Virtuality and Place

Brian R. Johnson
Design Machine Group
University of Washington

Abstract

This paper explores the relationship between place, computation, and experience. In particular, it seeks to understand the zone that exists between the digital world on the one hand, and the physical world on the other. It is suggested that the ideal of "immersive virtual reality", by focusing on technology systems to replace the sensory world, misses the opportunity to explore a broader range of connections. Such connections involve combining physical and digital components to create blended environments. A number of examples of such environments are examined. The term "blended reality" is proposed to describe such digitally augmented physical environments and to distinguish between them and virtual environments or cybrids. A design studio series formed around the exploration, design and experience of blended physical and digital spaces is described and selected results presented.

1 Introduction

On first consideration, *virtuality* and *place* might seem to be unrelated. Places are physical. They offer predictable, repeatable experiences. They are, have been, or can be physically inhabited by people, and are often special because of particular events or people. Virtuality, on the other hand, in the context of computing, is used to describe metaphoric, analog, or "pretend" projections, ranging from the "desktop" graphical user interface (GUI) to immersive 3D "virtual environments". They cannot be physically (bodily) inhabited. In fact, the sense of being "outside" peering in is often integral to these systems. They are, by nature, multiple and variable. In fact, this is one of the central and fundamental powers of desktop computation—the ability of the machine to become, or seem to become, a variety of objects, from drafting machine to typewriter to card file.

Modern use of the term "virtuality" has blurred but still includes the original (digital) meaning of "acting like" (as in "virtual memory" or "virtual terminal"). This powerful mutative and imitative characteristic lies behind the transformation of personal computers from electronic curiosity to essential corporate commodity. “Place,” on the other hand, derives meaning from permanence. It is often involved in anchoring memory, in securing learning, precisely because it provides a persistent, immutable background and focus for our experiences.

Nonetheless, various authors have documented the ability of online environments to engage/elicit the behaviors that we find most human (Turkle 1995; Anders 1999; Maher 2001). Whether that means learning, flirting and falling in love, or theft and deception, humans are able to "inhabit" these environments.

These issues are often approached in terms of "virtual reality". As used, the term invokes an ideal of a perceptually complete alternate experience mediated by digital technology. This paper suggests this approach is fundamentally flawed and suggests a more fruitful approach through understanding the blending of physically and digitally mediated place. Several examples of "blended" environments are drawn from the world around us. Finally, an architectural design studio sequence is described, a sequence which seeks to explore the opportunities, limitations, and challenges of such environments.

2 Experience, Virtuality & Place

Virtual as a synonym for *digital* draws all our attention to the mediating computational technology and the ways in which is succeeds and fails in "fooling" our senses. *Place* focuses on external reality, apart from human occupants. These ideas can be brought together, I believe, through the consideration of *experience.* It is *experience* that focuses on the human component. It is experience that the digital technology produces. Together, virtuality, place, and experience form a triangle. The role of each can be more clearly ascertained by examining the three pairings, or sides, in this triangle.

2.1 Experience & Place: Embodiment

All that we know, we learn from the world around us, through *experience* of the places we inhabit. What is sometimes overlooked by those who are not epistemologists, is the fact that our direct experience of the world is *mediated* by the sense data we receive. Many philosophers have struggled with the implications of this observation, and most conclude that it is an act of faith to assert that there is an external reality, and that we share a common external reality.

Thus, knowledge derives from experience. But the "embodied" nature of knowledge almost certainly goes beyond perception, to include learning and memory. Research indicates that the same brain areas are involved in both motion to retrieve an object and memory of the object (Ratey 2001). Most of our strongest memories are associated with specific, physical places. Often, particular learning memories are linked to visual or social memories of a place and the other (often unrelated) events that occurred there, forming a cluster. The relative permanence of "place" in comparison to our lives makes accessing place a powerful way to access memories associated with that place.

This may be why people frequently return to the locales in which they grew up (to access the 'place-based' memories) and perhaps also explains why "you can never go home again" (because our different bodies and psyches do not experience the place in the same way we did as children).

