

Anthropic Cyberspace:
Defining Electronic Space from First Principles

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Abstract

This paper proposes principles for the design of human-centered, anthropic cyberspaces. Starting with a brief examination of our cognitive use of space, it suggests that we address cyberspace as an extension of our mental space. The paper proceeds with twelve concepts based on scientific and cultural observations with respect to individual cognition and social interaction. These concepts are general - not specific to any culture or technology. In the accompanying arguments the author expands on these concepts illustrating them with examples taken from conventional and electronic media, space and cyberspace. The author hopes with these conjectures to begin a discussion on the anthropology of space and its emulation.

Space to Think

The field of cyberspace design is populated by those working at the boundaries of their professions as artists, designers or engineers. Distinguishing nascent principles of cyberspace design from those of its tributary disciplines is difficult since cyberspace depends on the vision of its contributors - each working within their own fields. Instead, it may be more useful to address cyberspace at its root level, understanding cyberspace as an extension of our consciousness. Doing so allows us to discover principles innate to the medium rather than prejudicing its development with values of pre-existing disciplines.[1]

Examining cyberspace on the basis of first principles requires us to understand what cyberspace is, how it supports human activity and aspirations. If we characterize cyberspace as the spatial reference used in electronic media, we are still left with defining space itself. For what we experience as space is actually the product of complex mental processes.

The dimensionalized environment of thought and experience is a powerful tool for cognition. It is the array of sensation and thought in a matrix of our own making. Itself an artifact of cognition, space only contains the products of mental processes. Moreover, all objects of our attention are imbued with meaning, whether through the deliberate signs of our culture, or through the construction of our mental image. Concrete objects undergo cultural and linguistic manipulations before we are even aware of them.[2]

This transforms all objects into subjects. Distinctions between physical and symbolic artifacts are leveled-out in this process, taking the same status. Distinguishing between a brick and its image becomes a matter of perception and cognition rather than a biased polarity between reality and simulation.

Anthropic Cyberspace

This is crucial to realizing cyberspace's potential. By understanding the human-based (anthropic) relationship between space and information we can see cyberspace as a means for appreciating information - turning it from data into knowledge. This informs the design of cyberspaces that extend our innate abilities, anthropic cyberspaces.

The following pages propose twelve principles for the design of anthropic cyberspace. They are stated as general issues of human behavior and followed by illustrations taken from conventional and electronic media. The diagrams and concepts depend for their validity not only on scientific observation but also the themes, motifs and archetypes of cultural experience. For this reason the present images are archaic and

concrete though the concepts themselves are highly abstract. Though they are subject to critique and change, I hope with them to begin a discussion on the anthropology of space and its emulation.

<insert image 1. Percep/cog.jpg here>

Caption:

This diagram presents a cognitive model of space. The outer circle represents the body's sensory envelope, the inner represents the mental space of imagination divided into perceived space above and cognitive space below. Impression and expression are shown as diagonal lines extending beyond the body envelope.

1. Space is a mental construct that conditions our relationship with the world.

We use space to manage sensory and cognitive phenomena. Its emulation, cyberspace, is the spatial reference evoked in electronic media. These media extend us beyond our bodies and locality, thereby changing our cognitive model of the world and our relationship with it.

The electronic extension of our senses grafts new perceptions onto a prior construct, the mental map of our context. The higher the dimensional quality of such extensions, the easier it is to assimilate them into our conventional understanding of space. We notice this in our engagement with high-resolution graphics versus text or other low-resolution images.

Ease of assimilation is one of the reasons that the concept of cyberspace has such popular appeal. Media images of cyberspace treat it as a deep, dimensional environment devoid of gravity and material consequence. It is the space accessed through computer media, the modern counterpart of Alice's looking glass.

Yet cyberspace predates computer graphics. The telephone gives its remote users the illusion of being in the same room, for instance. There is a momentary collapse of the space separating them. Hanging up the receiver restores the space to its normal dimensions.

