Place, Time and The Virtual Design Studio

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A design problem shared over the Internet raises issues of how digital media and group dynamics affect networked design collaborations. This paper describes how to conduct a long-distance studio and compares asynchronous and synchronous collaborative techniques. Digital methods are discussed in relationship to both the creative process and design communication. In schematic stages, less precise tools used asynchronously allow free exploration and creative misreadings, while in later stages, more direct real-time exchanges bring a project to resolution. For the final review, synchronous video-conferencing with interactive graphics allow comparison of cross-cultural differences. Used effectively, these tools can electronically create a compelling sense of place. Ways to foster a strong virtual community are discussed in an agenda for future virtual design.

Introduction

The co-location of design team members is promoted by many as the means to improve design. For example, “project partnering”, currently in favor in many building design projects, often attempts to improve design communication by bringing together the participants of a design team. In other fields, too, physical proximity is identified as a contributor to better design. For example, Chrysler has attributed the recent success of their Dodge Intrepid and related models in large part to the fact that the previously dispersed members of the design team were all brought together in one place to work on the project. There remain instances, however, when members of a design team cannot be physically present in one place over the course of a close collaboration. The reality of architectural design projects today is that they involve members at distant locations more often than not. With this in mind, we set out to look at the issues of Place, Time and the need for a Virtual Design Studio: that is, one in which physical co-location was not possible.

No Stopping Except for Emergencies

It is interesting that the super-highway, a feature in the American landscape generated by automobiles, has been adopted as a unifying metaphor for the communications technology revolution. Just as the American car was defined by our search for individual freedom and identity, it appears that in the Information Super-Highway, motion, change, and access will define our use of these new technologies. It
Participants in the Virtual Design Studio (VDS) were located in five different time zones, while addressing and resolving a given design problem given by yet another location. To bridge this evident gap of space and time, we relied on the application of computational tools and contemporary telecommunication and technology to design and communicate. Geographically isolated, yet united by common tools and goals, the participants of the project attempted to collaborate as one creative atelier.

Objectives included: understanding the dynamics of designing across the barriers of space and time and exploring how design collaborations are affected by technology.

This paper will give an overview of the VDS, highlighting the dynamics of collaborative work in the VDS and instances of cross-fertilization between design proposals. The cultural, technological and methodological factors producing a variety of design solutions will be analyzed. A critical review process, implemented using various forms of interactive environments, is discussed in this paper. An electronic "sense of place" resulting from this collaborative endeavor is proposed. Conclusions are drawn and an agenda for the future VDS is outlined.

Precedents and Background

This project builds on previous exercises in asynchronous design over the Internet (Wojtowicz 1992, 1993). The predecessors explored various aspects of the collective design process and its supporting technology. The first experiment involved a simple design correspondence via modem, between two designers. The second dealt with a collaborative project including shared storage and retrieval of data, within the limits of a single, conventional, but computerized studio. The third experiment addressed the issue of distance collaboration between two larger groups of designers, a continent apart, utilizing Internet WAN facilities. These early exercises helped to define notions of design correspondence, a digital pinup board and distanced collaboration, all of which we integrated into the last Virtual Design Studio.

The School of Architecture at UBC gathered original material on the typology of traditional Li-Long courtyard housing during a study abroad program in Shanghai in May of 1993. Li-Long is a unique tenement form developed in the early 1930s and of particular interest today as it holds many lessons for the future. The information gathered was used as a point of departure for the 1994 Virtual Design Studio - the design of modern, medium density housing much needed in Shanghai. Participants in VDS '94 were provided with photographs of a proposed site, CAD drawings, renderings of several housing typologies, and scanned images and text documenting daily life in a typical Li-Long complex.

During the first half of the studio project, participants were asked to exchange design ideas in the form of sketches and schematic drawings and in the second half to publish models and renderings which would then be modified and combined in an urban setting. The sample images from various stages of VDS '94 can be found at the conclusion of this paper.

Description

Objectives of VDS '94 were many, with each site bringing its own inquiry to the experience. Shared objectives included understanding the dynamics of designing across the barriers of space and time and exploring how design collaborators are affected by technology. As the studio progressed, each drew its own conclusions and lessons for the future.

