DESIGNO ERGO SUM

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Abstract. Reviewing a decade of research from the University of Hong Kong, the paper traces a path that develops understandings of communication in design activities.

1. The three aspects

There have been significant developments in application of digital media in architectural design or as it was called earlier 'computer aided architectural design' (CAAD). At the beginning, the field was divided between explorations of automated processes for design (Negroponte, 1970; Cross, 1977) or technical issues such as data structures, hardware operation and graphic conventions (Mitchell, 1977; Mitchell et al., 1987). Sometimes pushed along by developments in underlying technologies, such as hardware or software, developments in CAAD have at other times been progressed to an agenda dictated by the researchers in the field. Typically, though, research in the area has mirrored the attribute of architecture in that we have worked at adapting developments elsewhere to the benefit of the built environment. There are, however, some attributes of design for the built environment, especially the complexity, scale and singularity of the product, which make the field distinctive and particularly apposite for the exploration of digital tools. Is the research we undertake necessary in design and essential of design? What characterizes this work and distinguishes it from that in other realms of digital media?

To address this question I will engage in an examination of a personal agenda, tracing the trajectory of investigation that was undertaken at the University of Hong Kong over a period slightly longer than a decade. Initiated in the early 1990s, the work started with the typical narrow imperative of training in a professional curriculum, the compelling need to ensure that graduating student were properly equipped to engage digital media in the design and documentation of buildings. While this focus was perhaps

debilitatingly narrow, it provided a clear foundation of application from which to explore the use of such media in design.

Reviewing the work from this research community, I can identify three threads which bind together to form a strong anchor. One thread follows a series of investigations in human computer interaction with a particular emphasis on designing together. A second develops computational tools and contexts in which designers work; the third examines who digital media can be used to enhance the understanding of a user. Thus, over the decade we developed the exploration to encompass design collaboration and communication within or outside of design studios; the theories and philosophies that lead the theoretical part of the research and the findings that allowed a different design understanding, education and creation within architectural design.

2. Collaboration and Communication

Riding as we do on a technological base, we are affected by advancements in technology which carry the field in new directions. At the time this association was founded in 1996, one such change occurred that greatly affected the field of digital media in design, namely developments in communication facilitated by the World Wide Web. The result was a substantial increase in interest on the activity of working together, *collaboration* as it is usually called.

This shift initiated a new model of applying digital media in design. The first modes of working with digital tools assigned a user to a machine, be it either mainframe or minicomputer. Tasks were formulated as singular activities of preparing data and submitting them for processing. Users could work together on a project by accessing data files sequentially. With the introduction of the desktop in the mid 1980s users returned to individual activities. The complexities of design, therefore, were reduced to individual activities of groups of participants. Software and task formulation supported the isolation dictated by technological constraints.

VIRTUAL DESIGN STUDIOS

As has been observed, the practice of architectural design is not typically a solitary activity (Muir, 1995; Pressman, 1995). Thus, using digital tools for modeling, rendering and representation solely in a single user context fails to apply digital media in a manner that effectively supports design. Architects work in teams and collaborate on projects. The medium needs to address these creative and communicative roles of the designer. As the basic networks of communication emerged, several universities worldwide started to collaborate on Virtual Design Studios; the University of Hong Kong was one of the first

to participate, joining the University of British Columbia, Harvard and MIT in the first Virtual Studio in 1993 (Wojtowicz et al., 1993). In these studios, students and tutors were able to share and collaborate in a new environment, engaging in tasks that had not been possible until this time. These studios also liberated for the first time the single user out of solitary practice, as such, the studios had a tremendous influence on architectural design education. Today it is standard that students work together with colleagues all over the world and gather knowledge and experience via digital media that allows them to communicate without boundaries. They do this without formal setting of studios and it has become the normal way of collaboration in learning and practice. Here we see an example of the academy moving ahead rapidly to explore and demonstrate a mode of working that is then taken up in practice.

The field of research into collaboration in design coalesced rapidly around questions of data and technologies of sharing these (Wojtowicz et al., 1995b). These technical details were rapidly settled by establishing processes for working together and also by technological advances that rendered the issues moot. Initial questions started to emerge, however, as to the nature of the interaction undertaken in such a studio (Bradford et al., 1994; Wojtowicz et al., 1995a) for only from such an understanding could we begin to plan to support this interaction. Importantly, there emerged a lack of knowledge in understanding how designers worked when collocated, let alone at a distance. Thus, we soon moved to studying the activities of designers and comparing collocated and distal activities (Kvan et al., 1998). In this, we discovered that students working together on tasks in different environments engaged with the task in very different ways and that the assumption that high bandwidth social interaction was essential in supporting design was not necessarily the case (Kvan et al., 1997). Most recently, we have found that the limited channel of a chat line, where communication is engaged in text mode, appears to support the development of richer design investigation through continuing development of ideas (Kvan and Gao, 2005).

