Hybrid[s]: new Pedagogical Applications for Designing our evolving Spatial Environment.

Tim B. Castillo
University of New Mexico, USA.
timc@unm.edu
http://saap.unm.edu/

The continual emergence of new informational and technological systems has impacted our cultural landscape. As society continues to evolve, we are becoming more connected to virtual systems that impact our spatial environment. The awareness and understanding of these invisible forces requires new curricular pedagogies in architectural education. This paper will document an ongoing course that was developed to research new methodologies for working with haptic environments and informational systems.

Utilizing a high performance-computing center, students in the class are developing new adaptive intelligent spatial systems that engage a multiplicity of scales. They researched environments for PDA's (Personal Data Assistance), I-Pods, cellular phones, GPS (Guidance Positioning Systems) and a new immersive virtual dome environment. The goal of the class was to reevaluate how architectural practice will encompass a more holistic approach to both physical and virtual spatial development in the future.

The New World

"No longer part of the order of perceptible appearances nor the esthetics of the apparition of volumes assemble under the sun, this monumental disproportion now resides within the obscure luminescence of terminals, consoles and other electronic night stands. Architecture is more than an array of techniques designed to shelter us from the storm. It is an instrument of measure, a sum total of knowledge that, contending with the natural environment, becomes capable of organizing society's time and space. This geodesic capacity to define a unity of time and place for all actions now enters into direct conflict with the structural capacities of the means of mass communication."[1]

In a world where time is measured in nanoseconds and space has become more than a tactile or physical manifestation, architecture continues to redefine itself. Architects must be able to understand the complexity that virtual space provides and also ensure that design implementation has the ability to adapt to evolving technologies. As information and space continue to merge, the need for intelligent real time response systems has become more relevant. The notion of media (ted) landscapes and electronic prosthetics continues to be a phenomenon ubiquitous in urban culture throughout the modern world. Personal data centers such as cell phones, PDA's, I Pods and PSP's (Sony's Personal Play station) continue to redefine our environment unlike any other technology previously. The ability to carry your network data and interact with it has new meanings for the way architectural space will be developed in the future.

The issue of being connected has vast spatial implications and our research began to focus on work we identified as hybrid fluidity. These were environments that allowed for multiple inputs to be engaged at various scales. Most influential in our research was the Fluid Space dwelling by Hybrid Environments. The Fluid Space is an electronic billboard and dwelling space that is driven by digital data. Unlike traditional billboards that rely on visual connections, this billboard disseminates personalized digital data to cell

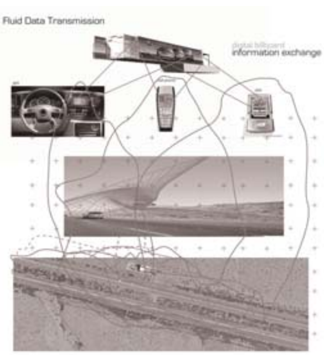


Figure 1

phones, pda's and GPS systems[2] Developed on the premise of RFID (Radio Frequency Identification) tagging and On Star technologies, the fluid space is a global extension of personalized space. [Figure 1]

Internally, the Fluid Space is an interactive environment that is controlled by the inhabitant. The space is dynamic utilizing a mutateable pin structure that can be redefined to conform to the ergonomic and performance criteria of the consumer. The body controls the space through multiple inputs ranging from temperature, light and movement. The notion of traditional static space is called into question and speculates on a new architecture that is interactive and responsive to user inputs. [Figure 2+3]

Figure 2

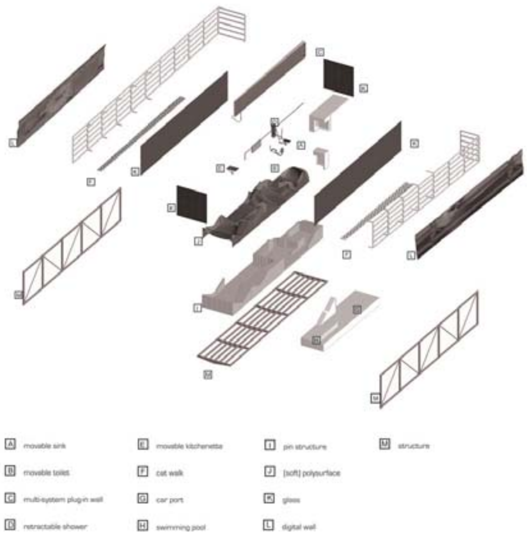


Figure 3

This research begins to question our new environment which is organized by spatial information. The notion that form follows function, is common practice however, what happens when information takes form? These were questions that we were interested in pursuing collectively and investigating how the real and virtual merge to form hybrid spatial interfaces.

