

Digital Iteration: Defining a Synthesis between Manual and Digital Craft

by James F. Eckler Jr.

Preamble

Digital modeling has established a firm foothold in the industry and education of architectural design. Nevertheless its role in the development of architecture is still as undefined as it was at the inception of these technologies. Often digital, three-dimensional modeling is relegated to a presentation tool in mainstream architectural practice. It has little impact on the conception or the development of the design. This is symptomatic of a disconnect between conventional design thought through iterative process, and the immediacy of virtual design. The mantra of design software is often expediency. However, this is a proposal that explores the possibility that design software can become an integrated component of the iterative process; that it can add to a way of thinking through making. In the exercise detailed in this paper, digital design achieves a synthesis with the conventional ways of making and integrates a way of thinking in virtual space with that of manual manipulation. The digital design software doesn't replicate or replace skills already possessed through drawing or modeling by hand, but augments them and provides a different way of viewing and understanding the possibilities of architecture. A single and continuous process of design is achieved.

Engaging Process

What role might digital, three-dimensional modeling play in the process of design? In seeking an answer to this question, a beginning graduate studio of architecture at the University of Cincinnati was given an assignment that would develop, not only a proficiency with the **form•Z** tool, but also an understanding of its potential to be used as a component of process that would facilitate thought and discovery. They were tasked with integrating other techniques of making and thinking with this digital mode of thought. The students used techniques of collage to move from digital manipulation of form and space in **form•Z**, to manual methods for organizing, structuring, and thinking of tectonic assembly. The bridge between two methods for creating architectural space would facilitate an understanding of the potential for digital modeling to have a significant impact on the way experience is structured through architecture; it was envisioned as a stage along a process of invention and discovery rather than a means to visualize something "complete."

At this stage of the curriculum the graduate students were in their second academic quarter of architectural design. Each has a different background and bring different skill