Whether space is evoked passively - as on the phone - or deliberately through constructed environments, the users' interaction in space has important social and psychological consequences. Social spaces, the traditional realm of architecture, affect the behaviors of their occupants. [3]

We see this in the reciprocal relationship between architecture and the activity it houses. Behavior appropriate in a bar, for instance, is unacceptable in a church. Environments temper the actions of their occupants. For this reason cyberspace is not only an extension of our perceived space but an expansion of our social environment. This has already begun to affect cultural and social relationships in fundamental ways.

<insert image 2.Bodyspace.jpg>

Caption:

Our bodily experience conditions much of our thought. The body's relationship to the perceived world is a basis for cognition, language and culture.

2. The body both senses and measures the world, forming its subjective center and the foundation of thought.

The body is the bridge between ourselves and the world. Our world-view relies as much on our body's senses as it does upon the environment itself. Standing, we view the world at eye level. Our posture establishes verticality by day, horizontality by night. We see, hear, smell - even taste - with a frontal bias owing to our physiognomy. Up, down, left and right, back and front are terms used to describe the directions and orientations of our world. These terms are anthropocentric, derived from our bodily experience.[4]

Though we measure space objectively in inches, feet, and meters, our presence in the world is more subjective. It depends on the body as the measure of things and sets our standards of scale and propriety. We come so much to expect some sensations that they become transparent to us: the pressure on our feet as we walk, sunlight overhead, the horizon uniting earth with sky. Deviations from these expectations causes discomfort and anxiety. We take for granted these patterns, our assurance that the world is right.

Representations of space - paintings and photographs - play upon these expectations for specific effect. [5] Distorted perspectives and viewing angles unsettled viewer, while a serene "realistic" image instills tranquility. Reasons for such emotional responses are complex, but may be explained this way: our body-based, haptic model of space is the standard against which we measure difference. Too much difference - too much new information - causes distraction and stress. Too little will at first calm, then bore us

This knowledge is useful in the creation of information environments. Emulating haptic space in cyberspace capitalizes on innate methods of orientation. Knowing up from down, right from left, is important in relating conditions of any space - physical or not. More importantly, these abstracted body references are a common language shared with others. Any information space that is used collaboratively for work or entertainment must acknowledge this language. Otherwise parties will be distracted by differences between their spatial expectation and experience. If the sole purpose of the cyberspace is to challenge these expectations there is no problem. But if the space is created as a normative backdrop - a container of information distinct from itself - it should be informed by the space of our expectations, the haptic model. Though we are physically absent, the shadow of our bodies is implicit in anthropic cyberspace.

3. The body's relationship to its environment is an a priori condition for social interaction.

Beyond relating to the objects of our world, we relate to one another. Bodily presence is the foundation of social environments in both human and animal populations. These environments extend our bodily zones of privacy to that of territory. They manifest themselves as property, neighborhoods, districts and states for reasons of defense and affiliation. [6] These zones have only a psychological and social existence and cannot be seen directly. Yet they are present in socially-accepted behaviors, the placement of furnishings, and the shapes of buildings.

Viewed discretely, they reveal our cultural dispositions, gender, and even pathologies. Viewed collectively, they form the context of social interaction. For example, we are more likely to converse with someone facing us than one facing away. A group facing an individual exalts him with its focused attention, a fact that influences the architecture of theaters, concert halls and churches. [7]

Our collective presence has ineffable and subtle effects. Sometimes we cannot say why we feel comfortable or uneasy in a social situation without understanding the roles our bodies play. Unwarranted intimacy, lack of eye contact, and rituals of formality expand or contract our zones of privacy according to social demands. Our body zones affect our sense of comfort and well-being, operating on an emotional as well as sensory level. Arguably this psychological aspect of our environment gives space meaning. We read it for values beyond proximity and magnitude to establish relationships in both our physical and social contexts.

