Chris Beorkrem, Eric Sauda, Jeffrey Balmer

Architectural User Interface: Towards a Performative Architecture

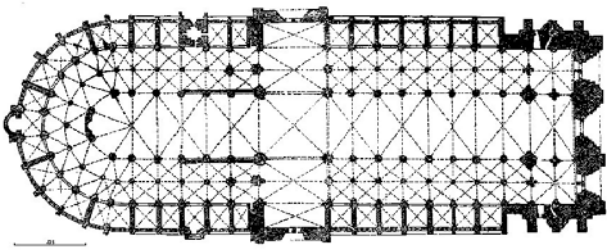
Chris Beorkrem
Architect
University of North Carolina, Charlotte
USA
beorkrem@gmail.com

Eric Sauda

Jeffrey Balmer

Chris Beorkrem, Eric Sauda, Jeffrey Balmer

Architectural User Interface: Towards a Performative Architecture



Notre Dame, plan

I

"This will kill that. The book will kill the edifice." [1]

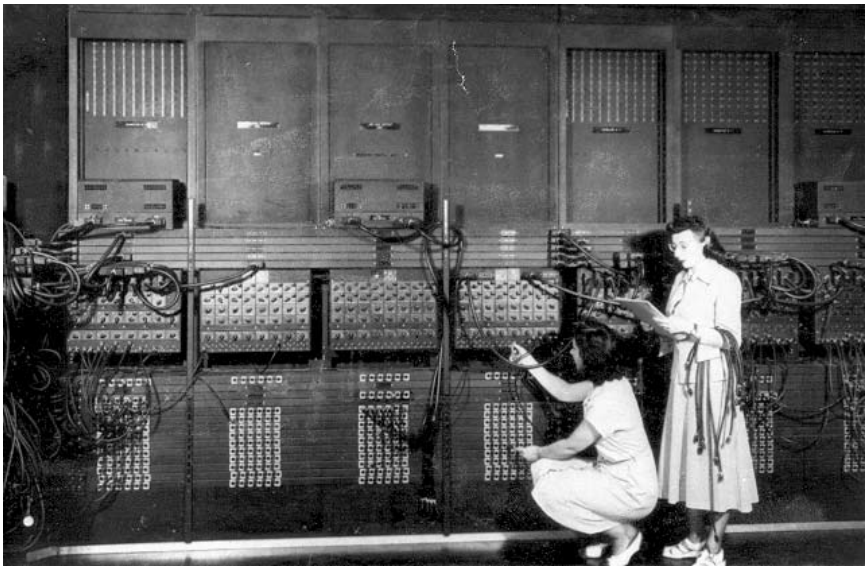
This is our primary question: with the inexorable advance of digital technologies along all fronts of human endeavor, whither architecture?

We identify *performance* as the primary criterion to revealing a new paradigm for architecture. We do not delimit this definition to the role traditionally played by mechanical and quasi-mechanical technologies in the optimization of environmental control systems and building skins. Nor do we intend to ascribe to performance the interpretation narrowly defined by the emergence of digital gadgetry, primarily optical in methodology, which have nonetheless already radically altered the means by which we negotiate our environment, built and otherwise.

Instead, we seek to engage a notion of *performance* that encompasses these definitions in a wider arc: one that seeks an understanding of a broad interface between architecture and technology, and one that attempts to solicit optimal collateral advantage from their respective strengths. From architecture, we affirm *presence* as its quintessential condition, its inalienable concreteness, with the necessarily contingent properties of Benjamin's 'tactile appropriation'. And from technology, we recognize the emergence of models of interactivity and intelligence that allow for not only new possibilities for the inhabitation and manipulation of space, but for indications of a new definition of architecture itself.

Epitomized by Hugo's observation, technology has long been portrayed as *adversary,* heedlessly overthrowing established cultural mechanisms with new modalities. Hugo's archdeacon divines in the printing press not only the loss of doctrinal hegemony by the Church, but by extension, the very stones of that institution itself: From the loss of the didactic monopoly of the inscribed monument and the illustrated cathedral, engendered by the rise of the printed word, comes the displacement of architecture's (implied) historical centrality towards the margins of cultural discourse.

Hugo's contemporary, Viollet-le-Duc[2], simultaneously identified in technology its potential role as *saviour,* believing it to be the means by which architecture might return to its former exalted stature, epitomized for him by the gothic cathedral. Viollet-le-Duc proposed an architecture freed from issues of 'style' and based upon a rational foundation of tectonics and materials science, and as such was instrumental in establishing a post-Enlightenment view of architecture, and design in general, that has sought to privilege performance (measurable, empirical) over aesthetics (subjective, idiosyncratic). His ecstatic vision for the emancipating role of technology morphed long ago into the breathless genre of futurology, exemplified in the pages of *Popular Mechanics* and, more recently, *Wired* magazine.