Engaging a new pedagogy

The fundamental aspect of this experiment is to investigate new technology and understand the programmatic potential for cultural interaction. With the development of a new high end computing facility here at the University of New Mexico, students were given access to a variety of computational systems. The new facility houses a super computer with a motion capture space, green screen technology and a new 3-dimensional environmental dome. These facilities formulated the backbone for our curriculum that focused on digital spatial interaction, haptic development and environmental visualization.

***Open source** describes practices in production and development that promote access to the end product's sources. Some consider it as a philosophy, and others consider it as a pragmatic methodology. Before open source became widely adopted, developers and producers used a variety of phrases to describe the concept; the term open source gained popularity with the rise of the Internet and it's enabling of diverse production models, communication paths, and interactive communities. Subsequently, open source software became the most prominent face of open source.*

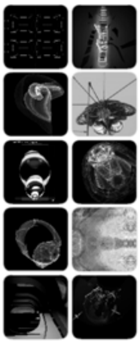
The open source model can allow for the concurrent use of different agendas and approaches in production, in contrast with more centralized models of development such as those typically used in commercial software companies.[3]

The class was developed on an open data source pedagogy that allowed the students the opportunity to investigate different vectors related to time, space, culture and technology. Utilizing this methodology based on algorithmic abstractions and cartography studies, a five stage investigation was implemented that allowed a process where the students created, analyze, critiqued, programmed and disseminated material. The ability to visualize and generate data quickly allowed for innovative trajectories for the development of new intelligent interfaces.

The steps we employed begin with:

1.New Spatial Networks: this process began by creating a series of abstract templates that would allow the students the ability to see new opportunities. As a catalyst for evaluation of personal context, the students produced several studies that engaged virtual landscapes.

These virtual landscapes were topic driven based on algorithmic processes to be utilized as instruments of multiple registrations. Three-dimensional models were created from an abstract story that was passed along in a series of vector iterations from student to student. The "corpse" or manipulated data was engaged by each designer in various form of translation and recorded in a master data set. Through multiple processes of development the corpse was then accessed as material to inhabit or transform. These algorithmic systems (or instruments) ultimately become integral components in the development of form and environmental texture. [Figure 4]



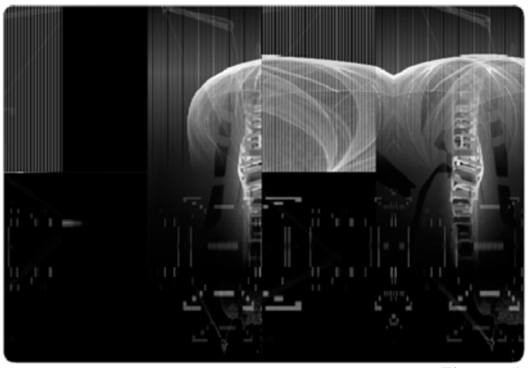


Figure 4

the age of information, cartography techniques have become very prevalent in allowing complex data to be visualized. Making this data accessible by utilizing mapping strategies is valuable for designers/architects to understand the inflection that physical and virtual forces have on our environment. To design is to invent strategies for visualizing information that make new interpretations possible.[4]

In this phase the students were asked to develop a series of maps that documented an environment that could inform processes for development. These maps (or data sets) varied in scale ranging from the physical urban environments to informational network systems. They generated animations in Macromedia Flash, allowing for an analytical probing process to inform programmatic content. [Figure 5].

4.Finding Form and Interface: students developed programs that evolved from observations that emerged out of the algorithmic and cartography studies. In overlaying these investigations with contextual dynamics, new relationships were formed that provided opportunities for spatial interfaces to be developed.

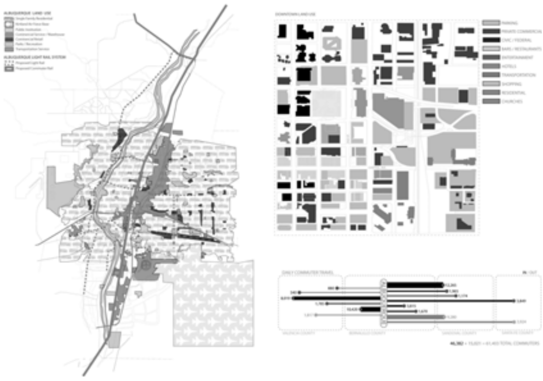


Figure 5

The students prototyped these investigations as a series of geometric studies aimed at extracting virtual and haptic interaction. By critically challenging existing spatial networks, they began to speculate on how information could produce more efficient spatial systems for our environment.

5.Development and Interaction: these projects were developed and prototyped with user interaction as the primary design criteria. The ability to prototype and assess the interaction was very critical in the development phase. The students developed assessment criteria that allowed them to constantly redevelop their projects to produce the most efficient spatial interface.