By extending ourselves into cyberspace we loosen our ties to our bodies and space. For cyberspace is entirely symbolic. While its contents draw on physicality for their substance, they effectively have none of their own. For this reason our representations online are pale shadows of ourselves, divorced from our bodies. Players in multi-user domains are as likely to appear as animals as human beings, betraying the contrivance of avatars and the counterfeit reality portrayed on-line. Body zones - a foundation of social interaction - are moot in cyberspace. After all, how does one relate to an avatar lobster? How close does one stand in casual conversation with it? Here our physical absence in simulated social environments forces us to reconsider our social conventions.

<insert image 3. Extensions.jpg>

Caption:

Our gestures extend us into the environment, allowing us to learn and affect it. We use tools to extend these gestures beyond the bounds of our bodies.

4. Human gesture extends us into our environment. Its replication expands its effect.

Human gestures include motions, utterances, and the artifacts of expression. Any re-presentation of a gesture propagates it through lower-dimensional replications. This results in the effective magnification of the gesture. Clearly its multiplication makes it accessible to more observers. But, paradoxically, the

reduced dimensions of the copies can also magnify the source, forcing the observer to focus and interpolate - read between the lines. This is similar to the heightened awareness we might feel peering into a keyhole. Any movement seen through the aperture hints at much we cannot see. We are forced to expand upon our perceptions, filling in missing information as we go.

In electronic media, scale of effect is a product of speed and distance. A live video transmission's significance is enhanced by the distance it has to travel. If it came from the room next door, it is not likely to be as important as if it were transmitted from far away. Curiously, physical distance enhances the message, in effect validating the gesture it conveys. Transmission speed is directly related to effectiveness as it more tightly couples the message to its source. This is particularly true of analog transmissions where the two are directly related, the representation as true to its source as the medium will allow.

The apparent magnification of gesture has two divergent effects. It allows the individual to have a much greater effect than without electronic media. The scope of what would be normally isolated gestures is now limited only to their medium. This forces the receiver to distinguish the importance of the magnified, remote gesture from a more proximate, unmediated one. The resulting confusion of scales disrupts traditional relationships based on proximity and physical substance. It can also magnify details of human behavior to monstrous proportions, as is borne out by our increasing concern over privacy and public media.

5. The radical re-scaling of gesture magnifies private activity to a public scale.

Electronic mediation affects a message in ways that McLuhan could not have predicted. This is particularly true of digital media where any subject or gesture must first be represented digitally prior to transmission. This digitization effectively levels all signals - images, sounds or text - to electronic pulses. For this reason the digital representation of a mouse differs little from that of an elephant.

The first effect of digital media is to eliminate dimensional scale. However, the scale of gesture must be restored at any scale to be perceived. As receivers of the information, we have to situate it contextually to derive its meaning. For instance, a digital signal representing microorganisms has to be presented as an image larger than the actual source. Of course, the opposite is also true. A full-scale image of the earth would be less useful than one, say, the size of this page.

But the scalar effect of digital media is not limited to the size of its incarnations. Scaling is also measured in the replication of the source. One instance duplicated is likely to affect twice as many viewers as before. The increase in the availability of an instance via its images is directly related to the scale of its potential impact. This is regardless of the means of transmission or the quality of replication. Replication and - more importantly - repetition fundamentally alter the apparent scale of the source. Also the degree to which the signal successfully connects with the viewer is an important measure of impact. 5,000 televisions playing to empty living rooms are less effective than one TV playing to an engaged viewer.

But if those 5,000 televisions are watched, their viewers form a dispersed public. This makes the source instance - no matter the content - a public event. Further, the instance can be invoked repeatedly, presenting it for review again and again. This multiple exposure produces a media artifact independent of the source material. The effect is that of magnification and decoupling of the source from its context. It enlarges the original gesture - however intimate - to the public scale. At the same time, the context attending the gesture is filtered out by digitization and - later - mediation. Paradoxically, this levels the status of intentionally public gestures to that of private ones. The private life of the current U.S. president, for the example, recently overwhelmed his professional life in American media.