Listed from East to West, participants in this VDS included students and tutors from the University of Hong Kong, ETSAB in Barcelona, MIT in Cambridge, Cornell, Washington University in St. Louis and UBC in Vancouver. Each participated with architectural designs while Washington University decided to undertake an urban planning role using architectural designs from the other schools.

Geographically isolated, yet united by common tools and goals, the participants of the project attempted to collaborate as one atelier.

In common with earlier Virtual Studio exercises, a pinup space was located at UBC. Scanned images in TIFF format, structured CAD models in
Project 4: VDS94

Figure 1: A diagrammatic representation of computational environment illustrating information flow during VDS 94.

DXF, posted ASCII files and e-mail text messages were all traded freely among participants. While e-mail moved directly, other exchanges were centered on the pinup board. Thus, all participants could log in and scan the board on an equal basis with others using File Transfer Protocol (ftp). These asynchronous exchanges were supplemented by the use of various shareware for interactive exchanges between those sites which had adequate network throughput to support the communication (these only included those within northern America). The systems included Collage (version 1.2.1, an interactive white board and image sharing program from ftp.ncsa.uiuc.edu), var (LBL Visual Audio Tool v2.17beta, an audio conferencing tool from: ftp.ee.lbl.gov), CU-SeeMe (Macintosh video conferencing program from Cornell) and talk, well familiar to those using UNIX.

seems appropriate to ask where this highway leads. What is the objective or goal? What results from traveling on the highway?

Mark von Wodtke has provided an appropriate set of analogies:

- Hardware: Automobile
- Software: Driving Skills
- Mindware: Knowing how to get somewhere
- Soulware: Having a reason for going
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<th>Location</th>
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<th>Boston</th>
<th>MIT</th>
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1. (a) Copper (slower) Connection  
   (b) Satellite (slower), 64Kbps Connection  
2. Single card only, No Multicast Facility  
3. (a) B+T 6000, Dec 5000  
   (b) Dec 5000  
   (c) Sun

Figure 2: A diagram illustrating diverse communication programs and platforms used during VDS '94

Initially the pinup board contained the basic program and background information but slowly it came to be populated with enticing and individualistic messages. Barcelona, for example, posted a picture of candy which had been distributed at a carnival which occurred during the VDS period. The random assortment of scanned material gave us glimpses into the moods, emotions and thought processes of the participants. Interestingly, this assortment included images of "Chinese" images from the Occidental participants which illuminated the cultural gaps between East and West.

To bridge the great distances between the participants, the studio relied on the application of different computational tools and telecommunication technologies. With so many participants from various locations, it was inevitable that we developed a technological cocktail. Although standardization was desired, it was not deemed necessary. Each school used a different set-up, employing whatever tools were available or familiar. Even within schools, teams used a variety of equipment. At HKU, for example, one team of three worked on a Mac, a PC and an Intergraph.
system. Washington University used a Macintosh Quadra, a VAXcluster, an SGI Indigo and 80486 systems for modeling and communication. Other sites had similarly diverse arrangements. Even at the final video-conference, different kinds of input were plugged into the video feed. It was inevitable that the variety of systems should introduce its own problems but it is a sign of the times that we were able to integrate all these elements with various degrees of success.

Observations

This VDS was interesting for several reasons. The number of participating universities was much greater than in any previous exercise. The participants were more geographically dispersed. Video-conferencing was used for the final review. Collaborations using interactive white board software were established between two or three sites at a time, incorporating video, audio, and textual information. Inevitably, technology helped and hindered. The parameters for working became at once secondary to the content of the problem. Each site immediately got immersed in the effort to design. For some at each site, however, the issues of connectivity, compatibility and schedules became a living nightmare. Each site evolved its own physical space with which the teams could identify. The intangible nature of digital media had to be supplemented by local tack boards on which paper versions of downloaded material were kept. At the end, we felt that we were able to comment on lessons learned. Each site extracted their own lessons from their own experience; other lessons were universally acknowledged. We have summarized the two most important lessons here:

1. The importance of socialization in the design process.
2. The influence of media on the communication of designs.

In both of these, technology plays an important role in facilitating and mediating exchanges and communication.