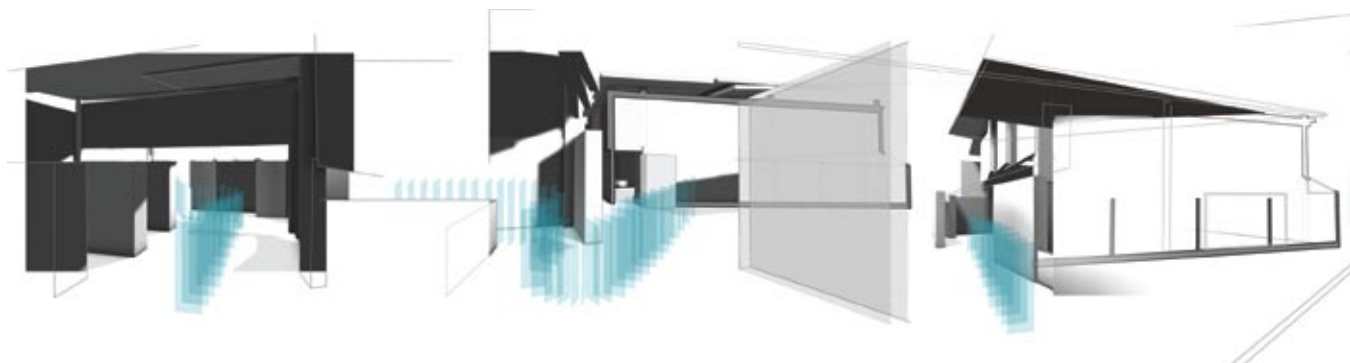




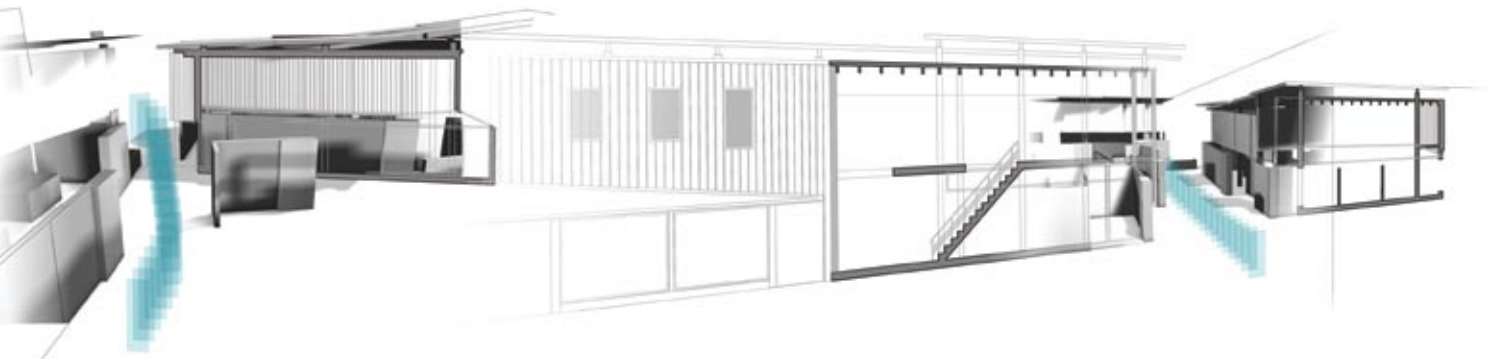
Figure 1: Jessica Helmer. The wandering, itinerant section that is unfolded in the construction of this collage is apparent. The primary moment of focus – the vignette in the center of the composition – is well resolved. The layering of the rendered vignette and the hand drawn section effectively communicates the relationship between event and path; movement and pause. The other vignettes – toward the edges of the composition – are less integrated with the unfolded section, which acts as an organizational datum for the drawing. This lack of integration makes them read as incidental or autonomous. These peripheral experiential moments, while individually well considered, seem not to contribute as much to the overall architectural scheme. This accurately reflected some of the struggles this student was having with the direction of her design, however the use of the section as an organizational tool had the potential to push her in a direction of greater integration for subsequent iterations.

sets to the development of their own way of viewing and making architecture. The students were given a project that incorporated multiple disparate programs into a single architectural construct (or, as the project evolved for some students, a collection of smaller structures). They worked on developing the design continuously in this skills course as well as the primary design studio taught by Prof. Karl Wallick where the project was introduced. The overarching goal for both the design studio and the skills component was to provide an opportunity for the students to explore the possibilities of tectonic assembly in the conception of architectural space. The studio focused on the development of tectonics in the structure, organization, and sequence of space, while the skills course focused on experiential qualities of light, proportion, scale, texture, and the event of space using **form•Z** in conjunction with other more conventional design tools.

“Architecture begins with a metaphysical skeleton of time, light, space, and matter in an unordered state; modes of composition are open. Through line, plane, and volume, culture and program are given an order, an idea, and perhaps a form. Materials—the transparency of a membrane, the chalky dullness of a wall, the glossy reflection of opaque glass—intermesh in reciprocal relationships that form the particular experience of a place.”—**Steven Holl**

form•Z was introduced to the students at a point in the development of their designs where an understanding of programmatic and spatial relationships was leading to experimentation with built form. In this way the digital tool became a component of the iterative process as opposed to a means of representing its results. Here they were able to continue refining spatial and experiential ideas as

Figure 2: Brian Ballok. Here the section is less apparent than in Figure 1. The lack of a central organizational component reflects complex movement patterns created by irrational geometries in the design. The integration of rendered vignette and drawn section communicate relationships between disparate components of the design well in the right half of the composition, however the left side degenerates into a series of independent renderings. Their relationship to one another is impossible to determine. Essentially they are completely different drawings. It is however difficult to overlook the sophistication that directed the composition and established relationships between itinerary and programmatic moments along the path of the right side of the collage.