2.2 Experience & Virtuality: Mediation

If all experience is mediated, why do we sometimes characterize digitally mediated experiences as "virtual"? Has "virtual" become a synonym for "digital" or is it used primarily to connote "new, high-tech, and spiffy"? I don't talk about my trip to Disneyland as a "virtual" experience, though it is surely as contrived and artificial in some ways as a video game, nor do I dwell on the fantasy components of the Disneyland ambiance. It is simply my experience of Disneyland. I may find this experience to be distant and quite unlike my experience of physical reality while hiking alone in the mountains, but it remains "experience"–grist for the mental machinery which structures memory, personality, and opinion. We are still learning how the human body and nervous system incorporate experience, but it is clear from the sad stories of stimulation-deprived children that bodily experience is very important in this process (Ratey 2001).

The fact that we have taken our communal experiences of communications on the internet and collectively labeled them "cyberspace" speaks to the degree to which we spatialize experience, and the power of (old fashioned) virtuality present in the technology.

Certainly, there are non-digital virtual experiences: dreams, imagination, fantasies, day-dreams, and hallucinations are all part of human existence. We may remember dreams as vividly as we remember real experiences. Physical experience can influence these virtual experiences too, as when we startle ourselves awake at night remembering, with muscular response, some sudden motion or physical activity from the day.

The idea of an all-enveloping simulated experience, a virtual environment, is powerful. It appears in popular culture in the Star Trek "holodeck", as well as academic "immersive VR" systems. This desire to somehow turn our fantasy over to an "other" to control is interesting, and perhaps a bit voyeuristic (hoping that its imagination is better than ours?). Still, our best current technology cannot eliminate the inverse "motion sickness" that often accompanies VR immersion. Our bodies know we are not flying, not upside down, not moving at high speed through the labyrinth. Most researchers believe the dissonance is due to tension between the bodily-mediated "situated" awareness (arising from the inner ear balance

mechanisms), and the powerful visual experience presented to the eyes.

In the end, experience is experience. The qualification "virtual" is misleading and unnecessary. Most of our end-state fantasies about virtual reality are really about "out of body experience". Even if we could reproduce the Holodeck, allowing our physical bodies free motion within a simulated environment, one has to wonder how water from a holographic water fountain tastes.

2.3 Virtuality & Place: Fantasy

There are numerous examples of physical virtual places, starting with the nearest child's play structure, and including theater stage sets, theme restaurants, revival architectural styles, and the “back stories” of new urbanism developments. What they share is a conscious, constructed reference to some other place (thus taking advantage of the link between experience and place to evoke positive feelings or memories). This goes beyond imagination, as it often relies on cultural references (“Frontier Land”) and myths (“the good old days”). Behavior, of young and old, is often altered in these places.

Architecturally, the relationship between virtuality and place is a powerful tool. The use of personal and cultural historical or memory references, of imitation or mimicry in the delineation of new spaces, is certainly an important part of design.

2.4 Place, Experience & Virtuality

I am suggesting that our common usage and understanding of *memory* and *fantasy* are sufficient to encompass "virtuality", and that the embodied character of most digitally mediated experience dominates our memory of those spaces. Further the duality and separation implied by the distinction between *reality* and *virtual reality* masks their fundamental similarity. I recall the room in which I first experienced an ill-fitting head-mounted-display at least as well as the virtual environment it gave entry to. More to the point, I remember both as a unified piece of the past. This is not to deny the power of immersive (and other) systems to deliver various kinds of experience, but to try and bring our attention back to the question of the experience rather than the technology.

2.5 The Question Restated

How, then, do we explore the use of digital technologies to replace, alter or enhance the spaces which we inhabit and our experiences of those spaces? If we do not leave our bodies behind, can we ever truly "inhabit cyberspace"? Are there "thresholds" between the physical and the digital, as suggested by the conference theme? The answer suggested here is that we already inhabit cyberspace, that it is not a case of choosing between reality and virtual reality: rather than striving for a substitute virtual experience, we should concentrate on strengthening and broadening the connections between the physical and digital aspects of our existence. Digitally controlled components can be used to project aspects of the digital world into the physical one–to supplement physical reality, and sensors can extract and localize information about the physical world for use in the digital one.

