Enhancing the Precision of Design Processes with Localized Time-based Media

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Time-based media in design, especially adaptations of film and television techniques, continue to hold much promise in emerging architectural design processes; one potential use is to overcome the conforming regularity of Building Information Modeling, or BIM technology, by guiding the ongoing implementation of design in the Building Information process. This research and its associated pedagogy explores the potential benefits of using video diagrams, or memory diagrams, in micro design environments, rather than as overall design compositions, to provide location specific design instructions within a larger conceptual framework to inform the BIM process. It also evaluates the related potential of architecture embedded with smart technology as an extension of memory diagrams in an expanded BIM function.

Keywords: BIM; memory diagram; smart architecture; micro-design; film.

Building Information Modeling (BIM) and smart technology

Revit’s streamlined Building Information Modeling (BIM) software has garnered widespread recognition in professional architectural practice. Yet innumerable obstacles confront Autodesk and its competitors from realizing capabilities more significant than improved management and production efficiencies already demonstrated in BIM – claimed improvements in core design function appear speculative and incomplete.

In an era largely defined by advances in information technology, the role of the architect is transitioning, from designer and master builder, into the role of systems designer: master of design optimization, environmental simulation, and artistic vision (Flanagan, 2007). The relationships between methods, processes, and creativity are subjected to fundamental realignment, yet Vitruvian principles endure, “Architecture depends on order, arrangement, eurhythmuy, symmetry, propriety, and economy”. (Vitruvius, first-century BC)

Architecture is one of many professions struggling to accommodate the escalating requirements of “smart” technology. At a cursory level, “smart” technology has transformed the typewriter into the personal computer and the telephone into the cell phone; it is in the process of transforming the computer and cell phone into a hybrid, multimedia-communication device, as seen in for example in Apple’s iPhone. On closer inspection, the role of technological transformations is nuanced and both capabilities and limitations need to be carefully measured. The
electronic sketchpad has not replaced the common pencil nor has photography replaced paint and canvas – despite countless predictions to the contrary. While the evolutionary dynamic in “smart” technology will not replace architecture as it is practiced today, “smart” architectural environments, characterized by reconfigurable information spaces will continue to expand the range of professional practice.

**Masking BIM’s promise**

BIM’s potential contribution in architecture is masked by interpretational miscues and by exaggerated claims of its potential contribution in conceptual design development. These are diversions from its primary contribution, as a means to visualization and production. On the one hand, “smart” technology is transforming consumer demand; on the other, BIM technology is transforming manufacturing and building practices – but neither improvement fundamentally redefines the role of the architect. Each provides the opportunity to build on and enhance Vitruvian sensibilities, yet design conceptualization remains steadfastly outside the realm of BIM’s capabilities; design conceptualization is in essence an intellectual endeavor, the necessary precursor to the objectification of ideas.

**“Smart” spaces, Building Information Management, and mental constructs**

BIM’s integration of visualization, management, and manufacturing capabilities is significantly advancing manufacturing and building technology practices in architecture. As for the future, an emerging demand for “smart” architecture will progressively displace form as the principal function in architectural practice – it is not an either or situation, it is one of proportionality. A period of transitory equilibrium in practice will allow for the architectural development of a unique style founded in “smart” technology that is optimized and manufactured with BIM technology. The relationship between these factors is that concepts originate in and are built in the mind, architecture is defined and codified in BIM, and architecture’s emerging role is to function as a support mechanism for “smart” environments.

BIM software is the culmination of forty years of development and is transforming form-making into a commoditized gesture. Form-making will over time, as its commoditized character matures, require proportionately less architectural input. This is most pronounced where building contractors and developers need only purchase a prepackaged prototype, calculate the economic viability of some configuration, and adjust the BIM model accordingly. Copying banks, factories, schools, and courthouses from place to place is an age-old phenomenon founded in pattern books that will undoubtedly continue or expand under BIM. However, this should not be a concern to the future of architecture since precedent dictates that architects should be pursuing new markets and “smart” architecture is the most promising development on the horizon.

