INTRODUCTION

Networks have a number of effects on our perception of built space. In the form of a web-camera they can allow one to see a coffeepot in London,[1] as radio to listen to old Beatles songs, and as television to watch our favorite sitcom—nearly simultaneously. ATM machines can augment or even replace traditional bank halls.[2] Intelligent spaces can monitor who passes through, adjusting their environment accordingly.[3] As a profession concerned with creating those built spaces, the changes wrought by networks require our attention.

Before discussing the subject at hand, a disclaimer should be made. Note that nowhere above does the word "computer" appear—this is intentional. Instead the term "network" has been substituted; for while the changes discussed in this paper can be wrought by a computer network, they can also stem from radio or television networks. Furthermore, with the development of technologies such as WebTV or interactive cable television, the definition of a "computer networkî is blurring into other forms of networks. To limit the discussion to traditional computer networks, then, would be potentially to exclude some instructive examples.

A network, as a forum for electronically mediated communication, is unique in its level of interactivity and its ability to act as a common reference point. Traditional broadcast television and radio stations are essentially one-way streets; their content originates at a fixed location and is disseminated to the end consumers, who access the programs by tuning in with their television or radio set. Because many different people can receive those programs, it is possible for a uni-directional network to act as a common reference point between people. Water-cooler discussions about the football game last Sunday are possible, and a community of sorts can be formed.

Going a bit further, when the networks take on bi-directional status their effects become particularly pronounced. The difference is similar to that between a traditional stage play and a performance by an improv troupe. In a production of Hamlet for example, the cast performs on stage, and the audience observes that performance from their seats. While they physically inhabit the same room, a number of architectural and behavioral cues serve to effectively divide the theater into two separate spaces. By contrast a performance of an improv troupe—in the same room—depends on audience interaction to be successful. Audience and performers inhabit the same space where traditionally two would exist.

Translating the analogy into network terminology, compare the following three experiences: Sitting on a couch, sitting on a couch watching a broadcast television program, and sitting on the couch watching a program over an interactive cable system. In the first case, only one space exists—the room in which you sit. Only those in the room with you can interact with you, and the room frames your experiences. In the second, two spaces exist: The room, and the room (or rooms) visible on television. Your experiences extend beyond built space and into network space; but there are two restrictions. Your experience of the network space is fixed and entirely dictated by someone else such as the show's director. Additionally, in order to interact with someone they must still be in the room with you.

It is the third example that has the greatest implications for architecture. A sort of space has already been created by the television program, which draws the viewerís attention away from the real world and into the network world. The shift from broadcast television to interactive cable, however, adds other aspects to the experience. Because of greater bandwidth capability multiple camera angles might be broadcast simultaneously, allowing the viewer to have a role in defining his or her experience.[4] A chat room might be maintained instead, allowing viewers to comment on the program in progress; adding a third space to the two already available.

This example shows the kind of changes that a network or group of networks can have on an architectural space. Three different operations can take place in this example: creation, dissolution, and evolution.

CREATION

The first operation to consider is creation. In this context, what is created can be either a link between two real spaces; or else one of the spaces themselves can be created. Examples of the former include a telephone call or television news broadcast. The latter situation would include a fictional radio or television program, or the Worldwide Web.

Both types of creation are germane to our discussion here. The first, a simple link between two physical places, can have the effect of distorting our impression of the physical world. The world never quite seems as big as it once did after you've spent the night listening to the BBC World Service's morning report to Britain at 2:00 a.m. The bridging of vast physical distances via the network creates an awareness of events elsewhere that is almost impossible to duplicate by reading a foreign newspaper or listening to a fellow traveler's stories. This is understandable, as network communication carries an immediacy not possible through other forms of communication. The print stories filed during the Gulf War conveyed much the same information as the televised reports, but public attention was focused primarily on the television because it showed what was happening now. Similar impressions were generated surrounding the Soviet coup attempt in 1991 and the Tiannenmen Square protests in 1989.[5] Simply put, the immediacy possible over the various networks

allows for a greater distorting effect. The world seems smaller than it did when it took communication days or months to span it.