ENIAC Programming,U of Pennsylvania

II

"The fathers of the field had been pretty confusing: John von Neumann speculated about computers and the human brain in analogies sufficiently wild to be worthy of a medieval thinker, and Alan Turing thought about criteria to settle the question of whether machines can think, a question of which we now know that it is about as relevant as the question of whether submarines can swim."[3]

It is a commonplace that the recent history of technology has been marked by the rapid expansion of the scope, both conceptually and literally, of the integration of computers into our lives.[4] We all know that computers are in our cars, our watches, our toasters, our cell phones, and virtually everywhere else.

The near ubiquity of digital processors brings with it a defining design challenge of our era: that of the interface between computer and operator. Beyond the punch-card and DOS-based keyboard models that characterize the natal stage of digital technology, the emergence of the GUI(Graphic User Interface), first developed in the '70s at the Xerox Palo Alto Research Center, currently defines the essential paradigm for digital interactivity. More advanced models are presently under development, including the Tangible User Interface(TUI): the interface theorized by researchers at the Media Lab at MIT[5] that extends the computer beyond the monitor into other forms that can be touched and manipulated. In addition, techniques such as CavePainting have been explored that use virtual reality techniques to make three-dimensional paintings[6].

These efforts within computer science represent, if not a challenge, certainly a poaching of architecture's physical and conceptual turf. Each specifically appropriates traditional elements of architecture (surfaces, volumes, spatial hierarchies). As this work progresses inexorably, it is fair, indeed necessary, to ask what remains essential to architecture?

III

"…the tasks which face the human apparatus of perception at the turning points of history cannot be solved by optical means, that is, by contemplation, alone. They are mastered gradually by habit, under the guidance of tactile appropriation."[7]

Architectural User Interface is an operational metaphor to an architecture that might exist if we think of the computer not as a means of representation, but as embedded with-in the media of architecture itself.
The first question that arises from such an investigation is the nature of the media itself. In any interface, the physical and ergonomic nature of either the punch card and the teletype or the mouse and the screen establish a particular relationship with the user, a presence that has grown more involving as immersive technologies have developed.

Architecture's irreducible presence is its engagement of all our senses. We do not make an argument for a phenomenological approach, but rather recognize the manner in which architecture inevitably engages our senses of sound, tactility and smell as surely as it does our sight. This physical presence and the digital interface are two separate yet complementary aspects of any architectural interface.

IV

"A picture is worth a thousand words. An interface is worth a thousand pictures."[8]

Interface design has developed by trial and error, gradually assembling provisional rules of thumb. For example Ben Schneiderman's "Eight Golden Rules"[9] (consistency, shortcuts, feedback, sequences, error handling, easy reversal, internal locus of control and reduce memory load) are an inductively derived set of principles assembled from graphic design, communications and hardware limitations.

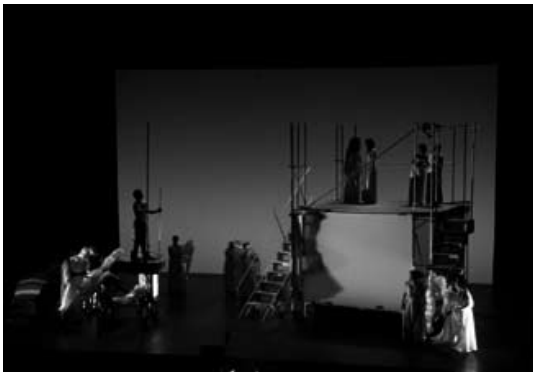
Among these principles of interface design, several are clearly applicable to architecture. Indeed, with the principles of consistency, sequences and easy reversal, it is tempting to speculate on the degree of influence that the shared experience and navigation of traditional built space has had on developers of digital interfaces: the metaphor of urban space has been used in computer science to help organize complex data.[10]

One principle among these that is foreign to architecture as currently practiced is feedback. An environment responding directly to its user is likely to transform our idea of architecture.

Feedback is related to architectural programming, behavior studies and all its variants within architectural thought. But the predominant idea of the human use of building is that it generates a fixed set of requirements, which a sensitive architect will be able to use as the starting point for design. At best, this results in work by architects such as Van Eyck and Herzberger that propose an open-ended provocation of human occupation. Post occupancy evaluations are the only (pathetic) example of architectural feedback. We demand an on-going recursive participation of the user over time.