**Conforming regularity in Building Information Modeling**

While Autodesk’s Revit offers significant improvements in optimizing building processes, it offers little to substantiate its claim that “Revit Building works the way you think …” (http://download.autodesk.com/global/revitbuilding/ADesk_1051_OL/ADesk.51.html :March 2007). Typical media used by designers to address form and function (including multisensory attributes) in architecture include sketching, photography, collage, and poetry, storytelling, abstract composition, text, graphics, and paper models. Inspiration is founded in history, philosophy, precedent, context, science, politics, religion, and economics. Revit does not address the way that a designer thinks about these issues. Autodesk’s claim that “Design is an iterative process; you create a design and then change it, again and again”, is also flawed (2007). In practice, there is overwhelming evidence that visualization is a
validation technique to speed up schematic design development that does not significantly influence conceptual design generation.

**Non-object oriented design strategies with BIM technology**

This research and its associated pedagogy explores the potential benefits of using video diagrams, or memory diagrams, in micro design environments, rather than as overall design compositions, to provide location-specific design instructions within a larger conceptual framework to inform the BIM process. Memory diagrams inform BIM development at the micro-design level as memory diagrams are applied to individual surface areas. The advantage is that the designer’s concept is localized and imbedded in the form. Since a memory diagrams accesses the extended range of design information available in film media, a scripted narrative largely constructed of traditional media can be imbedded into the virtual model with the video diagram. The localized memory diagram is available to the entire project team to be interpreted and implemented in BIM.

**Memory diagrams (Flanagan, 2001)**

“In conventional-print as well as in other tangible media, the poetic potential of the design message is contained in a fixed composition, a collection of sketches, models, and text (figure 1, storyboard).” Memory diagrams are time-enhanced design diagrams that function as conceptual design generators; they function much as television commercials, providing complex, often intangible, sensory and value information in a sequential audio-visual message (figure 2, video diagram). The approach is characteristic of film-based compositions; but rather than a thirty-seconds message typical of television commercials, they are three-to-five minutes in length.

**Precedent: media, message, and process**

Experiments in the use of time-based media in design span more than a century – while interest has waxed and waned in architecture over this time advances in time function in the arts generally, are notable. The artist Moholy-Nagy in the essay, “Vision in Motion” (1936) expounded on “kinetic concepts of spatial articulation.” Of relevance is the excerpt, “Vision in Motion is seeing moving objects either in reality or in forms of visual representation as in cubism and futurism. In the later case the spectator, stimulated by the specific means of rendering, recreates mentally and emotionally the original motion.”

**Memory, place, and imagination**

The use of localized design generators is a variation on a memory technique described by Frances Yates in “The Art of Memory”. “It is not difficult to get hold of the general principles of the mnemonic. The first step was to imprint on the memory a series of loci or places. The commonest, though not the only, type of mnemonic place system used was the architectural type. The clearest description of the process is that given by Quintilian [Institutio oratoria, XI, ii, 17-22.] In order to form a series of places in memory, he says, a building is to be remembered, as spacious and varied a one as possible, the forecourt, the living room, bedrooms, and parlors, not omitting statues and other ornaments with which the rooms are decorated. The images by which the speech is to be remembered
– as an example of these Quintilian says one may use an anchor or a weapon – are then placed in imagination on the places which have been memorized in the building. (Yates 1966) The principle employed in this research is to place the mental map of the video image in the “loki or places” and then to create the memory map, or memory diagram, to function as a conceptual design generator of that place.

Memory diagrams and smart surfaces

The relationship between BIM and “smart” architecture can be illustrated in the architectural function of a cube. The continuous application of “smart” technology, both virtual and actual allows surfaces and spaces act as substrate and carriers of information in the design of form and function. Multimedia applications (memory diagrams are discussed here) consolidate a wide range of conceptual factors into a coherent design message; they are capable of accompanying design development in BIM software and into the final architecture if desired.

Transitory spaces in architecture

The earliest simulation of visually compresses media infusing vacant space dates to the introduction of the 20th century motion picture theatre. The theatre shelters the theatregoer from external environments that would alter an otherwise neutral sensory environment: temperature (conform), sound (quiet), conform (seating), and obscurity (dark environment). Once the film starts, the movie infuses the space with the message of the film with sound and graphics. Through the physiology of human perception, especially the persistence of vision, the voluntary suspension of disbelief, and story lines in constructed timelines of artful narratives. For the duration of the movie, the viewer enters an alternate reality that effectively space that is only configured when the projector is turned on.