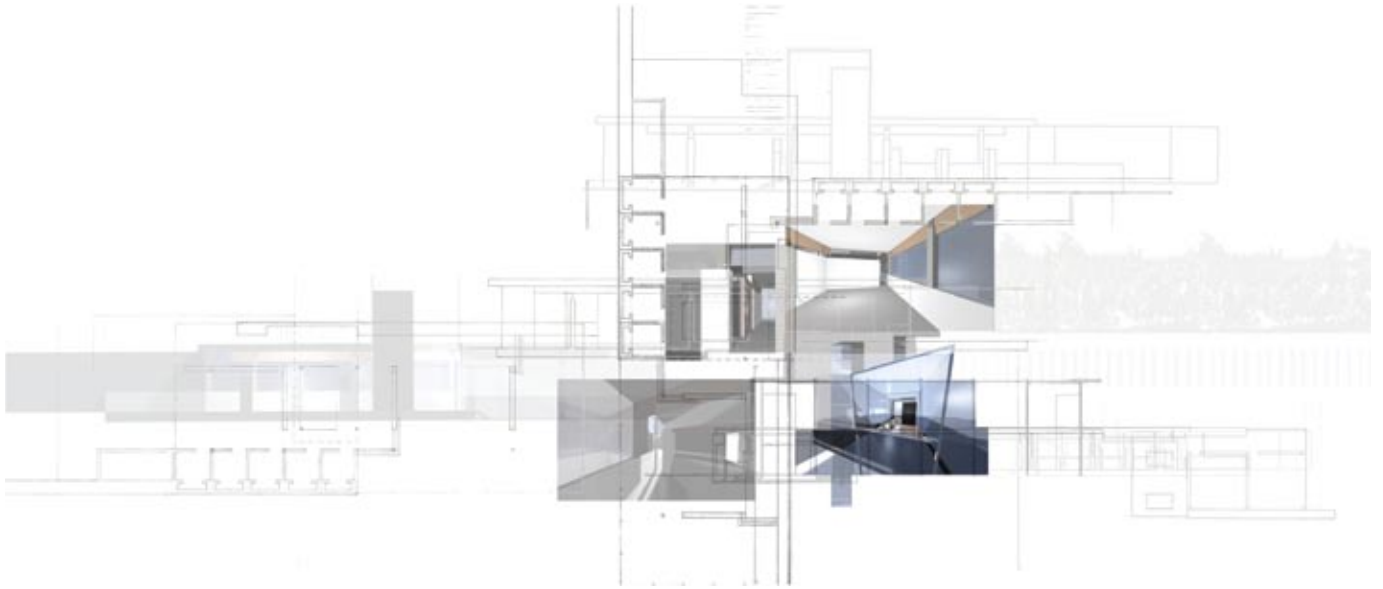


Figure 3: Christopher Bartell. The four primary vignettes are positioned centrally. The composition details the proximal relationships between them while major differences in material and light quality speak to variations in program and interaction between occupant and architecture. The positioning of the four distinct moments as an organizing device for the entire collage addresses placement of the individual spatial moment within the overall scheme, as well as its contribution to that scheme. The juxtaposition of hand drawing and digital rendering at that central node is compositionally seductive without offering much information regarding a relationship between the event and the path. This becomes clearer as the composition becomes simpler toward the edges of the drawing, but there is still work to be done on the weaving of the two drawing systems in order to be effectively communicative.

