The Field in the Object:
Three Case Studies on Interactive Assemblies

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Abstract

With the rise of digital design in architecture it became possible to not only accelerate and consider new modes of representation, but also new methods of fabrication and new formal typologies. Initial “paperless” architecture of the 1990’s de-emphasized the production of the material object. With the introduction of animation software, traditional methods of formal composition became subservient to the articulation of surface derived geometries. Digital fabrication tools increased the proliferation of mass component assemblies leading to the dissolution of the monolithic. As we move into the first decade of the twenty-first century, the gap between digital design and physical production shrank and many projects began to rely heavily on a simple formal operations and assembly techniques to organize part-and-whole aggregations. In many cases, these techniques became the signature idea of the resulting project. In the wake of the adaption of these tools to implementation in general architectural practice through utilization of commercialized Building Information Modeling (BIM) software, there still remains some ground to tread in terms of formal exploration based on the traits of digitally developed forms as our technologies evolve, but the infatuation with technique and its limitless formal results has been set aside in favor of new (or perhaps previous) conceptual models to drive the architectural projects such as narrative and event. With this in mind, there opens up a possibility to consider the use of the systematic processes of computation in design to be directed towards the development of the architectural object that not only considers the operations embedded in the development of form, but how to consider the relationship of the products of these processes to culture and event through communicative form and interactive fabrications. The explorations of the academic design studios I conduct and the architectural research practice in which I collaborate have investigated these issues presented here through three case studies. These are:

1. The X,Y,Z HOUSE, a project developed for a first year architectural design studio in which a small domicile is developed from procedure-based assemblies of standard elements.
2. *Massimals*, a design research project where full-scale models serve as prototypes to examine how physical form can engage the public realm.

3. *The Play Lounge*, the result of a graduate level elective course in which the class designed and fabricated full-scale interactive objects developed from a systematic approach to material assemblies.

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Introduction

With the rise of digital design in architecture it became possible to not only accelerate and consider new modes of representation, but also new methods of fabrication and new formal typologies. Initial “paperless” architecture of the 1990’s de-emphasized the production of the material object as it explored the realm of the virtual. The introduction of more complex animation software such as Alias Wavefront and Maya to the architectural design process allowed designers to move beyond traditional methods of formal composition utilizing static grids, intersecting masses and volumes, and folding of angular planes to the use and articulation of surface derived geometries. Greg Lynn’s book, *Animate Form* (1999), outlines theories in support of topological explorations of architectural form that is not considered static, but behavioral in which the vectors or paths of “geometric particles that change their position and shape according to the influence of forces”1 become the final project form. Digital fabrication tools such as the CNC router, the laser cutter, and the 3D printer became more readily available; designers began to experiment with the production of mass component fabrications leading to the dissolution of the monolithic. Stan Allen’s essay, *Field Conditions* (1999), theorizes models for architecture described as “bottom-up phenomena, defined not by overarching geometrical schemas, but by intricate local connections. Interval, repetition, and seriality are key concepts. Form matters, but not so much the forms of things as the forms between things.”2 Moving through the first decade of the twenty-first century, the gap between digital design and physical production shrank and many projects began to rely heavily on a simple technique to organize part-and-whole aggregations. These techniques in many cases became the signature of the resulting project as exemplified in Aranda/Lasch’s *Pamphlet Architecture 27: Tooling* with project headings such as “Spiraling, Packing, Weaving, Blending, Cracking, Flocking, and Tiling.”3 These projects exemplify the result of bringing together the years of implementation of the forms derived from behavior and component distributions as described in Lynn and Allen’s texts respectively (figure 1). In the wake of the adaption of these tools to implementation in general architectural practice through utilization of commercialized Building Information Modeling (BIM) software, there still remains some ground to tread in terms of formal exploration based on the traits of digitally developed forms as our technologies evolve, but the infatuation with technique and its limitless formal results has been set aside in favor of new (or perhaps previous) conceptual models to drive the architectural projects such as narrative and event. With this in mind, there opens up a possibility to consider the use of the systematic processes of computation in design to be directed towards the

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development of the architectural object that not only considers the operations embedded in the development of form, but how to consider the relationship of the products of these processes to culture and event through communicative form and interactive fabrications. The explorations of the academic design studios I conduct and the architectural research practice in which I collaborate with Akari Takebayashi, Design Office Takebayashi Scroggin (D.O.T.S.), have investigated these issues presented here through three case studies (figure 2).

Figure 1. Behavior, Components, and Techniques

Form derived from behavior  Field of components  Technique becomes building

Figure 2. X,Y,Z Unit, Massimal Typology, The Rocker

These are:

• Case Study 1: The X,Y,Z HOUSE, a project developed for a first year architectural design studio in which a small domicile is developed from procedure-based assemblies of standard elements.
• Case Study 2: Massimals, a design research project where full-scale models serve as prototypes to examine how physical form can engage the public realm.
• Case Study 3: The Play Lounge, the result of a graduate level elective course in which the class designed and fabricated full-scale interactive objects developed from a systematic approach to material assemblies.