Turning to the second, more involved, type of creation it is possible to see even greater implications for architecture. Here an augmentation of the real world takes place; the fictional apartments of television sitcoms, for example, do not exist except via the network. Our perception of the spaces around us is still distorted, but that distortion can act in more varied ways because the network spaces we access can be defined more creatively.

Consider that to the people involved in a network-based community, a significant portion of their time is spent sitting in front of either an interactive television or computer screen, reading the messages sent to them by other people in that community. As they perform this activity, is the crucial aspect of their existence their physical location in front of a computer screen (that could be located in a university, their living room, a laptop as they wait to catch a plane, or virtually any other place on the planet)? Or is it rather their virtual "location," with their e-mail inbox open and a certain web page visible in their web browser?

The above question raises an interesting issue. The concepts of space and inhabitation have to be radically rethought when they take place over the network. Television can be said to be spatial, in that the images presented in any one program help build an awareness of the world of the program. Whether that world is one of a television sitcom like Friends or a sports event like the World Cup the totality of experience offered by the program as a whole allows the viewer to experience, even if temporarily, a complete "space." Different television programs then, might be compared to separate buildings, on their own streets (television stations) in separate cities (networks).

While television can be said to be spatial, is it possible to speak of the "space" of the Internet—a medium that is primarily textual? Clearly it is possible to spend time performing activities via the Internet, such as shopping or communicating with others.[6] But is a user truly inhabiting the Internet, or are phrases such as "home page," "web site," or "in a chat room" simply misnomers? To argue from an extreme, turning the lights off in a room does not remove you from the space; it simply prevents you from experiencing it fully. After some exploration, it is possible to build a mental map of your surroundings even without traditional visual cues.

Similar to the example above, spending time performing activities over the Internet (and the total immersion possible when actively pursuing those activities) makes a strong case for the existence of an "Internet space." That most of our experience with Internet space comes through textual rather than graphic representations certainly changes our perception of that space. But it does not mean that the space is not there, waiting to be explored and created.

Networks, then, affect our perception of space by creating links to other spaces. Some of those network links join two already existent spaces, while at other times the network allows the creation of entirely new spaces. These new spaces can be inhabited in at least a limited way, drawing our attention from the real world around us and into the network world. As William Mitchell has noted, "[i]nhabitation is taking on a new meaning, one that has less to do with parking your bones in architecturally defined space and more with connecting your nervous system to nearby electronic organs".[7] Architects must be aware of the distortions networks cause in our perceptions of space, and architecture schools must be prepared to expose students to those distortions.

DISSOLUTION

An opposing development that is seen in the rise of networks is that of dissolution. With the greater interconnectedness fostered by the network, spaces that used to have meaning have been reduced to relics, if not disappeared altogether. In 1993, Tracey LaQuey Parker wrote:

Imagine discovering a whole system of highways and high-speed connectors that cut hours off your commuting time. Or a library you could use any time of the night or day, with acres of books and resources and unlimited browsing. Or an all-night, nonstop block party with a corner table of kindred souls who welcome your presence at any time. Well, that's the Internet.[8]

That Parker used analogies to spaces and architectural form is telling about the relationship between networks and built form. Many of the activities available via the network can also take place in a physically constructed space, which raises the issue of competition between constructed space and networked space. Will the physical world suffer because many activities have begun to take place over the network? Certainly there will be—and indeed already have been—some changes that deserve closer inspection.