A second fundamental finding from this work emerged when we examined modes of collaboration. Earlier work in supporting working together had always referred to the activity as collaboration without distinguishing what this implied. Upon reflection, it became clear that designers engaged on a project manifested degrees of risk sharing and thus degrees of engagement. This observation led to the distinction being made between co-ordination, cooperation and collaboration, opening up a range of modes of working together and thus allowing a range of tools to be introduced to support these distinct modes (Kvan, 2000). Conceptually this was an important step as it allowed different technologies to be identified with distinct modes of work and distanced us from disagreements on degrees of social engagement.

Changing the way we communicated in design led to experiments in studio teaching. Over the next decade we devised virtual studios that explored a

variety of learning concepts and supported this with laboratory experiments to investigate aspects of communication and learning. Taking the research from the laboratory into the studio, we found that indeed students did reinforce learning when using digital tools to communicate with themselves as well as others, their tutors and colleagues (Kvan et al., 2003). Examining how students were working on their designs had helped us to understand not only techniques for better online communication but also better collocated learning opportunities.

AUGMENTED REALITY

The explorations in virtual studios had given us the context and material to explore digital media beyond images and technology. In 2001 we made another fundamental change to virtual design studios with the experiment in running the first immersive virtual environment studio in which students from different locations met into a three-dimensional digitally generated environment and designed, communicated and collaborated together on a common task (Schnabel et al., 2001). For the first time, students were working together across great distances in immersive environment. For this to happen, however, we had to have defined the modes of working earlier as this gave us the conceptual freedom to design an appropriate environment.

The next step forward was to allow real and virtual environments to merge into each other to eliminate the boundary of digitally generated representations. This was explored in two ways, in one the designer moved freely between the digital and the physical as phases of the design conversation required (Schnabel et al., 2004) while in the other the design activity simultaneously engaged both digital and physical (Seichter, 2004). In 2004, an augmented reality studio proved how this overlay of real and virtual media allowed students to work in a shared space, exchanging ideas and developing new understanding of digitally supported architectural design (Seichter and Schnabel, 2005).

TOOLS AND ENVIRONMENTS

While research had focused on ways in which designers work together and the digital media provided the environment for such human interaction, we began to look again at a topic in a realm that had formed one of the earliest CAAD fields, the development of support to the act of designing itself. Whereas earliest work had assumed that the system would require the designer to prepare data and submit this for action, we developed the concept of the design conversation (as Schön called it) as the framework for interaction. To this end, we explored ways in a number of tools and environments as methods to develop the conversation. Thus, the research still focuses on the designer as

an active participant in a team effort; in these instances, however, one of the team is a software system in which the designer and the software system contribute to the conversation (Wong and Kvan, 2003).

Similarly, our investigation of cellular automata (CA) has developed from the assumption that digital environments can support an ineffable design exploration, that there is no need for the design process to be articulated and encapsulated. Just as a human design partner may propose design solutions which you then wish to modify and feed back for further discussion, so have we investigated ways in which CA can become a design partner (Herr and Kvan 2005). The research takes the form of a series of design investigations along side which CA systems are devised, amended and examined.

COMMUNICATION

Digital media in design exist not only as environments for designing but also communicating. It can be observed that much of the work undertaken in this group addresses aspects of communication, whether it is with team members the designer themselves. A third group with whom to communicate viewers and consumers of the design. We have therefore extended these investigations of interaction without extending them to broader aspects of communication. These have been tested in two realms, one of heritage and the other of animation.

Design studios are environments of communication, Designs are juried, the critics engage with the designer and the design. Digital media have roles to play here too. Drawing upon the work if group support systems, we have examined ways in which to support design jury communication (Kvan and Li, 2005), noting that rather than replicating traditional juries, participation can be enhanced using digital media. Similarly, we sought to enhance interaction with the displayed image using laser pointers (Li and Kvan 2005).

While some viewers are collocated, others are dispersed and the viewing asynchronous. The lack of proximity to the object viewed may be intentional or necessary, as in the case of a heritage site where temporal proximity is not possible (i.e. in reconstruction) or the site is simply inaccessible. Digital media enable viewers to overcome both temporal and locational distance while offering an enhanced form of engagement. Not only can digital media recreate the object, they allow the viewer to reconstruct its meaning through joint online interpretation (Affleck and Kvan, 2005).

Threads

Over the decade, our research has worked around the theme of a design process yet looked at ways in which the process might change as we introduce

different media and tools. Broadly, the findings have been consistent in suggesting that digital design activities can be considerably richer than those engaged with traditional tools.

While the mode of engagement changes, the processes are, in certain circumstances, substantially richer if supported appropriately. We constantly re-evaluate the findings and their implications for design and design learning. It is crucial that not only frame the tasks ahead but also reflect on the path that we took. Now we know that two-dimensional representation is only one aspect in the overall process, we know that collaboration not only enhances the design process but also changed the tools allowing designers to work together remotely or co-located. We realized by moving away from normal studio teaching that an integration of digital media allows students not only to express them in a new language but also create a learning environment that is stimulating for both teachers and students. We also found that the simplest tool can enhance problem solving as good as very sophisticated applications. There remains much to be done. Keeping in mind Tom Maver's warning (Maver, 1995), we nevertheless find ourselves exploring the obvious and questioning the answered because the answer is sometimes not what it seems to be. The act of designing research has led us to reveal strengths of the media, not just the tools.

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