Socialization:

The new paradigm of the virtual design studio conceives of designing not simply as a technical process but also fundamentally as a social process (Mitchell 1994). Clearly, a sense of place (real or virtual) is essential to give a common context to this social exchange. In VDS 94, we addressed this issue of sense of place, despite the non-existence of a physical space proper to it. With the multiple modes available for transmitting information, participants need to understand how each one shapes the communication process. For example, video-conferencing can betray feelings in a non-verbal way that carefully composited text does not. We are just beginning to explore how the interactive dynamics of this social place are affected by the media used to communicate ideas and emotions.

One of the preliminary lessons learned was that the timing and pacing of the experience should allow for socialization to occur. The socialization process occurs gradually through interaction and participation. We need to understand how this process can be best coordinated with the design process. For example, isn’t trust, which leads to rapport, very critical in the germinating stages of a project when directions are being formulated, perhaps rather more important than in later stages when the principles for refinement have been established? Does the unpredictability of anonymous partners stimulate the formative stages? The problems of intersubjective relations have barely been reviewed in design contexts and not at all in the experience of technology-mediated design, yet we found them to be of primary importance and influence.

Potentially, the technology can assist communication in ways that are quite specific to the stages of design. In the earlier stages, the shape recognition process and assistance in defining organizing principles would help to articulate simple diagrams to group members. In the later stages, the computer can act as an organizer for masses of data. Systems can also play a role as a mediator in communication. For example, could the design process be divested of some of the ego and emotion, much as e-mail seems to permit franker, more penetrating discussions (Sproull 1991)?

Assuming that Howard Roark has indeed met his appropriate end, a vision of a better profession of architecture might start by reversing von Wodtke’s list and asking ourselves: why do we want to use computers, where would we like to go with them, what abilities will we need to get there, and what technologies will we employ?
The problems of socialization were exacerbated during this experience of VDS by the large number of participants. It would be easier if we could focus the attention of various teams, helping to accommodate the number of participants. Using a chess metaphor, what we need is the equivalent of a team competition with a series of two-way exchanges going on, thereby comfortably allowing a large number of participants. What we experienced was a hierarchy of communication — within the teams, within the sites, between the sites and, finally, at the big event, the video-conference.

The most recent experience also reinforced the need for a common level of understanding to be established in order for meaningful dialogue to occur. Socialization thus helps to focus the collaborative effort. For example, the teams from the various universities exhibited a great diversity of approach after interpreting just a few statements of the program / brief. Social and cultural biases were introduced both in approach and in form. The brevity of VDS'94 meant that there was not enough time to establish the kind of dialogue that would have illuminated the local interpretations. Collaboration became difficult with these differences unresolved.

The need for a broader understanding between participants was illustrated in an exchange between teams separated by half the globe. Students at HKU commented that the MIT students seemed to be interested in the architecture as form and light while those in Hong Kong were interested in function and the user. In another exchange, the students in Barcelona posted the results of an AutoLisp routine which generated possible arrangements of courtyards and housing, and then applied a rule system to review and mark up "permissible" solutions. This logical, thorough approach contrasted starkly with the more intuitive processes followed by others who more typically explored a rapidly narrowed set of choices. Participants in the studio observed that they came to appreciate different systems of values at other schools of architecture.

If these discussions had gone further between the students, we might have uncovered something about cultural differences which are important in this kind of "remote" design process. For example, it would have been instructive to explore whether there was Chinese bias for function and pragmatics or whether the Asian students' identification with the Shanghai residents created the focus on the user. From that exploration, perhaps the socialization could have occurred which is necessary for the two cultures to understand each other.

Media:
Among other results, this studio experience explored again the relationship between the medium and the message. Given the short time, there was a tremendous pressure to deliver, putting emphasis on mastering the digital tools needed to share the design.

Comprehension of a design proposal is based upon a shared understanding between the author and audience of a graphic vocabulary to describe space and mass. The tools chosen to convey the message must support the chosen vocabulary; likewise, the choice of medium influences the clarity with which a design intent is conveyed. Thus, design schools have periodically emphasized different media as architectural theologies pass. Little work has been done to identify the effect of the media on perception but the results were clearly at play in this studio. Some students chose to present using softly illuminated renderings conjuring up a romantic illusion of Li-Long. In others, the dominant bright sky (as supplied by graphic systems vendors) strongly influenced the perception of the scheme.