The focus of our work, then, is to make the building responsive, to see the performance of the user as an integrated part of the building. A performative architecture will have the user become a central part of the experience in a way that modernist thought, absorbed as it was with function, could embrace in only a desiccated form. But just as Hugo warns us about the triumph of the printed word and widespread literacy turning into a second Tower of Babel, the diffuse user "input" of performative architecture has its dangers. Precisely to the extent that it is responsive, it is unpredictable in ways that are unaccustomed and almost certainly uncomfortable for architects; the myth of the master builder will be difficult to sustain in such an environment. At best,

Gutenberg Bible



Dido & Aeneas, Henry Purcell, Opera Workshop

we may be able to embrace the idea of narrative, but there will be so many narratives, and our pleas for authority may be unnoticed.

This proliferation of narrative engagements will lead to an issue of framing. Lacking the clear mechanisms of the literal picture frame and the metaphorical frame of the museum, architects have almost always relied on geometry to call attention to their art; it is “here” and not “there” that you should look. Whether this takes the form a simple and reductive form (Palladio and Eisenman) or a loosely composed grouping set apart from the context (Gehry) or a set of particular and idiosyncratic gestures (Libeskind), we have no problem identifying the limits for our attention. But a truly *performative* architecture must disdain these limits, and accompany the user into overlapping and loosely defined environments.

V

“Interactive media do not sap the spontaneity or variability from a live performance, as linear media do, since they embody those qualities. Media are interactive to the extent that they adapt to the performer rather than making the performer adapt to them. By definition, the more interactive the media, the more responsive. Theatre that incorporates interactive media has the potential to combine the strengths of both live performance and media.”[11]

The primary venue for our research in performative architecture is theatre and opera. These endeavors enjoy a tradition of human interaction that is more focused, time-based and articulated than a general architectural practice.

One advantage of such venues is the existing tradition of liveness in theatre, and which define practices that align themselves with our research preoccupations with interactivity. Interactive media can be invented and explored to extend this idea in a controlled setting.

In theatrical settings, electronic interactivity has both a traditional theatrical meaning and a potential to destabilize and expand the theatre setting. Interactivity defines an essential characteristic of theatrical performance; actors making asides to the audience, entering from the house to the stage, and performances that physically engage the audience demonstrate aspects of the fundamental liveness of theatre. Computers offer a way to extend the reach and character of this interactivity, but ironically only to the extent that they clearly reveal their character as artificial. Computers can force the audience to be aware that it is watching a play, and create critical distance from the action; Bertholt Brecht describes this as *Verfremdungseffekt*, or "estrangement effect".[12]

Another advantage, particularly in early stages of development, is the fact that the users are more expert at using what are often systems that are initially less than robust. Just as a line in the score may be awkward and a costume change may come at inconvenient moment, actors are more agile in their adaptation to unconventional participants. They can find ways to avoid a particular position in a motion capture suit the same way they learn not to make a particular move for fear they may tear their costume.

The collaboration of the Opera Workshop and the Digital Design Center at UNC Charlotte is a laboratory for the development of performative architecture. We have collaborated on performances of Dido and Aeneas by Henry Purcell and *Les Arts Flousissants* by Marc-Antoine Charpentier .

During the staging of these operas, we used video and sound capture, motion capture suits, real time compositing and a variety of other technical devices. But our focus was not on the technical aspect, but rather on the transformative aspects of the technology.

Our work had lead us to recognize three realms of presence: the presence of time, the presence of material and the presence of experience.

The presence of time arises from any form of interactivity. As the computer is incorporated into the stage, it connects actions on the stage with reactions from the setting in new, more immediate ways. This has been accomplished using video and audio feedback mechanisms, motion capture suits driving avatars and through motion controlled sound systems. The immediacy of real-time effects heighten the interaction of the actors with their control systems. Timing is everything and the reaction of the entire troupe to a misstep or to a misguided wii-mote, renders their characters more human, despite the very unreal nature of their mistakes.

The presence of material has contrasted the virtual and the tangible aspects of the stage design. Our design have emphasized the physical presence of the stage sets though large scale rolling scaffolding and elaborately fabricated sets that have a physical presence that sharply contrasts with the virtual devices and effects. The visceral sound of the rolling stage is made evident by the artificial layering of images and projections. The physical objects become surfaces, which are both seeing and being seen. They are the devices for interpreting the actor's moves and for redisplaying their altered states.