<insert image 4. Artifacts.jpg>

Caption:

All artifacts exist on a scale of abstraction that extends from the material world to that of symbolic concepts. Nearly all have both sensory and cognitive attributes.

6. All artifacts are vessels of meaning existing on a scale that extends from the most abstract to the most concrete.

Since our experience of the world is a product of mental activity, it is inevitable that the objects we perceive bear the stamp of their making. Specifically, stimuli pass through our sense organs and the body prior to entering the brain. Light, sound and other sensations are converted to sensory signals. Once in

the brain, the signals are sorted for personal, cultural and linguistic significance before we are even aware of their source. The a priori conditions of the mental image are that the image is a subject - a fabricated artifact - distinct from the external stimulus. This artifact may be queried for meaning or stored for reference in ways that an object - or stimulus - may not.

Defined in this way, human artifacts range from the most concrete implement to the abstractions of words and concepts. Yet, artifacts necessarily occupy a position on this scale between the absolutes of materiality and abstraction. [8] They depend on both for their substance. It is doubtful whether we, as humans, could even recognize something at either extreme. For at one end even a brick represents the abstractions of process and proportion. At the other extreme, language's nouns, verbs and metaphors ferry meaning back and forth between the worlds of thought and matter.

Computers - and consequently cyberspace - are well-suited for similar symbolic operations. The metaphoric artifacts of software let us interact with computers. Icons, graphics and symbols abound in digital environments. They are low-dimensional references to much richer sources of data. This facilitates their manipulation for specific tasks.

However, computer metaphors are distinct from those of language. Like linguistic metaphors, they embody abstract concepts, yet their presence may change depending on their use. A line of code, for instance, may be manifested as text, bits of data or a graphic image. Such metaphoric incarnation is limited only by the complexity of its supporting data. For this reason the artifacts of cyberspace are subjective, their meaning volatile.

7. Metaphor is the bridge between our abstract thought and worldly experience.

Of all our linguistic tools, metaphor is among the most useful to cognition. It is arguably the link between our physical and mental worlds. A metaphor, a word derived from Greek for "to carry over," ferries meaning back and forth between materiality and abstraction. This happens on both social and psychological levels. We will return to the social aspect shortly, but for now we will focus on the epistemology of metaphors - how we use them to think.

Metaphors depend on a correspondence between observed, nameable phenomena and our higher abstractions. We use them as a mental shorthand, employing physical objects to denote values based on their attributes. However, metaphors are limited. "Time is an arrow in flight," depends for its meaning on the directed transience of arrows rather than their physical composition. We don't expect time to have feathers or be shot from a bow. But the metaphor is apt, useful beyond its allusion. A well-chosen metaphor offers productive associations and consequences. In our metaphor, time - like an arrow's flight - appears linear, teleologically projected toward an end. It entails a beginning, conclusion, and an inevitable course.

Metaphor also enriches our physical environment. A simple cross of wood can evoke the Passion of Christ. A rock can convey solidity of character, the wind its caprice. We identify the world with our associations in a form of mental economy. For we use its objects as scaffolds for thought.

Cyberspace depends on metaphor not only for its use but its being as well. It is comprised entirely of symbols. As an artifact it is highly abstract - a dizzying network of relationships sustained electronically. And yet in using it we rely on its material references, its images and icons, its avatars and domains. Human-computer interfaces depend for their effectiveness upon the concretization of concepts. Here the metaphor - true to its definition - carries meaning over from the inscrutable relays of networks to our world of people and things. We could describe "meaning" as what we gain by changing a degree of abstraction, for we learn both by abstraction and concretization.

<insert 5. Metaphor transfer.jpg>

Caption:

Metaphors let us relay abstract concepts by reference to our common, physical world. They are an important part of language and social interaction.