With this change in focus, the central question becomes: what are appropriate, available, and desirable alterations of the built environment which will help occupants enjoy their activities more, accomplish their tasks more quickly or comfortably, and so on. These are inherently architectural questions, having to do with the human use of space. To be sure, answers to this question have technical components like computer screens and projectors, speakers and microphones, gesture recognition, graphics pipelines and polygons. They also have implications for the usage behaviors and interactions of occupants, programmatic and other implications for designers, and construction and maintenance implications for contractors and owners. These questions are rooted in the discipline of architecture, and their answers will contribute to the discipline and the profession.

In short: what happens when the building *is* the interface between physical and digital worlds? What if the building is the browser?

3 Examples of Blended Reality

While experience may be unitary, there are certainly differences between current physical and digital realities. The fact that we can move between them suggests a boundary, openings, and thresholds. Unfortunately, much of the literature and research into the boundary between cyberspace and physical space has focused on the screen: "On our computer monitors we may be just beginning to see a reflective surface that looks increasingly like a mirror. In the virtual world that exists on the other side of the mirror's surface we can just barely make out the form of a body that looks like us, like another self" (Biocca 1997).

A more fruitful metaphor may exist in the vocabulary of gradual transitions and continuous variation, where characteristics of both the physical and digital co-exist. The term “augmented reality” describes the more digital approach to this area. I am suggesting the term “blended reality” to describe the more physical approach.

The zone of overlap between physical and digital experience can be studied in a variety of other ways, as well. As a sociological phenomenon, it relates to the suite of issues that cluster around human behavior, social interactions, need for visualizations, flame-wars, gender-impersonation, etc. (Turkle 1995). As the interface between the digital and physical worlds–where physical inputs become digital constructs and data structures become sensory stimuli–it belongs to the realm of computer-human interaction (CHI). Finally, as a connection between humans whose interaction is mediated by networked computers, it involves questions of task knowledge, group process and organization, and communication, where computer supported collaborative work (or learning) (CSCW and CSCL) hold sway.

In fact, there are quite a few examples of blended reality already in existence. The following sections describe a few of them.

3.1 Simulators

Some of the earliest examples of blended reality involve simulator environments: flight simulators, spacecraft simulators, tank simulators, etc. In most cases these environments simulate devices which use traditional electronics for input and feedback, so the insertion of a computer as the "reality simulator" is straightforward, as indicated in the following description:

"The BattleTech Center in Chicago mixes physical and virtual reality. The Center itself is consistent with the theme of the virtual BattleTech experience. Uniformed crew take you to a training center to view video of a nervous trainee being initiated by a tough commander. The crew member then escorts you to your 'Mech cockpit. Inside the cockpit you find more than 100 buttons, a primary and secondary screen with 6 selectable inputs, foot pedals and a joystick all of which are physical, not virtual. But they control your virtual 'Mech. You navigate, turning, stopping, starting and it appears through your view screen that these events are occurring" (Heeter 1992).

3.2 Physical Widgets

Much of what happens in cyberspace is opaque to those not engaged in the environment through their screens. This has bothered various people over the years, with some interesting results: The MIT Media Lab Tangible Media Group has done a number of experiments in this area, including the ambientROOM project which explicitly set out to use architectural space as computer interface (Wisneski et al. 1998).

Another, simple, example of blended reality is provided by CALLER ID, where the basic connective character of a telephone is combined with the digital switching system's billing data to deliver a "preview" of the call in the form of the caller's name and number.

The "Hit Tunes" web server plug-in can be configured to make a different sound on the host web server whenever specified web pages (URLs) are accessed (Shotton 1997). This makes the web server into an active reporter of web activity, rather than a silent cyberspace pseudopod extended into our physical environment.

In each of these examples, hardware and/or software have been employed to make an existing digital event "available" in a physical form. While they do not serve an architectural function or purpose, serving primarily as interface components, they begin to suggest architectural applications.

3.3 Cybrids

The superposition of parallel physical and digital representations of space, termed "Cybrids" by Peter Anders, and the possibility of extending physical spaces with cyberspace features has been explored before (Mitchell 1995; Anders 1999). These systems, which offer a number of interesting opportunities, blend physical and digital reality largely by reference. That is, you can visit many museums on-line, or in person, and see similar imagery, but the experiences are disjoint. You do not see digital visitors wandering around the physical museum, nor do you see physical visitors (or even other digital ones) in your digital meanders.