The projects are presented in chronological order of development as the issues raised through each design investigation yields questions from which the next investigation begins. The first investigation, X,Y,Z House, serves as a stepping-stone to move out of the discussion of purely digital design methods to work with physical models as a process.
Case Study 1: X,Y,Z House

The X,Y,Z House is project developed for a first year design studio in which non-linear design processes addressing issues of behavioral form, field conditions, and techniques in relation to architecture are taught without the use of the computer. Projects were “grown” based on a set of rules written by the students that governed the connection logic of the physical component assemblies. The students were given a basic unit assembled out of three 2” basswood sticks connected at 90-degree angles with each stick pointing in one of the x, y, and z directions to begin their investigation. These units were assembled into three-dimensional arrays expanding in the x, y, and z directions to develop tectonic fields with the ability to be modulated through incremental shifting of the connections to vary field densities (figure 3). The students deployed these arrays within the volumetric constraints of a 9” cube yielding a variety of results based on adjusting the rules of assembly (figures 4,5). The final forms, by the nature of their “animate” processes, take on a variety of configurations when deployed within the cube, but what if this static context for these field deployments becomes not a formal constraint, but the final form in which the behavior driven elements are deployed? Could there be a field within a defined object, a Field-Object and what if this object were based on a familiar shape?

Figure 3. Unit Variations

Figure 4. Procedural Component Array in Volumetric Constraint
Case Study 2: Massimals

The Massimals project is an ongoing design investigation conducted by D.O.T.S. since 2010 in which a series of fabrication prototypes are developed to consider possibility of new relationships between assembly processes and the volumetric envelope to examine how physical form can engage the public realm. These design objects are abstractions of animal forms built in the manner of massing studies produced in an architectural design practice (figure 8). Like massing models, they are volumetric, devoid of details, and fabricated from one material such as chipboard, polystyrene foam, and foam core. The suggestive forms and their specific arrangement imply docile behavior similar to animals in a petting zoo augmenting the way visitors approach and engage built form (figure 9).

Rather than porous field configurations developed from bottom up phenomena or forms derived from behavioral techniques adaptive envelopes, Massimals are top down, determined forms, defined by mass and overall shape. The material system gives it its unique character. What is acting as formal
constraint (the cube) to contain the behavioral field of component arrays in the X,Y,Z House is now the form.

**Figure 8.** Massimals by D.O.T.S, Photo by GLINT Studios

**Figure 9.** Massimals Petting Zoo, Photo by Glintstudios
The object’s affinity towards the shape of polar bear shifts the focus of the product of the design research from technique to cultural engagement. This is an ongoing investigation for our design practice, seeking how these discoveries could potentially apply to building.

While the recognizable form helped communicate the complexity of the design to visitors, a new question emerged which became the topic of my graduate elective course, how can we physically interact with these objects developed from systematic material assemblies?

**Case Study 3: The Play Lounge**

The graduate level design and fabrication elective I conducted in Spring 2013, *Tectonics, Typology and Distribution*, developed and fabricated objects that facilitate physical interaction with complex geometric assemblies. Picking up on the question asked with the *Massimals* project, the course considers how we can activate user participation with design objects. As a research exercise we investigated a series of simple, non-electronic toys, of no particular distinction to understand what activities inspire interaction with the user. The class charted the results and used these as the initial motive for the design of the interactive geometric assemblies and spatial relationships (figure 10). It was a requirement that the final constructs were durable and gave a range of tactility. Like the Massimals, the projects were conceived as a related series initially determined by giving shape constraint (figure 11). The factors that further determined their relationships in terms of qualities, interactivity, material organization and assembly methods were determined through making, evaluation, and discussion in the course. The resulting constructs took the form of what we titled *The Play Lounge* including:

**Figure 10. Toy Interaction Analysis, Drawing by Scroggin Elective 2013**
Figure 11. Material Organizations Constrained to Circular Shape

The Bubble Bunch (figure 12)
An aggregation of rubber ball clusters contained in translucent stretch fabric that can be distributed into a variety of seating configurations.

Figure 12. The Bubble Bunch, Photo by GLINT Studios

The Foam Donut (figure 13)
A soft bench in the form of a geometric torus comprised of foam pool noodles.
Figure 13. The Foam Donut

The Rocker (figure 14)
A conjoined set of six rocking chairs lined with vinyl tubing for seating and a mirror-plated top.

Figure 14. The Rocker, Photo by GLINT Studios
Play: The Objects in the Field

While it is not yet clear what these investigations could yield at the scale of building, the fabrication and deployment of these assemblies within the familiar and interactive formal envelopes invites a performance beyond what was anticipated. Perhaps if a building’s spatial and programmatic organization and its methods and systems of construction are adaptive, interactive, and playful from its conception, there could be the possibility to create an architecture that not only adapts to its environment, but invites new forms of encounter (figure 15).

Figure 15. New Forms of Encounter, Photo by Glintstudios