The presence of experience serves to allow the "spectactor"[13] to be seen as both a character and a human actor. Clifford Geertz has called this effect "experience near" and "experience distant"[14] and identifies it as the critical skill needed to understand other people in a cultural setting. We have done this by making clear the mechanisms by which the opera are made to work. We reveal the projectors, the computers and the operators who cause the altered reality. These objects are placed in the theater in ways that make them as much a part of the performance as any one audience member or any one actor. The technology occupies the most prominent places backstage, onstage and in the best box seats of the theater. Speakers for real-time panning are even placed in the theater to sing back at the singers, under their control on stage, of course.

…..n

"The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are undistinguishable from it."[15]

"All that is solid melts into air, all that is holy is profaned, and man is at last compelled to face with sober senses his real conditions of life……..."[16]

We cannot yet clearly see the unborn child of architecture provoked by the onslaught on the digital. But perhaps we can begin to see an outline.

The Architectural User Interface will be a combination of the tangible and the virtual. Rather than proposing either that all intellect will become silicon based or that computers are essentially useless, it will make a new setting that takes advantage of the strengths of both.[17]

The Architectural User Interface will be defined not by geometry but by topology, which insists that the essential character of a problem is in the sets of relationships rather that in a singular form. It will probably doom most of the formal conventions of architecture, certainly as they are used to en-frame and limit a specific object.1[8]

Finally, and primarily, the Architectural User Interface is defined by interactivity with the user, through a specific and sustained performance. This is a disquieting situation for architects who

by training and reflex view the world quietly and synchronically. But, it is precisely this aspect of the digital that can force us to see the world with fresh eyes and to cast aside preconceptions masquerading as the natural.[19]

The extent and outline of cultural practices are not invariant. Even for what Benjamin characterizes as its uniquely "uninterrupted" presence among the arts throughout history, the practice of building has demonstrated a parallel fluidity in its very definition. Etymologies for the term *architecture* itself reach no further back than the mid-sixteenth century, and most definitions of it that we would recognize derive from post-Enlightenment discourse: this is very recent indeed. The *degree* to which technology is instrumental in the mutability of contemporary cultural practices suggests its *immanence* within a new definition of architecture, while the rate of change wrought by technology suggests the *imminence* of such a paradigm.

Architecture is dead; long live architecture.

Notes

1. Victor Hugo, *The Hunchback of Notre Dame*. (Croscup & Sterling: New York, 1892). Hugo intends at least two meanings for this comment, one related to the lose of authority for the church to the individual and ultimately secular concerns and another related to the end of architecture as the sole repository of concretized culture.
2. Viollet-le-Duc's hope for the role of technology as savior is focused mainly on the restoration of historic monuments, ironically enough, largely in Gothic structures that Hugo cites for their anachronistic quality. Eugène-Emmanuel Viollet-le-Duc, *The Foundations of Architecture*, (George Braziller: New York, 1990).
3. Professor Edsger Dijkstra, Lecture delivered at the ACM 1984 *South Central Regional Conference*, Austin, Texas, 16 to 18 November 1984. The common preoccupation with the inferred anthropomorphic dimension of computing continues as a thinly veiled apotheosis of fear. It is interesting that the "worms" and "viruses" that are significant agents of mischief are specifically human sponsored.
4. Paul Douish, in *Where the Action Is: The Foundations of Embodied Interactions* (MIT Press: Cambridge, Massachusetts, 2001) traces the development of four modes of interaction (electrical, symbolic, textural and graphical) and presents an argument for reconceptualising the idea of HCI around embodied interaction. Our argument accepts his framework but we will try to make a specific case ofr the role of architecture.
5. Hiroshi Ishii and Tangible Media Group, *Tangible Bits: Towards Seamless Interface between People, Bits, and Atoms,* (NTT Publishing Co., Ltd.: Tokyo, Japan, June 2000). The work of the tangible bits group at the MIT Media Lab has consistently connected physical objects and environments with computers. This work is notable for its early success as well as its insistence on the inclusion of both the computer as active elements in the design.
6. Daniel Keefe, Daniel Acevedo, Tomer Moscovich, David H. Laidlaw, and Joseph LaViola, "CavePainting: A Fully Immersive 3D Artistic Medium and Interactive Experience", *Proceedings of ACM Symposium on Interactive 3D Graphics,* (Association of Computing Machinery: New York, 2001) pages 85-93. Caves are an extreme example of immersion, combining a three-dimension model, gestures, tracking and see through head mounted displays. The combined effect is a three-dimension model that can be navigated and manipulated in real time.
7. Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction", *Illuminations* (Schocken:New York, 1969). Benjamin is very specific in specifying architecture as a canonical example of an art that is seen in a distracted manner. It is fair to infer that the distraction has increased as the extent and the nature of media have proliferated.