Perhaps the most noticeable in terms of its general impact has been the gradual dissolution of banks—not in terms of the companies themselves but rather the buildings that house them, and specifically the spaces where the public conducts their banking business.[9] As computer banking networks and their attendant ATM machines have been introduced into ever more locales, one's need to go to a traditional bank hall, with rows of tellers behind iron grates, has diminished considerably. Instead paychecks can be deposited automatically while normal banking transactions (withdrawals, balance inquiries, etc.) can be performed at an ATM located anywhere. Going further, some banks allow their customers to bypass even special-purpose objects like ATM machines and conduct their banking via the Internet.[10]

This migration of banking activities from physical to virtual is being repeated elsewhere as well. Our own architectural profession is seeing some of its programs dissolve. New York City's Department of Buildings is planning to introduce online plan submission, allowing architects to avoid physically visiting the inspector's office to drop off a set of drawings.[11] Even architecture schools are getting into the act, with schools such as Ohio State offering extensive class documentation,[12] options for homework submission, and student-instructor interaction over the network. At the far end of this process, the new Graduate School of Architecture began teaching classes entirely over the network in January 1999.[13]

In the judicial field Project Local Motion, the brainchild of Stanford professor Joseph Grundfest, is a network-based discussion platform that is designed for judges and attorneys to file briefs and even present arguments.[14] While it is extremely unlikely that the entire courtroom process would ever be conducted solely online, developments like these are an example of the potential disappearing act that some activities will play via the network—possibly taking with them the spaces used to house those activities.

With these sorts of effects, the need for awareness among architects becomes even greater. Not only is the nature of physical space being altered by the introduction of networks, but the primacy of the physical world might also be challenged as activities move into the virtual. It might be fruitful, then, for architects to have a role in defining these network spaces; cynically as a way of job preservation but more optimistically as a way of applying our skills of spatial organization to the network spaces being created. While it is highly unlikely that networks will overtake physical space in their importance in the lives of the average person, enough of a change is already being effected to demand our attention.

EVOLUTION

Of course, to gain access to the virtual spaces of the network a person needs a certain set of tools with which he or she is at least passingly familiar. Those tools can be incorporated into our structures or even into ourselves—which leads us to the question of evolution.

Both architecture and humanity have been evolving for centu-

ries. Architecture has progressed through various aesthetic styles from Egyptian to Post-Modern, yet perhaps the more fascinating change has come as buildings have ceased to be inert combinations of stone and wood and have started to take on changeable characteristics. Windows and doors that move can be seen on one end of the spectrum, while projects like Bill Gates' house "where computer chips keep track of who's inside and cater to their senses, regulate climate, play their favorite music, and present their favorite paintings on flat-screen monitors,"[15] exist on the more extreme end.

The network, then, is the latest step in a centuries-long tradition of buildings becoming more active participants in our everyday lives. This adaptation does not happen immediately, however. First, buildings experience these new developments as objects to be housed—as TV sets required tables on which to sit, bathtubs used to have feet and electrical wiring was in effect stapled to the walls of a room. As these developments became more accepted by the general populace, however, and as architects developed the ability to deal with them in architectural terms, previously discreet objects can become absorbed by the structure itself. Televisions become flat panels (possibly installed within a wall), bathtubs and showers are built into purpose-built alcoves, and electrical wiring is contained within stud walls and raised floors.

As buildings become more complex in response to new technological systems, another form of evolution also occurs. New programmatic uses arise, and require new building types in which to operate. The railroad required the development of the railroad station; television needed television studios. Computers have changed some coffee shops into cybercafes[16] and created wholly the gallery of arcade games.

Architecture is thus evolving in response to the introduction of networks. The nature of a space might be allowed to change depending on who passes through it. Previously interior spaces such as a living room become charged as a new "front door" to the house; families could encounter visitors not on their front step but on the telephone or via the computer. Even more changes are imaginable as the technology of the network continues its integration into architectural form.

Beyond the direct changes that the network has caused in architecture there is a second, more indirect, set of changes. Not only will the built form of architecture be redefined, but the nature of the people who inhabit that architecture is also open to redefinition. This evolution of humanity into network-inhabiting cyborgs comprises a more surprising type of evolution.