3.4 Augmented reality

"Augmented reality", blends aspects of digital and physical reality. In most cases users of AR systems view the world through goggles or glasses which overlay or superimpose computer graphic images of on the visual field, content which often tracks the movement of objects in the physical environment (Billinghurst 2001).

Other AR systems, such as the "Build-it" system, use physical objects as markers or containers for digital data. Using machine vision technology, users are able to manipulate a digital model by moving physical objects about on the work surface (Fjeld 2002).

A recognizably architectural, if prosaic, example of "augmented reality" can be found at Vancouver International Airport, near Vancouver, Canada. The check-in counters are not differentiated by airline. Instead, each agent position includes two monitors in addition to scales and computer terminal. When in use, one monitor displays the airline logo, while the other shows the flight number. Passengers check in at the counter designated for their specific flight. Once a flight has loaded, the counter space is recycled for a different airline or destination. Physical space itself has become virtual.

3.5 Blended Architecture

The use of digital technology to directly modify gross physical reality in a controlled way is just beginning. Art pieces such as Daniel Rozin's *Wooden Mirror* or Marcos Novak's La Biennale Di Venezia 2000 project are a start for (Rozin 1999; Novak 2000). A more advanced example is the "Hyposurface" wall, which is actually capable of substantial distortions in surface shape under computer control (Burry 2001).

4 Implications for the Practice and Discipline of Architecture

Stanford Anderson has articulately distinguished between the profession and discipline of architecture (Anderson 1999). He characterizes the *profession* (and practice) of architecture as mostly concerned with the realization of physical assemblages of material to satisfy human needs. The *discipline* is concerned with the theoretical underpinnings of the practice, and with abstract issues related to the practice (efficiency, industry structure, etc.). There is room in the profession and it is common in the discipline, to explore idealized models, to project "Broadacre City" or the "Mile High Skyscraper" into the intellectual discourse. These intellectual constructions often have significant impact on the profession, or the lay public.

The examples above show that blended environments are entering the profession. Pioneers in both the discipline and the practice of architecture are searching for models that provide commercial advantage, that extend the realm of architectural services, that reflect on and enlighten important issues in the practice of architecture. There are several specific ways in which architects might participate in this process.

4.1 Opportunities for the design of digital space

Digitally mediated experiences include screen based and immersive digital environments that are 3D environments or exhibit spatial characteristics. Usually these visualizations are intended to be used by people as a background for educational, entertainment, or social and business interactions. In these cases, it makes a great deal of sense for architects to use their design skills to project "virtual" spaces.

4.2 Delivery of technology solutions

Fine-tuning and perfecting the design and delivery of technological solutions presents both a professional commercial opportunity and a chance to push the disciplinary envelope. For example, the provision of natural and artificial lighting has moved beyond the application of uniform, "engineered" or palliative solutions, becoming an important design opportunity and springboard. Similarly, the design and engineering of the modern curtain wall has become an opportunity for technological innovation, and design expression. In the same way, the integration of digital technologies into buildings will offer new opportunities for form, function, financing, and fabrication. The designers of such systems will need to know more about electronics and digital technology than their predecessors, but design teams with these skills are beginning to emerge.

4.3 Changes in the use of physical space

It is inevitable that the development of blended spaces will also mean change in user behavior. If we could truly (i.e., sensorialy) meet "face to face" in our individual "holodecks" many miles apart, what would be the purpose of unpleasant or lengthy daily commutes? Just as such changes will have sociological repercussions, architects need to consider the ways in which these technologies will change the human use of space. Do we need some spaces less? Will others become more important? Which behaviors might be enhanced? Which quenched? Will the impact be felt first in the work place or the home?

5 Design Studio Investigations

The practical availability of low cost digitally controlled sensors, actuators and emitters make possible the limited blending of spaces indicated above. The rapid development of additional devices in this realm (e-paper, machine vision, etc) makes it certain that even greater blending will occur. It is important, at a disciplinary level, that we begin to consider and understand the architectural implications of these developments. We need to learn, as a discipline, how to inhabit the boundary between digital and physical.

In an effort to bring this investigation to the architecture programs at the University of Washington, we have, for two years, conducted studio projects that investigate the boundary. The first, described here, examined the social, physical and digital components of a hybrid Internet Café. The second considered the implications of online delivery or "e-learning" on the space needs of a school or architecture. Future projects will reconsider these issues, as well as the role and function of libraries, civic structures, and so on.