“Smart” architecture of a cube

In an extension of the movie theatre’s immersive environment, configurable information spaces can define a myriad of functions, from operating rooms to boardrooms. The reality of the future of professional practice in architecture with BIM and “smart” functions can be illustrated within the theoretical confines of an architectural cube. When the form is known to be a cube, it removes the hyper-expressionism of the geometric gesture that often overwhelms the more essential functions of architecture. By negating the external gesture, only to the requirements of function need to be addressed. Whether the cube houses a school, museum, or hospital operating room, future requirements of function are increasingly leveraged in information technology. Trends in this area portend larger and more complex information infused smart architecture.

The architecture of an operating rooms will engage full wall and ceiling displays to monitor patient health; smart architecture in a cubed operating room would require operable configurable space, information configurable walls, configurable windows (transparency), configurable screen displays (information panels), communications information displays, entertainment, illumination, environmental control (heating and cooling), and micro-containment zones. The external shell and its physical manifestation are peripherally related to the main function of the architecture. It is the smart spaces
and configurable environments that are transformed into the operating room and these are not necessarily dependent on the external gesture.

**Summary: Time based media and smart architecture**

This research proposes a methodology of precision design diagrams to “form a series of places in memory”, of how specific design events occur within the “building [are] to be remembered” – or in this case, inverting Yates classical theory of memory, to determine how the architectural loci are to be designed.

Existing solutions and design workarounds are often ad hoc, not well organized, and lack the specificity of design intention needed in large complex design undertakings. In an attempt to overcome this, memory diagrams embed design media in design geometry in the earliest phase of the design process. Memory diagrams are accessible and reconfigurable at any part of the design process and do not require a geometric alteration, allowing the architect to designate and update the design concept.

Smart surfaces introduce interactivity and micro-design to local environments. Configurable smart surfaces may be defined as transparent, translucent, and opaque. Configurable media also includes menus, media events, art, advertising, and work spaces. Smart media design may function in a post occupancy capacity, as in facilities management. It is the design of the media on the configured surface opens a potential market – architecture as information space.

**Conclusion: Traditional media embedded in its geometric carrier**

Autodesk’s ambiguity with the term “design” detracts from otherwise substantial advantage to be derived from its BIM software –especially noted improvements in manufacturing and production capabilities. Expediencies founded in improved building processes are not dependent on, nor should they be confused with claimed improvements in conceptual design capability. Autodesk’s speculation on how a “designer thinks” is simplistic conjecture. Its implication, that architecture is a shell to contain function, and that the form of the shell is derived from iterative visual gesturing is naive.

Reconstructing a designer’s intention is inherently problematic; there is never a complete accounting of a designer’s intention or process. However, it is evident from documented processes that conceptual design is not simply an iterative, three-dimensional, visual gesture –the software FormZ had that capability a decade ago. Professional, design-architects engage numerous, and varied techniques in conceptual design development. From the seed of a mental construct to its translation into a physical concept, computer technology has had limited influence. While Adobe’s Photoshop and other compositional software are used in collage – BIM is almost exclusively employed for Building Information Management in visualization, production, and manufacturing support roles.

Revit’s conceptual “design” functions remains essentially unchanged from AutoCAD, with similar capabilities and deficits. The work documented here and the recommendations of developing an improved user interface address the mind – practice interface while designing the architectural container (in which function takes place) is not a trivial task. The era of Goethe’s “architecture as frozen music” has been eclipsed by the promise of architecture of integrated IT enhanced function - especially information-imbedded, smart functions. Architectural spaces, both internal and external, are now platforms in the support of integrated Information Technology (IT) function: security, environment, information, entertainment, and communication.

Forward-looking architects can evaluate the potential of information technologies entering the market place. An important development is the potential to imbed smart content into the architecture substrate of configurable information spaces. Strengths and weaknesses of BIM are the precise, yet
cumbersome, interface required for strict adherence to the rules of software design logic, its use (and dependence) on standardized building components, and its necessity to efficiently document all aspects of the architecture. The use of memory diagrams in micro design environments is not conclusive, but it is an adaptable aid to connect BIM to conceptual design development. The transformation of architectural form as a commoditized product will certainly continue. Herein is the potential for expanded architectural practice - as flexible screen technology, holographic displays, and other multisensory capabilities emerge, to incorporate configurable architectural design services into the form and function of architecture.

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