Each team explored (or struggled) with the problems of media. HKU was forced by technical limitations at the final video-conference to present printed images, making some of their work unintelligible in this static form. Others used sophisticated technology to perpetuate conventions of paper presentations. Although Cornell was able to zoom and pan through images presented on a Macintosh during the video-conference, one of their teams' introductory panel of dense text was less suitable as a billboard on the information highway than as a printed panel to be browsed in a school passageway. The 640 by 480 pixel video resolution
forced on us by PictureTel was much more flattering to simple images presented as a series rather than as a complex collage.

This problem is not just one of presentations either. The role of an image changes as the phases of a project progress. Additional complexity arises with the ability to employ more than one channel of communication at one time. Early in the design process, fluid bit-map sketches can spawn desired variants with free association and fortuitous misinterpretation. Later, design refinement warrants the precision of 3D vector models clarified by written statements of intention and negotiated with gestures. All of these can be beneficially supplemented with spoken annotations. Design thrives through impromptu interactions using a wide and unpredictable selection of media, from plasticine to pixels. The particular mix of modes reflects the idiosyncratic mindset of the designer. How can we best foster this creative spirit in using the new media?

Graphic conventions employed in design communication help to make our thoughts readable by others. An important component of this legibility is time — the time it takes for the viewer to understand and digest the message being conveyed. During the VDS review, we found that the conditions worked against us, not allowing for proper comprehension of the designs. The resolution of the video display was limited but, more importantly, the linear sequence of images precluded the free visual access to various descriptions of the building.

Conventional presentation techniques allow the viewer to be distracted by details or fascinated by a particular aspect of the project, to view and digest the information at their own pace. They permit the viewer to synthesize an understanding by integrating information from more than one conventional projection (e.g., plan or section). With current technological limits in bandwidth and image manipulation, participants are precluded from engaging in random visual inspection and must instead follow the linear sequential flow of the presenter.

To make the studio more successful, we need to explore further the influence of media in communication. In addition, we need to extend the technology between sites so that the images become interactive. To a limited extent, we achieved the latter — we used white board collaboratively between some sites, although not for the final presentation part of the experience. It would be very useful to have a shared model of a design which can be viewed, manipulated and annotated in a collaborative mode.

Looking at the various ways that media shape communication, it becomes clear that a virtual design studio requires a combination of synchronous and asynchronous graphic communication. Real-time switched video connections are very exciting and useful, but in the near future they will remain quite expensive over long distances (or, if low-end solutions are accepted, will be of very limited quality); they are not always necessary, and are often difficult to establish across time zones. On the other hand, it is very difficult to discuss a design proposal simply through e-mail and CAD file exchange. In future virtual design studios, then, there is likely to be an important role for asynchronous communication by means of multimedia systems that conveniently integrate audio and video, text and CAD files. Technology to support multimedia mail in convenient ways is rapidly maturing, so this will certainly be feasible.

Conclusions

Did the studio work as anticipated? In many ways it didn’t. Lost network connections thwarted timely exchanges of data. The design teams behaved like design teams seemingly always do, posting data at the last minute, making any collaboration very difficult (especially when the uncertainty of technical failures was always present). At the level of architectural design too there were problems. As Dr. Wu Jianguo of the Department of Architecture at Tongji University in Shanghai commented (from Hong Kong) during the final video-conference jury, Li-Lung housing is more than a typology but also a way of life. At this level, he felt the solutions missed.

In other ways, the experience was a great success. The earlier experiences of the virtual design studio were extended to include work in both

We must first look to our response to our ideals as architects and then to computers. To paraphrase Shakespeare “The fault lies not in our computers but in us.”
synchronous and asynchronous modes. Designs were created and presented and the participants experienced something fundamentally different than anything they could have locally. In the end, we concluded that:

1. Geographically and temporally distributed design is practical today and it will gain even more importance in the near future due to the growing importance of networks.
2. Design collaboration via interactive links is particularly suited for quick critical feedback and fast problem solving (synchronous model); however, many wide area networks are not yet fast enough to support useful, real-time interaction.
3. The FTP based collaboration is much more suited for the additive design process, reflective criticism, editing and re-examining a project (asynchronous model).
4. Technological improvements, greater bandwidth and better interactive software can help but won't make much difference unless we can also adopt a collaborative process.

