

Digital Metropolis: The Implications of Information Densification for Spatial Society

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Introduction

With the spatialization of digital media, interaction design has become an architectural concern. The performative nature of digital information alters the user's physical environment, in turn generating distinct patterns of user behavior. Since the organization of the human body in space is the domain of architecture, changes in behavioral patterns call for corresponding changes in architectural typologies. Architecture ceases to act as a landmark or a background. Instead, it becomes a highly responsive interface at the center of human activity.

Bits and Buildings

Digital information saves people time. Coded data can be less massive (e.g. electronic or quantum bits), and less massive signals allow users to process and communicate information at a lower resource cost. Given infinite resources, the same results could be achieved at the same rate at any scale. In reality, however, energy efficiency translates to time efficiency. The less that information is bound to physical space, the greater its rate of change.

To the user, this means that digital information can be highly performative.

Conversely, physically massive artifacts like architecture are ill-suited for performativity. Building design is the attempt to accommodate varying conditions within a static spatial organization. Fixed to the earth, buildings revolve into and out of the line of sight of the sun, catching light as they spin. They house various systems within their floors, roofs and walls that allow inhabitants to heat up, cool down, open and close spaces as they perform their daily activities. Historically, people have considered architecture itself too heavy to be worth re-arranging on a routine basis.

The proliferation of the built environment is evidence of the proliferation of humanity. Like the coral reefs of polyps, architecture is one sign of our ability to transform matter into forms that sustain us. Digital information is another sign. However, the two operate at opposite ends of the scale of our sensory experience. Architecture orchestrates our movements through varied physical spaces; digital technology provides the convenience of varied information at a single location. Architecture is predicated on bodily motion, digital information enables us to experience more while moving less.

As per capita physical resources diminish and information technology advances, digital media generates an increasing proportion of human experience. Hans Moravec predicts a future where physical activity will gradually transform itself into a web of increasingly pure thought (1997). The responsiveness of digital technology compared to the inertia of the senses is making the human body itself obsolete. In Moravec's vision, information technology is rapidly co-opting the material domain of architecture. However, people continue to design for themselves, and the human senses have a determinate structure. This means that no matter how

efficiently information is coded it is only useful to us when it is translated into our scale. Digital information cannot completely replace physical information as long as it is directed towards human users.

The evolution of both architecture and information technology demonstrate increasing sensitivity to the complexity of the user's senses. In architecture, early 20th century approaches designed for a highly prescribed and proscribed set of human needs. The sterility of the resulting environments and their failure to effect their stated social goals continue to haunt attempts at so-called rational design. (McCullough, 2004; Venturi, 1996) Information technology has likewise grown toward a more holistic approach. While the earliest paradigms of interface design prioritized content over form, subsequent models have focused to a greater extent on user experience. The intricacies of sight, sound and touch have all become integral to interface design, and there is ongoing investigation into digital manipulations of taste and smell. Further, digital output frequently mimics forms found in the physical world, even when the technology itself has rendered them anachronistic. This trajectory represents the attempt to create a more convincing cyberspace. However, as "the illusion only got as far as the inner ear," (McCullough, 2004) interaction design has necessarily expanded into physical space.

Spatially Interactive Typologies

People are not designed for stillness and do not respond well to forced immobility. The human body must be active to be healthy and the senses - especially the kinesthetic - are not fully engaged when the body is stationary (Fleishman and Rich, 1963; McCloskey, 1978). For the user, the historical separation between information technology and architecture represents an unnatural condition. Digital technology's broad progression from stationary to mobile to environmental illustrates designers' recognition of this principle. Fixed devices force users to abandon spatial behavior. There is no architecture for such devices - they exist in stillness. Autonomous mobile devices are more adaptable to patterns of human behavior. Still these represent an alternative, rather than a contribution to the physical environment. The one can only inform the other referentially, and users must divide their attention between the two. Within this paradigm, "we live between two realms: our physical environment and cyberspace. Despite our dual citizenship, the absence of seamless couplings between these parallel existences leaves a great divide between the world of bits and atoms" (Ishii, 1997). Architecture remains relatively non-performative and digital information remains aspatial. The integration of digital information within the built environment, however, creates a unique spatial condition.

It is possible to produce a unitary experience of physical space and digital information in one of two ways. First, inhabitable surfaces and spaces can themselves become output devices. Taken to its conclusion, this approach would "turn each state of physical matter - not only solid matter, but also liquids and gases - within everyday architectural spaces into 'interfaces' between people and digital information" (Ishii 1997). In other words, the physical fabric of the built environment acts as a scaffold for digital information. The user is mobile relative to the digitally-informed physical

environment, and this environment responds to the user's spatial behavior. Second, mobile digital devices can mediate the pathway of information from the spatial world to the user. These devices move with the user through space, enhancing incoming information with digital output before passing it on to the user. For digital media to be spatial, output devices must be proximal or distal, but not in between. Spatial media is thus the incorporation of computation devices either "i) onto our skins/bodies, [or] ii) into the physical environments we inhabit" (Ishii 1997).

Digital technology alters the roles of the different human senses in producing experience. The sensory organs have evolved around the information patterns encountered in a world not informed by digital processes. They react to input from different areas of the body, with different signals, at different speeds. The distinguishing characteristic of digital information is its relatively performativity, so it tends to privilege the more responsive senses. As counterparts to the senses, output devices also impose constraints on interactive media. Different devices engage different senses, and each device comes with its own material costs. Further, such devices may respond to patterns of interaction different from those that people have historically exhibited. The structural constraints of the senses and the environmental limitations of interface devices mean that the human body behaves differently in a digitally informed world.

This in turn affects the behavior of architecture. Engaging the kinesthetic sense with digital media involves transforming architecture into a digital interface. Rather than a static background, comparable to a stage for human activity, architectural elements take part in the sensing, processing and communicating of highly responsive and concentrated information.

Performative Habitats

There is an inherent tension between architecture's dual role as digital interface and material system since, for designers, "the essential fact about [the] locus of attention is that there is but one of them" (Raskin, 2000). The more architecture is endowed with responsive information, the less it acts as a static object. The large scale and fixedness of buildings have historically helped people orient themselves in space and have declared the cultural values associated with spatially defined regions (Rowe and Koetter, 1984). As the elements of architecture become more fluid, these social functions diminish. The characteristics of certain locations change more rapidly, material history matters less, and inhabitants' ability to adapt and respond becomes more important relative to memory. Responsive technology promotes responsive behaviors.

As a communicative device, such technology represents a powerful social tool. Digitally informed space has greater visceral impact than aspatial media, and is more programmable and performative than purely material spaces. Proximal devices create highly individualized experiences, while environmentally embedded devices capture the attention of masses of users at once. Under hegemonic control, they enforce persuasion, while open source projects fuel subversion. Like any communicative media performative habitats are tools that can be used in many ways. What makes these unique is how extensively they influence our daily activities.

The realized effects of technological progress differ from the theoretical possibilities. In the case of spatial media, one dream of progress is to get the most out of digital technology without altering human behavior. As Mark Weiser, the father of ubiquitous computing put it: "Ubiquitous computers will help overcome the problem of information overload. There is more

information available at our fingertips during a walk in the woods than in any computer system, yet people find a walk among trees relaxing and computers frustrating. Machines that fit the human environment instead of forcing humans to enter theirs will make using a computer as refreshing as taking a walk in the woods” (Weiser, 1991). The competing dream (Weiser’s nightmare) is to get the most out of the human user as possible without sacrificing digital efficiency. However, when digital technology enters the world, the reality it produces will always fall between the two.

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