In 1960 Manfred Clynes and Nathan S. Kline asked the question:

"What are some of the devices necessary for creating self-regulating man-machine systems? This self-regulation needs to function without the benefit of consciousness, in order to cooperate with the body's own automatic homeostatic controls. For the artificially extended homeostatic control system functioning unconsciously, one of us has coined the term Cyborg."[17]

While Clynes and Kline were writing about the tools that would allow someone to inhabit outer space, the same question might be asked about inhabiting a network. It should by now be clear that it is no more possible to inhabit the network without a radio, computer, or television than it is to visit Titanic without a submersible or explore Mars without a space probe like Viking or Pathfinder. To be able to conduct any useful business in those places, the operation of their respective tools must be similarly natural.

To tune in to your favorite television program, you don't need to know exactly how the TV operates; but to watch with any enjoyment you should know immediately how to adjust the volume, change channels when necessary, or start the VCR. In the same way, browsing the Web and talking with people in a chat room is much more useful when you're not constantly trying to learn how to use Netscape, or how to control and present your online persona. The

more natural your command of your actions on the network the more truly you can be said to have an online personality.

In that crude sense, then, many of us have already become cyborgs. In his 1965 book on cyborg evolution, D.S. Halacy Jr. noted that cyborgs at their simplest are merely humans with tools.18 But in some aspects we are approaching a much more integrated state of cyborghood. William Mitchell in City of Bits writes:

"Anticipate the moment at which all your personal electronic devices—headphone audio player, cellular telephone, pager, dictaphone, camcorder, personal digital assistant ... electronic stylus, radiomodem, calculator, Loran positioning system, smart spectacles, VCR remote, data glove...pacemaker ... and anything else that you might habitually wear or occasionally carry—can seamlessly be linked in a wireless bodynet that allows them to function as an integrated system and connects them to the worldwide digital network ... Where these electronic organs interface to your sensory receptors and your muscles, there will be continuous bit-spits across the carbon/silicon gap ... You will have become a modular, reconfigurable, infinitely extensible cyborg."[19]

How do these changes affect our built spaces? With aspects of the network affixing themselves both to our buildings and to ourselves, the relationship between people and the spaces they inhabit will be moderated by our relationship to these network appliances. Localized space controls like light switches and thermostats, which are currently part of a building, could become part of our cyborg half—changing which lights they control as we pass through our house. Architecturally, changes like these will demand a response similar in nature to that demanded by HVAC, electrical or security systems.

As the evolution from person to cyborg continues, those buildings and spaces that are not information-enabled will be viewed differently than those with full access. These differences can be exploited by architects in much the same way that an artist like James Turrell operates. By placing the viewer in a darkened space, Turrell is able to achieve spatial effects that would be impossible in a fully lighted space. Similarly, by controlling the level of network access a space can offer, architects can emphasize its physical aspects. This distinction between network accessible space and those areas without access is not possible without the network, and in fact will become more meaningful as the network continues to pervade more areas of our lives.

CONCLUSION

Given the network's potential to greatly affect our awareness and use of the physical environment, it becomes necessary for the architecture profession and its educational institutions to formulate a response to these changes. Just as the development of electricity, concrete, or structural steel changed the way architecture was practiced and taught, so too will the rise of networks. At the least, we should be prepared to acknowledge these changes; minimally by making sure the buildings we design are wired for network access or, if we choose to not connect our structures to the networks, this choice should be undertaken purposefully and not in ignorance. Our curricula and design problems should be structured to expose students to this choice.

To truly come to grips with the networks' potentialities, however, will require a more imaginative response: at the very least the virtual spaces of the network will have to be designed—which architects are eminently suited to do. In fact, the architecture of network space can be fundamentally different from the architecture of physical space. Buildings experienced solely through the network (whether on television, Internet or otherwise) need not strictly follow the logic of the real world. Structural requirements might be denied, or seemingly small objects (a phone booth, Snoopy's dog-

house) might contain impossible spaces (cloisters, bedrooms, or swimming pools).

In the physical world, the network and its "inhabitantsî will require adaptations to the physical spaces they inhabit. Buildings will have to be wired for access, or constructed to allow radio transmissions to penetrate (or be blocked from) certain areas. Ports will have to be provided for a person's laptop, cell phone, or personal data assistant. Ideally these augmentations to a space will be reflected in the space itself; hopefully more inventively than simply by providing more outlets and cable jacks.