Next time around

For future experiments, we could tighten the focus on the collaborative process by composing the design teams across the Internet. This would push the computer-mediated groupwork issues to the fore. Putting together teams with members of different expertise and cultural background would help us understand how differences can be bridged. Including non-architects could also help to illuminate the different types of participation which might work better for non-design contributors.

One critical issue is how to accommodate different levels of groupwork. The collaborative process must first provide for the private germination of ideas and then their incubation, testing and finally, broadcasting. The challenge is to bridge between quick notations for private use and more informative pieces for sharing. As we master multimedia tools, we will find ways to package our thoughts, sketches and ideas into editable files for private exchange as well as more elaborate formats suitable for broadcast over a network.

At every level of sharing, there is a backstage arena where some thoughts are held back. During the video-conference, it was handy to be able to mute the microphones, allowing casual banter to spice up the official proceedings locally. It would have been great to capture these snippets and the more tentative digital explorations that never made it onto the pieup. Decreasing the formality of the interchange would allow more of the different site characteristics to come through.

Traditional video-conferencing technology as used at the final review works against this casual exchange. The interfaces are set up to facilitate orderly, structured interchanges — typically with a chairperson firmly in control. Limitations on the number of voice channels and the use of voice-activated controls have the effect of reinforcing this. But good design juries are often unpredictable, anarchic and unstructured. It is Procrustean to jam them into Roberts Rules of Order formats, and it is limiting if only one person can talk at a time. To support design juries (as opposed to business meetings), we really need multiplexed audio and a different style of interface. And this probably means that we need more bandwidth.

But instead of pushing for a totally transparent interchange perhaps we can try to understand how having some mystery can be an asset. The computer-mediated studio could be much more interesting than face to face [as suggested by Hollan 1993]. Perhaps the search to replicate physical proximity by using computer tools is inappropriate, just as mimicking drafting methods with commercial CAD systems has led to an emancipated narrow interpretation of their potential. Instead, we should explore the rich potential which might come from computer-mediated design processes. As we have noted in this paper, collaborative design leads to interesting results often because of fortuitous misunderstandings or random interludes. Should not the development of computer-mediated design places encourage such ineffable communication?
Notes

1 The term “Virtual Design Studio” was used for the first time and defined by W. J. Mitchell in his talk at the MIT Media Lab in February 1993.


References


Figure 3: The computer model of existing Li-Long fabric

ALAN KAY - Atan Research Lab! Our most powerful weapon is what we have between our ears provided it’s loaded. Point of view is worth at least 80 IQ points. 12
Figure 4: Some sketch ideas for the new Li Long.
Figure 5: Records of interactive video sessions between various design studios.

Figure 6: A video phone from the early sixties.

Notes

Figure 7: Interpretations of Li-Long as posted in Pinup by MIT.

Figures 8 & 9: Night aspects of Li-Long contributed by UBC.
Figure 10a: Interactive collage and vut session between three sites of VDS '94.

Figure 10b: Collaborative design development.

Figure 11: "Bad boy" designers of Li-Long.

Figures 8 & 9: Night aspects of Li-Long contributed by UBC.

Figures 13, 14 & 15: Evolving designs in VDS '94 as posted and negotiated by HKU, MIT, Wash U and UBC students.
Figures 16 - 21: Evolving designs in VDS '94 as posted and negotiated by HKU, MIT, Wash U and UBC students.

Figures 22, 23 and 24: LISP generated Li-Long variations from ESTA, Barcelona.
Figures 25 and 26: New housing fabric as proposed by Cornell site of VDS '94.

Figures 27: The modified Li-Long as a result of distanced design collaboration.

Interface

The papers within the pedagogic section of this book deal with the interface between technology and teaching. The first paper, by Professor Daniel Herbert, provides the seam between technical pursuits and pedagogic goals through the analysis of design media. Along the bottom of these papers we have repeated and enlarged portions of a drawing completed by Trent Tesch in an independent study with Professor Daniel S. Friedman at the University of Cincinnati.

These drawings explore space that exists beside or within the traditionally represented optical experience of modernity. The investigation contemplates the digital atmosphere of the contemporary city; it resists recent speculation that cyberspace is disembodied.

*Inspired by scenes from William Gibson’s novel Neuromancer."

*All drawings are details and sections of the original which measures 14” x 1’-10” doubled.*