8. Ben Bederson & Ben Shneiderman, *The Craft of Information Visualization: Readings and Reflections* (Morgan Kaufmann: San Francisco, 2003)
9. "Eight Golden Rules" are one of a number of lists, recipes and rules of thumb that Shneiderman assembles in this book. Much of this will strike those with a visual and design training as common sense mixed with a dollop of appreciation for the novel effect of the computer. Ben Schneiderman, *Designing the User Interface, Strategies for Effective Human Computer Interaction* (Addison-Wesley, Reading, MA, 1977).
10. See for example, Ruth Dalton's article "Is spatial Intelligibility Critical to the Design of Large Scale Virtual Environments?" in *Journal of Design Computing 4, Special Issue on Designing Virtual Worlds*, 2002. Dalton makes the argument that the use of ideas of urban legibility as a metaphorical framework allows users to understand very large data bases more effectively than other methods.
11. David Saltz, "Live Media: Interactive Technology and Theatre." *Theatre Topics* 11.2 (Fall 2001): 107-130. Saltz presents a convincing argument about the role of digital media in traditional theatre settings, including a taxonomy of the possibilities for further explorations.
12. Bertholt Brecht was determined not to let the audience be seduced by the "natural", but instead to be led to understand the artificiality of both theatre and by implication, current cultural conditions. According to Brecht, an actor "..never acts as if there were a fourth wall besides the three surrounding him..... The audience can no longer have the illusion of being the unseen spectator at an event which is really taking place." Bertholt Brecht, *Brecht on Theater: the Development of an Aesthetic* (Hill and Wang: New York, 1964) page 91.
13. Brazilian dramatist Augusto Boal extended Brecht's ideas, creating the Theater of the Oppressed". His combination of the actor and the spectator into a "spectactor" is his attempt erase the critical distance in conventional theatre as well as engage the participants in the substructure of the theater. His work includes *Games for Actors and Non-Actors* (London: Routledge, 1992) and Theatre of the Oppressed (New York: TCG, 1985)
14. Clifford Geertz article "From the Native's Point of View" in *Local Knowledge: Further Essays in Interpretive Anthropology* (Basic Books, 1983) seeks to provide a foundation for the way in which anthropologists can understand a culture which is not their own. He rejects simplistic ideas of empathy, instead calling on hermeneutics to provide a dual understanding of the world, one based on "experience near" immersion in a situation and the other on "experience far" understanding based on objective criteria and evaluation. He makes a claim for the necessity of both if we are to understand the "other".
15. Mark Weiser, "The Computer for the Twenty First Century", *ACM SIGMOBILE Mobile Computing and Communications Review* (Volume 3 , Issue 3, July 1999). There is a long tradition in the history of ideas that identifies the invisibility of a good deal of modern existence. (See, for example, Suzanne Langer's Philosophy in a New Key.) Weiser, however, seems intent on embracing it as a positive condition.
16. Karl Marx and Frederick Engels, *Communist Manifesto (Monthly Review Press: New York, 1998).* Marx and Engels intend this as a prelude to the economic enlightenment of the proletariat, but it is difficult not to read it as a more general description of the transformation of the cultural to the natural.
17. One parallel example of this is the work of Luis von Ahn and his idea of human computing. His very specific methods of combining the strength of human cognition with machine processing proposes a new paradigm for computing that avoids polemical position about either human or machine cognition. Luis von Ahn. "Human Computation." Google Talk, July 26, 2007. http://video.google.com/videoplay?docid=8246463980976635143&q=von+ahn&total=16&start=0&num=10&so=0&type=search&plindex=0.
18. One of the clearest examples of a theoretician moving toward this position is the work of Stan Allen, notably in his book, *Point + Lines: Diagrams and Projects for the City.* The projects presented in this book are as uncomfortable fitting on the pages of the book as it would be to identify them within the context of the city. Stan Allen, *Point + Lines: Diagrams and Projects for the City* (Princeton Architectural Press: New York, 1999).
19. Our challenge is similar to that identified by Banham when he notes that "The architect who proposes to run with technology knows now that he will be in fast company, and that, in order to keep up, he may have to emulate the Futurists and discard his whole cultural load, including the garments by which he is recognized as an architect." Reyner Banham, *Theory and Design in the First Machine Age,* (Praeger: New York, 1960).