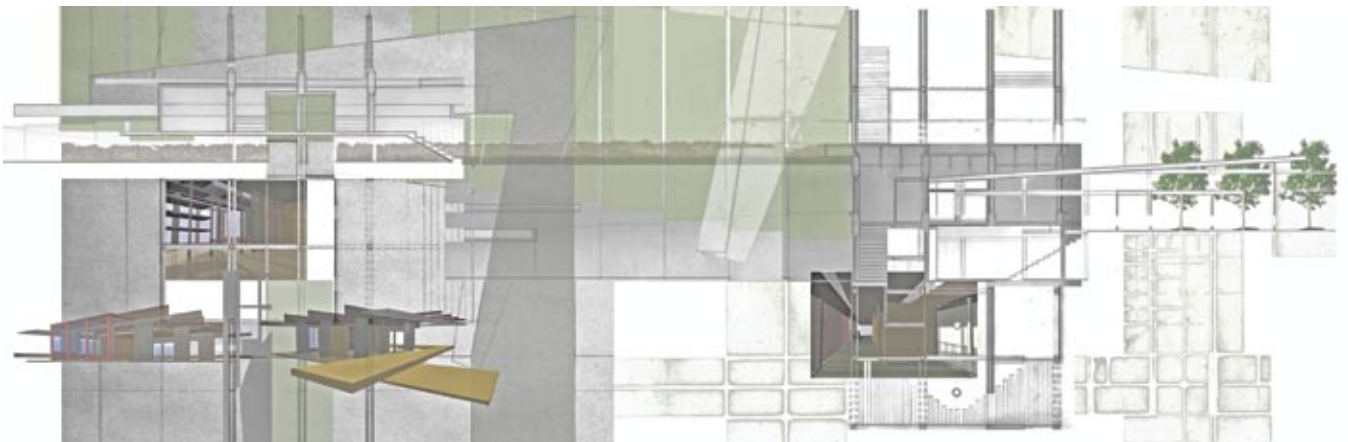


Figure 4: Michael Westrate. In many moments the path becomes completely overshadowed by the presentation of the experiential aspects of the vignette. The composition communicates, almost inversely of Figure 3, the contribution of the event to the entirety of the architectural scheme—they are nearly one in the same. The heavily manipulated drawings integrated with the rendered components (which in most cases are also heavily manipulated) show a continued progression of design development through the course of the construction of this collage. The level of integration between the two drawing types serves to communicate the relationship between tectonic systems of organization and spatial experience in the ultimate conception of the architectural scheme. The one moment that defies the general cohesion of the rest of the drawing is at the bottom left corner. Here the placement of an exterior rendered view of the digital model undermines the compositional integration of drawing types in that region of the drawing and offers no information relative to space, structure, or experience.

discoveries made in the hand-built model were tested and manipulated digitally. This exploration yielded a synthesis between ways of making and visualizing architecture.

The assignment was composed of two concurrent exercises. One was the advancement of the design through iterative drawing in plan and section from the studio curriculum. The other was the advancement of design through virtual assembly and manipulation of tectonic components in **form•Z** from the skills curriculum. As the plans and sections were developing schemes for organizing and relating space, the digital models were exploring the possibilities of experience and its impact upon architectural design. The students virtually built several important spaces within their project that were determined by the assigned program. How does one interact with the forms that contain them, and how does this interaction facilitate a prescribed activity within the space? At a particular point of resolution in these two concurrent exercises the students were asked to consider the hierarchies of space and relationships between programs in the development of a sequence; an order of encounter. How might one move from moment to moment within the project, and what happens to that individual along the way? (See Figures 1 and 2).

Vignette

How does an occupant interact with built form? What are the implications of this interaction for the programming of a space? Consider each virtually constructed space a vignette; a short narrative that describes the experience of a space and the activities it holds as a result. In the construction of the vignettes characterizing important spaces the students considered ways in which the tectonic assembly of architecture could be manipulated to produce very specific experiential qualities of space: the “transparency of membrane,” the density of a screen, texture, reflectivity, joinery, the behavior of light. Each vignette was characterized by an event that the architecture was meant to house. The vignette that describes this space of event also describes the architectural response to program. It addresses not only what an occupant perceives, but also the way that the perception is structured by the architecture (Figures 3 and 4).

Itinerary and Sequence

Architecture can be understood as a series of events positioned relative to one another in the creation of a building. How then does the architecture assemble the transition from one event to another? How does an occupant move through space from one programmed moment to another? And how does this transition impact a perception of space and event? The students were asked to consider

the sequence of movement in the construction of a single path through their projects. They explored ideas of arrival and the way that an occupant is introduced to a space/event as well as notions of direction, progression, expansion, compression, turning, vertical movement, pause and many other components that define movement along a prescribed itinerary. Using the plans, sections, and various renderings extracted from the digital models the students were to construct an “itinerant section” along a path winding through their project. This construct was a collage that positioned the vignettes relative to one another and investigated the linkages between as a path from one to the next (Figures 5 and 6).