8. Metaphor lets us communicate with others based on mutual experience.

Metaphor is grounded in common experience. It assists us not only in cognition - as we have seen - but also in communication with one another. Using metaphor we can relate ideas with reference to our environment, events and our bodies. This suits the purpose of communication which, by definition, expands the scope of our personal experience.

Though we all walk the earth and share our physiology, we each have a unique perspective conditioned by personal history and cultural context. We also have a private world of emotions and intuitions. Along with dreams and speculative reasoning these are hard to explain - we are often left without words to convey them. So we rely on illustrations and analogy. [9] Allusions to our material world bring such abstractions to a plane of mutual understanding. As metaphors, they carry meaning over the gap that divides us. They comprise the language of poets.

Metaphors take many forms. Some are the word pictures of text and speech. Others, manifested in art, appear in paintings, sculpture and architecture. Metaphors appear also in electronic media such as film and television. And here references may be more oblique. For instance, the movement of images in a film may suggest the flow and transparency of water. Here dynamism itself refers to our material world whether the images are realistic or not.

The medium of cyberspace - based on metaphor - is different from other media in two ways. The first is in its responsiveness to the user and accommodation her needs. The second is that metaphors employed in cyberspace may no longer be humanly-generated. For example, computer agents, relatively simple programs used for specific tasks, may be simple lines of code or animated characters depending on the system. In turn, their communication to us may itself take a number of forms and references. These are ways to computer and its systems talk to us. In their use of metaphors they take on the attributes of human correspondence. In this way cyberspace is a medium not only for human/human dialog but a structure for relating computational processes to human cognition.

<insert image 6. Process.jpg>

Caption:

Creative processes are characterized by alternative cognition and physical manifestation. Periodic incarnations of an idea augment further development of the process.

9. The creative process is marked by a progressive oscillation of thought between materiality and abstraction.

Creativity requires us to engage many levels of abstraction in order to accomplish our goals. In the course of work, for instance, an artist may oscillate between sketching and modeling, and more cognitive activities like visualization, evaluation and criticism. An artwork is merely one of many incarnations of the inspiration and ensuing actions of the artist. The artifacts leading to its creation - drawings and notes - are themselves manifestations of an evolving idea. In its development the idea moves like a pendulum between its mental and physical incarnations.

Though this example is taken from the world of art, the principle of oscillation applies to any human endeavor involving time. By descending the scale of abstraction periodically, we re-engage the physical world. Sketches and notes are used both by individuals and by others involved in a process. For example, the creation of a building requires many preparatory studies. An architect will make sketches, renderings and models to develop and communicate an idea. Manifesting the idea at different stages lets him evaluate his progress and get feedback from colleagues and clients. The building is just another incarnation of the idea, part of a cybernetic process.

Appropriately, architecture was one of the first professions to use computers in the design process. Now the artifacts of architectural production include data files, electronic spreadsheets and drawings. These symbolic objects hang suspended between the abstraction of thought and concrete materiality. Their versatility is an asset to architects. For instance, a CAD model resembles a physical model yet may be transmitted electronically anywhere in the world. An electronic drawing may be printed out physically, but unlike a physical drawing it may be simultaneously accessed by a remote design team. Cyberspace offers a way-station between individual thought and the public world of physical artifacts. Since it is

occupied solely by symbols it lacks the immediacy of materiality. Yet, because its symbolic nature, it helps us by retaining the artifacts of the creative process.

<insert image 7. Double.jpg>

Caption: Electronic media require a doubling of the source in order to be effective. The de-coupling of the source from its image has social/psychological consequences.

10. Our presence is relayed through our bodies and the artifacts of media. Electronic artifacts require a replication of the source as lower resolution images and proxies.