5.1 The Cybrid Café: Rethinking social spaces

In 2001 the food-services division at the University of Washington was about to convert an existing space in university housing into an "Internet Café." The design program was quite limited and prosaic–basically mixing a drop-in computer lab with a "quick eats" coffee shop, but it provided a touch or reality for the quarter. The studio program was expanded: participants examined the social and physical operation of a coffee shop, added some suppositions regarding availability of digital technology as well as on-line course and entertainment content, and were challenged to combine web presence with physical. Students examined the challenge, looking for opportunities to fit spatial needs, physical needs, social affordances and information processing together.

In order to more solidly ground the proposals in viable or nearly-viable technologies, "warm-up" exercises were done using the students' computer-equipped work-spaces as both the subject and

means of production of "cybrid" workstations, and a suite of tools were made available for mock-up use and demonstration (see below).

5.2 Blended Space Tool-kit

A set of web-based interaction tools was introduced to the students in order to break them out of “web as publishing medium” mind-set. Students were able to play with the tool kit in the studio, and were challenged to incorporate features from the tool-kit into design mock-ups where appropriate. Most studio presentations included web-based content and students were encouraged to create mock-up web sites for their Cybrid Internet Cafe. The studio also made use of a group bulletin board, a web-based bookmark file or catalog of web-sites, and web-based remote feedback by both external critics and other interested parties.

The tool-kit included: a web server located in the studio, streamed web-cam and screen-buffer images from the studio (including the final review) using Sorenson Broadcaster and WebCamToo, the previously mentioned "HitTunes" plug-in for the web server, a web server CGI (common gateway interface) application which speaks aloud on the web server text entered via forms on the web, the ConferWeb web-conferencing system, the Compadres social-presence system (Johnson 2001), CU-SeeMe video conferencing software (also used during studio review), and a "remote control" web browsing tool.

5.3 Results

In addition to consideration of web-based social environments and their possible use and impact in physical architectural design, students were encouraged to reflect on the way in which web-based presentation changed their approach to presentation content. The public parts of the site are archived at <http://dds.caup.washington.edu/w01>. A private staging area has been removed to save space.

Of course, students learned a great deal about basic web-based presentation issues and had to examine their design and presentation goals in light of “web-as-medium”. Most presentations were hybrid digital/physical affairs, making effective use of large-format color plotting. They also made extensive use of Javascript, 2D animations (Quicktime), 3D modeling software (form-Z) and web-presentation software (Flash).

On the topic of “web-as-social medium” the students arrived at some interesting insights. For instance, one student proposed an online "auditorium" with individually selectable "seats". This may seem odd at first, since in a cyber-theater every seat can be a front-row –center seat. However, seating serves a social dimension as well, creating a local social group for whispered conversations, holding hands, etc. The student’s solution provided for this subtle social support even in a fully online experience.

Another student, in her "personal cybrid workstation", proposed a physical panel, similar to a shoji screen, which could slide so as to (a) obscure a video-conferencing monitor, and (b) simultaneously and symmetrically restrict access to her on-line environment. That is, the screen could act as both a physical and digital privacy screen.

While a number of novel propositions emerged, almost every project proposed to include flat panel displays or LCD projectors showing student art-work, online visitors, and so on. Personal and ubiquitous HMD or AR displays did not play a significant role. This may be due to efforts to keep the studio focused on user-centric rather than techno-centric strategies.

6 Conclusions

This paper has considered the relationship between *virtuality*, *computation*, and *place*. It has presented the case that embodied experience remains the central reality of human existence, but that many opportunities exist to blend that physical reality with the results of digital computation, creating new places in which to live and work. It is suggested that the common tendency to focus on virtual reality puts too much emphasis on interface technology and that a focus on *blended reality* might be more fruitful and productive, both for the profession and the discipline of architecture. Several examples of

blended realities were introduced, as well as one in a series of design studio projects which is examining these opportunities. The results suggest this approach is fruitful in that it provides greater opportunities for architects to exercise their skills and insights in shaping both physical and electronic spaces in support of human activity rather than relying on technology alone to produce a solution. In addition, blended reality projects can be used to focus student attention on the human activities contained within, as well as the affordances of technology, challenging them to reflect on the core issues of architecture.

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