Architectural Principles

The open data source pedagogy was developed for students with advanced architectural skills. All of the students enrolled in the class were graduates and fourth year undergraduates. Their background in architectural studio process allowed them to apply principles they acquired in previous architectural design research. The following principles were applied in conjunction with open source framework:

1. Spatial representation, simulation and communication.
2. Organizational strategies.
3. Spatial psychology and behavior.
4. Aesthetic and spatial poetics.

This framework allows students the ability to work with complex data in the context of a studio environment well suited for information visualization.

Intelligent Systems: New Spatial Networks.

Several projects are documented here that demonstrate the methods and processes used

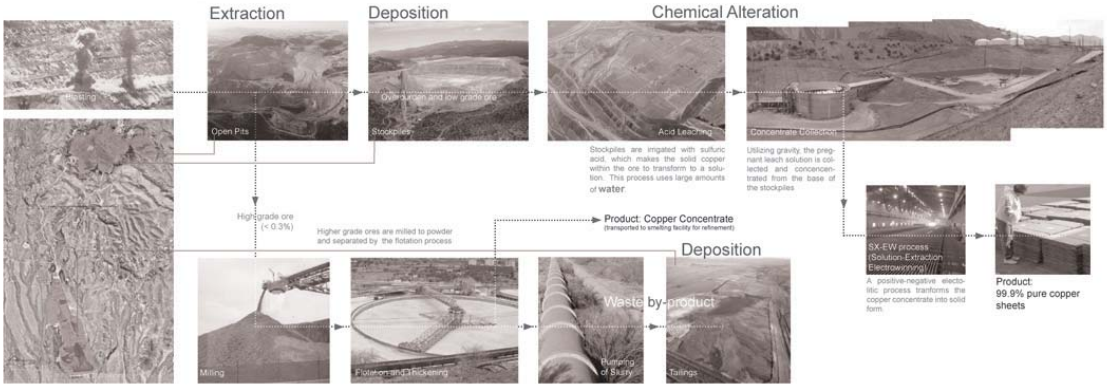


Figure 6

in the class to develop intelligent interactive interfaces. By engaging in new territories the students began to uncover the potential of decision making on informational visualization. Working with human perceptions in pattern finding, these designs are intended to improve organization and performance. As the semester can be a relatively short time frame for research development many of these projects are still in the early development phase. However, many innovative problems were researched and documented below.

***Example One**: Navigating Bigness-Redefining the Corporate Landscape*

The ability to understand both physical and economic networks as visual complexities was a primary programmatic goal of this project. Corporations globally are identified through products, image and financial portfolios. The corporate annual report is a public inventory (by law) for corporations to document all financial activity, properties and holdings.

The challenge of this project was to merge visual information, corporate data and physical property holdings of the Phelps Dodge Mining Company. By reformatting the corporate report to incorporate visual data tied to Global Position Systems, a new assessment of scale and resources was documented. In visualizing the vast scale and detrimental environmental impact of this corporation, a new understanding of the corporate landscape was created. [Figure 6 + 7]

***Example Two**: Artificial Intelligence*

Working with algorithmic studies, this project engaged in a process of design where a digital breeding mutation system process allowed for a variety of innovative trajectories. The program consisted of an ongoing study with the school of engineering where artificial intelligent robotics are being developed. The selection process was based on critical data sets based on performance efficiency. The final algorithmic sets were then modeled and programmed in Flash to observe interactive input. The virtual prototype was then utilized to understand different modes of environmental negotiation. Through several animations and interactive studies, a vehicle was selected for analog fabrication (pending funding). [Figure 8]