The virtues of electronic media are largely due to their speed and pervasiveness. Obviously sending a fax or making a telephone call is faster than sending a message physically, whether personally or by post. However, what arrives through electronic media is not the original article. Instead the recipient gets a low-dimensional representation of the source. [10] While the source remains at the message's origin, its simulation materializes at the destination. In a phone call, for instance, the caller is duplicated as a tiny voice at the other end of the line. This voice, though analogous to the caller's own, is actually a distinct artifact.

The relationship between the source and its simulation depends in large part upon the interactivity of the medium. We may be reluctant to shout at the tiny voice on the phone, but we feel comparatively free to tear up a fax or delete an email. The fax and email are distinct from their sender, whereas the voice - attenuated electronically - is still the sender's own. It maintains a live connection to its origin.

This connection is strained in digital media. Artifacts of computers and networks - arbitrary presentation and delays in response time - isolate the simulation, breaking the causal connection to the source. This rupture also leaves the simulation to the mercies of the receiver who may modify, duplicate or otherwise manipulate it. Significantly, the digital go-between changes the relationship between the two communicating parties. It paradoxically separates them at the same time that it connects them. For this reason, on-line avatars are often described as masks worn by correspondents in digital media. A conversation between two parties inevitably includes the addition of two avatars.

The social consequence of this apparent user-multiplication is hard to predict because of the novelty of digital media. Yet the distance between the user and the representation underlies many misunderstandings and frustrations on Internet IRCs and multi-user domains. We would expect this from any indirect communication except that cyberspace seems to magnify the effect owing to the false intimacy of the medium.

11. The decoupling of information from its context affects fundamental notions of place and presence, of identity and community.

The effectiveness of an electronic medium depends on the specificity of the expression. A written note will translate more readily into email than verbal speech. This is because spoken communication is attended by inflections and emphasis that text lacks. Gestures closely coupled with our bodies differ from those that produce artifacts like faxes or images. Much of our electronic media necessarily reduce bodily gestures to low-band width images. What results is an artifact distinct from its source. This media artifact is merely a simulation - a crude double of the source.

Electronic media create such replications in order to operate. We take for granted that the images we see are the source itself, though, actually, they are devoid of context and materiality. This simulation without substance is merely a low-grade image when compared with the original. Yet, if it is actively linked to the source, the image is treated by viewers as if it were the source. If the connection between the image and its source is maintained, and we are communicating remotely, we are less engaged with our physical setting.

This focus of interaction - distracted from the physical context - diminishes the individual's presence at the source while enhancing it at its destination. As a result, a form of conservation of presence is in effect when using social, electronic media.

When the connection between source and destination is not live, the time lapse disconnects the two. This leaves the image to the interpretation of the viewer, and the sender free to engage in his context. Such attenuation between individuals and their images is also exacerbated by low-resolution. One of the great future challenges is the effect of those images being mistaken for their source. Relationships founded on such electronic intermediaries would challenge the conventions of social conduct, and are already producing unforeseen consequences.

<insert image 8.Dimensionality.jpg>

Caption:

Images affect our relationship to the objects that support them. We momentarily forget the material surface as we enter the depths of the image.

12. Images increase the dimensions of their substrate and affect social relationships to time and space.

Traditional architecture embraces the activities it houses. Walls surround us, roofs shelter us. This containment protects us from the elements, but also - through scale and presence - sets the tone for the contained activities themselves. Architecture, a frame for social interaction, also socially defines - even constraints - our daily affairs. Our behaviors are tempered by our physical environment.

Just as architecture is formed by social forces, it also channels these energies through material presence. We demand stability of our architecture to sustain our activities and to provide a consistent social backdrop for our activities. The persistence of buildings in time manifests and reflects patterns of cultural behavior.

Conclusions

Notes

1. Anders, Peter. 1999. Envisioning cyberspace. New York: McGraw-Hill. pp. 108-110.

6. Ardrey, R. 1966. The territorial imperative. New York: Atheneum. pp. 48-49.