What is Gained...What is Lost?

Why is this synthesis between modalities of making important? As designers we think through making. This iterative thought process has been undermined by the ability to immediately arrive at a solution through the use of design software. In this immediacy, much in the way of understanding and consideration of space and experience is lost; replaced by formal manipulations made possible by the computer. At the point in the process where spatial relationships and experiential considerations are sacrificed in favor of formal experimentation, architecture is reduced to a novelty. A synthesis defines a role within traditional ways of thinking and making for the possibilities and advantages of digital design. The thinking behind the design process is not altered by the tools we use to make, but instead defines the way in which we use them. The energy devoted to accelerating production is rechanneled into the development of a built form that is responsive to site, experience, and program.

References

1. Steven Holl “Idea, Phenomenon, and Material”, From: “The State of Architecture at the Beginning of the 21st Century”, Edited by Bernard Tschumi and Irene Cheng, The Monacelli Press, Inc. & Columbia University, New York, 2003.

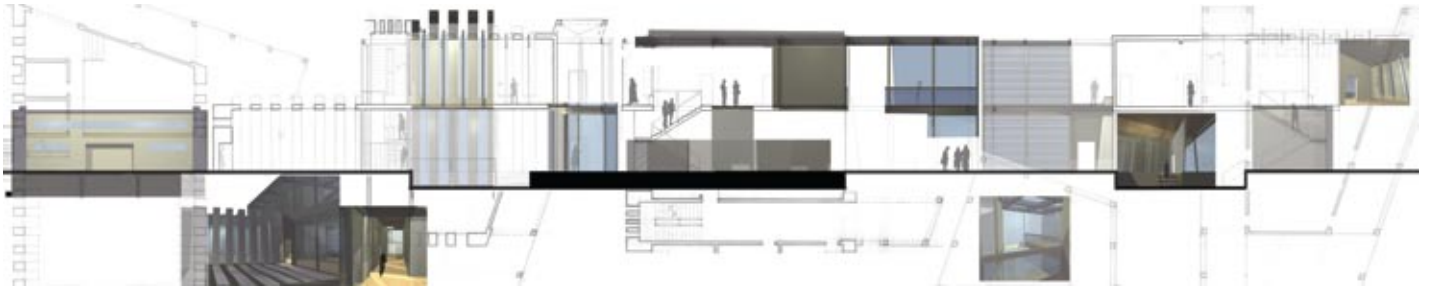


Figure 5: Kyle Campbell. The sequence of space and event is apparent. This is a solid drawing that effectively communicates the relationship between the path and the moments of program along it. The use of scale to define ideas of movement is used most effectively. The density of drawing elements, as well as scale figures, and transitional elements speak to the structured sequence of movement. Ideas of compression, elevation, turning, pause, and progression are addressed in this way. The tectonic nature of path is far more resolved than the experiential vignettes that positioned along it.



Figure 6: Noah Bergman. In this composition path and vignette are blurred and become nearly indistinguishable. The contribution of the programmed event to the structuring of movement seems to be a primary focus for the derivation of tectonic assembly as well as the composition of this collage. The flow of spaces as a vignette make transitions into another reinforces the structure of the path created by the overlapping plans and sections. This facilitates the creation of a continuous sequence of events that conspire to generate a notion of path rather than path and event being independently considered and later brought together. The one major compositional failure of this collage occurs just toward the left of the center where a large rendering of a somewhat neutral space serves to disrupt the otherwise continuous sequence without providing much useful spatial information. It distracts from the overall communicative nature of the drawing and does not reflect the qualities or conditions of the actual design. However, both the components to the left and right of this moment are well crafted and integrated to effectively communicate the co-dependence between itinerary and event.



James Eckler Jr. received his Master of Architecture, as well as a Master of Architectural Studies in Pedagogy, from the University of Florida. He is currently a Visiting Assistant Professor of architecture at the University of Cincinnati, where he teaches design, representation skills, and digital skills. In addition to teaching, James is actively engaged in research concerning place and place making within an urban environment, particularly the city of Cincinnati.