Of course, architects should also not abandon the solely physical world. At least for the foreseeable future a significant portion of the population will not have the economic resources to truly experience life on the network; more ideologically there are qualities of experience that can best be emphasized through built work, which can hardly (if at all) be provided through the network. Just as the development of photography allowed painting to emphasize techniques unavailable to the camera, so too can the development of the network allow architecture to emphasize its strengths.

As a case study, a comparison can be drawn between online bookstores such as Amazon.com and traditional bookstores like Borders. Faced with the increased ease and selection offered by a network bookstore, traditional bookstores have started to emphasize "being thereî by offering more than products; visitors can relax in a cafÈ to read a magazine, chat with friends, or listen to folk music. By offering more than a business transaction, the bookstore can become an opportunity for creative architects to emphasize the multi-use qualities of physical space—which cannot be duplicated over the network (yet).

The space of the bookstore, however, could also be augmented by a network. If a book is not in stock, the store's computer system can send an order to the publishing company. The cafe might provide Internet access or televisions for patrons to use; and of course music from the radio could be piped in through speakers. Some network accessories might even be for sale as well, like an electronic book that downloads various texts from a central computer via the Internet.

While parts of this example are admittedly hypothetical, it should be enough to indicate the kinds of responses available to the introduction of the network. Whether the reaction is to deny, accommodate, or embrace the network is a decision each architect and student can reach on his or her own based on whatever values we hold. But a reaction must be made because the various forms of the network already are among us, affecting the world we inhabit as well as how we perceive that world.

NOTES

[1] For more information on the first known web camera, see <http://www.cl.cam.ac.uk/coffee/coffee.html>

[2] William J. Mitchell, *City of Bits: Space, Place, and the Infobahn.* (Cambridge: MIT University Press, 1995).

[3] Aaron Betsky, "Machine Dreams,î Architecture (Jun 1997): 88-91.

[4] Susan Gregory Thomas with Jack Egan, "The Networked Family," *US News & World Report* (1 Dec 97): 66-80.

[5] Tracey LaQuey Parker's, online book "The Internet Companion, 2nd Edition" describes these and other online events. <http://www.obs-us.com/obs/english/books/editinc/top.htm>

[6] Lorrie Grant, "I Lived On-Line for a Month," *USA Today* (14 Apr 1999): 1A-2A.

[7] Quoted in Aaron Betsky, "Machine Dreams," *Architecture* (Jun 1997): 88-91.

[8] <http://www.obs-us.com/obs/english/books/editinc/top.htm>

[9] William J. Mitchell, *City of Bits: Space, Place, and the Infobahn.* (Cambridge: MIT University Press, 1995).

[10] Huntington Bank is one institution already offering these services. <http://www.huntington.com/webbank/personal/ibank/index.shtml>

[11] Jerry Laiserin, "Automated Approvals," *Architecture* (June 1997): 194.

[12] Assistant Professor Steven Turk is one example. <http://www.arch.ohio-state.edu/arch/faculty/slt/site/cover.htm>

[13] Lee D Mitgang, "Cyberspace Replaces Classrooms in Internet Architecture School," *Architectural Record* (Dec 1998): 36. The newGraduate School of Architecture can be reached on the network at <http://www.newgraduate.org>.

[14] Jesse Freund, "The System on Trial," *Wired* (Dec 1998): 78.

[15] Aaron Betsky, "Machine Dreams," *Architecture* (Jun 1997): 88-91.

[16] Ann C. Sullivan, "Wired on Java," *Architecture* (Jun 1997): 116-121.

[17] Quoted in D.S. Halacy Jr., *Cyborg—Evolution of the Superman.* (New York: Harper & Row Publishers, 1965).*

[18] Ibid.

[19] William J. Mitchell, *City of Bits: Space, Place, and the Infobahn.* (Cambridge: MIT University Press, 1995).