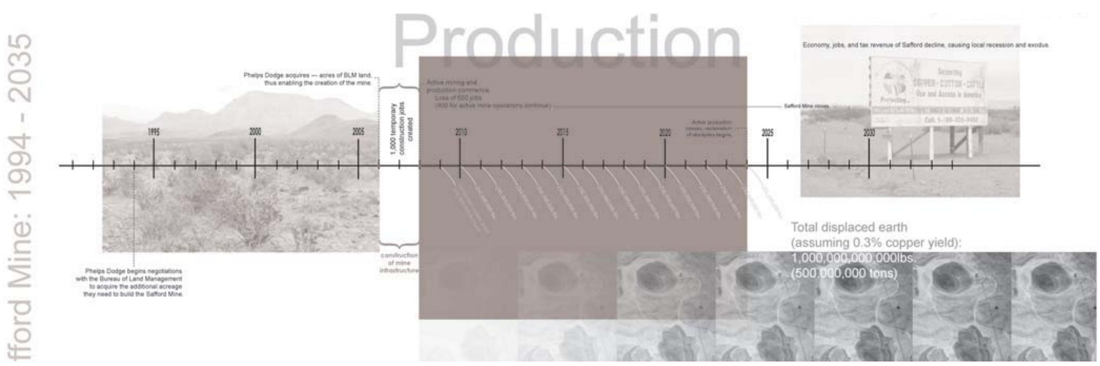


Figure 7

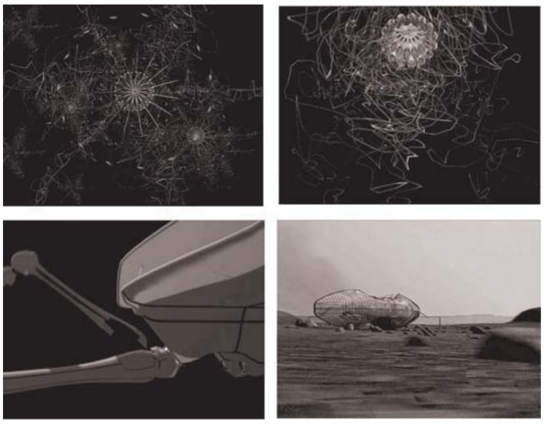


Figure 8

Example Three: *Interactive Dome Environments.*

The University of New Mexico Art, Research and Technology Laboratory has become a leader in environmental dome visualization. The dome environment is a six-projector system that allows immersive media to be visualized.

The students goal was to develop a game application that utilized haptic interaction. The content of this application allowed users to interface with several games in a spherical environment. The students envisioned a full spherical spatial environment that would allow the user full immersion in a weightless environment. Pushing the limits of our current dome technology a modified version was scaled to fit the parameters of the dome, the final animation speculated on a potential haptic user interface. [Figure 9 + 10]

Example Four: *Personal Data Environments.*

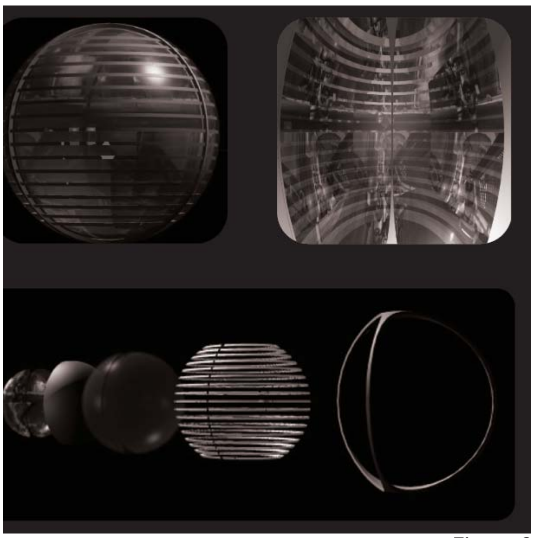


Figure 9

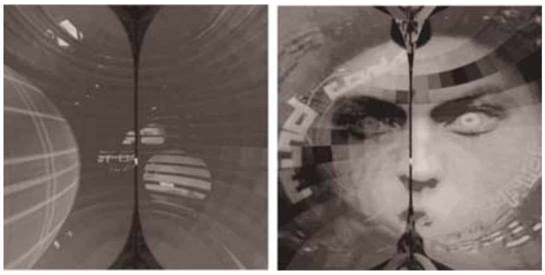


Figure 10

As we continue to see the emergence of personal data devices (such as PDA's, cell phones, I-pods and PSP's), new architectural responses need to be considered to incorporate invisible data networks. This project began to explore new forms of consumer shopping utilizing Bluetooth technology as a means of redefining our shopping environment. The project was developed as a new spatial experience where retailers generated information media to personal data devices. The premise would allow an individual to enter a shopping environment and have personalized information based on their own shopping profile be exchanged. The interface created allowed a reconsideration of both physical and virtual spatial efficiency, where a three-dimensional map of the shopping environment would guide an individual to retail spaces based on personalized shopping profile.

The final project was an attempt to rethink how this hybrid fluidity in shopping environments would allow for new architectural designs to become responsive to evolving technology.

Conclusion

Developing new pedagogies to explore emerging technologies is a challenge in architectural education today. We are witnessing an exponential growth in new technologies and its impact on architecture today is daunting. Environments in the future will continue to get more complex, smarter and more responsive. Providing a venue for this exploration is a necessity in any architectural curriculum. The difficulty we find is in generating enough new courses to allow students the opportunity to engage all the new emerging technologies. The foundation that we are developing in this course is a methodology for thinking about the manipulation of informational data to produce innovative solutions.

As the practice of architecture has become more about different forms of data integration, the ability to think critically about the technology becomes a greater asset. Students must have the confidence to critically probe digital information as a means to problem solving. A new paradigm generated from the post-spatial networked environment will continuingly need new intelligent interfaces to respond to both virtual and physical inhabitation. This class alluded to the future of the profession and it became apparent that architectural education is lagging behind new technologies. We hope that these pedagogical initiatives help the reconfiguration of architectural curriculums focus on the future, as it will continue to become so complex and we might not have the tools to comprehend it or design it.

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