ANIMATE EDUCATION: EARLY DESIGN EDUCATION PEDAGOGY

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Abstract. This paper presents a novel approach to the introduction and use of animation and motion graphics in foundation design education. Design inquiry and understanding as generated from, and translated by, movement is the focus. This work explores animation as a design methodology in the first weeks of architectural education. The proposed design exercise discussed here will probe the concept/context and spatial/visual literacy of the learned sense of space-time in architectural design education and representation. Here the digital application of animation and motion graphics is intended to be process driven to encourage students to find an *attitude about solutions* rather than *a solution* to the design project. The intention is to examine the relationship between form and space through a structured exploration of movement within a *kit-of-parts* design project that explores a three-dimensional spatial construct. Animation as a design method poses unique potentials and pitfalls. Animation and motion graphics, as a collection of instances, is both questioned and exaggerated. This project creates a threshold experience of learning that puts in motion an exploration of integrated digital process and design product.

Keywords. Education, design theory, design studies, animation

1. Introduction

> "Implying always a beginning, teaching is about initiating excitement. It entails the deployment of pleasure, the build-up of passion, the obsession vis- -vis a particular field of endeavor, the grounds on which the discipline operates, and its intellectual as well as physical practices."
>
> - Marc Ang lil, *Inchoate* (2004)

The foundation design studio is often concerned with primary issues of composition, three dimensional thinking, drawing, conventions of visual communications, and simple tectonics. This project explores the use of digital animation and motion graphics to aid the foundation design student in all of these areas in a way that excites and invigorates the design studio with process based explorations. The use of animation allows the design studio to address composition both of the digitally modeled geometry, the perceptual experience of a virtual participant, and the framed representation of the animation itself. The use of digital animation introduces time as a foil for space while providing a tangible language for many beginning students to visualize, understand and manipulate three-dimensional constructs and their representation. The use of a frame-based medium, as in animation, allows the final composed version, considered film, to illuminate constructed connections to drawing and visual communications happening in other media in the design studio and throughout the design process.

The primary objectives of this project are to enable the student to: visualize and communicate three-dimensional space, understand the concepts and techniques of digital modeling and animation in architectural terms, and develop an understanding of the interdependence of design representation process and product. The project provides the student the opportunity to explore design potentials of media. The goal of the project is to critically examine current developments within the rapidly expanding architectural discourse related to digital media and information technologies that are challenging many of the established understandings of architectural production, the conventions of communication and the design process. The project promotes the examination of the impact of digital media on the conception and transformation of form, shape, surface and space therefore leading to a revised understanding of the processes from which architecture may emerge.

Students engaged in this project have the opportunity to explore and expose concepts of digital media as a design method and/or process used to translate ideas embedded in the work to be simultaneously expressed as both process and product subverting the conventional form-based bias often associated with digital media/modeling. Digital animation and motion graphics are generative processes that have the potential to influence and reposition understanding of form making, space making, and critical visual literacy. The transformation of ideas and meanings through crafted expressions in digital terms is the embedded conceptual agenda throughout all the facets of the project. The intent of this project is to encourage the student to develop an understanding and appreciation for the *design potential* of digital media within the discipline of architecture. Digital design media is understood here not simply as a tool for visualization but as a generative process for the derivation of form and its critical transformation. Within the broad curriculum of ideas and methods, developing a fluency in an animate language is an asset as future advanced studios topically spiral back through these concepts with a more critically aggressive and research-oriented approach.

2. Pedagogical Context

Animation in architecture is traditionally used as post-design exercise in service to the representation and visualization of a project. Animation, albeit imbued with motion, thus becomes a shockingly static tool; simply a fly by, or walk through of an already completed project. Neil Spiller sums up the contemporary problem, writing on the use of animation in architecture pointing out that, “instead of the virtual being groped for and approached by inner vision and the moving pencil, it has become static in order to be animated.” (Spiller, 2001) Most schools of design introduce animation late in the curriculum in this after-the-design, representational/visualization spirit. At SCI-ARCH, a school leading the integration of digital technology in architecture, the class *Strategies of Representation 4: Advanced Digital Tools, Modeling and Fabrication (SCI-ARCH, 2007)* introduced “animation as a dynamic mechanism that *extends* the spectrum of representational tools.” At Yale, animation is used for testing digital fabrication, “this course investigates this process through the design, animation and fabrication of an architectural assembly.” (Yale, 2007) Often when animation is used in the educational process it occurs late in the curriculum because it is usually part of a complicated, abstract process for translating (inspirational, poetic, didactic or otherwise) content into form. Concepts of animation, the virtual, movement, and abstraction are traditionally introduced near the end of a design education or a design process, where it is not readily able to afford students the time or instruction to fully realize or explore these ideas. The intent of this project is to front-load the design experience with animation as a means of simultaneous inquiry and representation adding value to the exploration of time as a design component. There are practical impediments to this end. Animation of architectural form in a meaningful way can be tedious, technical, time consuming, hardware intensive and actually a hyper-literal process that assumes knowledge of equivalent but static relationships. All of this works counter to the quick, often abstract, and exploratory nature of early design exercises and

design projects. The "fourth" dimension implies not another layer of complexity but another *order* of complexity. In this project the attempt is to subvert this by not animating architecture but animating an abstraction of architecture. Even for many practitioners, animation tends to be used to generate form or produce marketing visual aids, rather than inform a design process or spark design thinking. Mark Goulthrope of dECOI, writing in the *Architecture + Animation* issue of AD discusses animation as a way for generating dynamic forms; "[Animation] release[s] new forms to cultural imagination, the muscular birthing of an infant electronic sense that has liquefied the notion of time as being simply a sequence of frozen moments." (Goulthrope, 2001) The power of animation as a tool of representation, and generator of new ideas not simply new forms is important. The full potential of animation as a design tool is realized when it is incorporated in the early stages of a design process and can be as nimble and abstract as all other means of representational production and inquiry at the earliest stages of education.

Those exploring animation as a design process most fully today conceptualize this in terms of *emergence* and *parametric design.* Emergence focuses on process, not an intended end result. As an emergent process, animation dictates certain decisions be made by the design student, such as the initial frame and the last frame, the computer interpolates the frames between the start and the end to as well as trajectories for values outside the keyed range. Generating animations yields unintended yet not entirely unexpected solutions, thereby uniting the student and computer in a collaborative process of design and computation that privileges process over product and eliminates the computer from the simple "tool" paradigm elevating it to process-driven design inquiry.

Animation implies a type of parametric design, and parametric design is inherently an emergent process. In his lecture *Constructing Parameters* Nader Terhani explains parametric design through comparison to the game Twister, which, "doesn't give you form but gives you rules by which form can be generated." (Terhani, 2007) In mathematics, parameters are expressed as qualities that define certain characteristics of systems or functions. For instance, a function maybe defined as (x, y) = (cos*t*, sin*t*), where x and y vary according to the parameter *t*. Translating the mathematical concept of parameters to design allows the development of directed and emergent processes and forms. The designer sets initial restrictions and controlling variables, which generate results that were not preconceived. Specifically in animation, a student will have to select specific parameters, such as time, movement, and camera angle, which will then guide the outcome of the animation.

Animation and digital modeling have been critiqued as a media where everything must be known concretely and in detail in advance to be modeled and subsequently animated. In contrast, traditional hand drawing is praised for the ability to allow for constructive ambiguity and multiplicity. Introducing animation into the design process early in a design education (or the design of a building) potentially brings this level of multiplicity and constructive ambiguity to digital media. The proposed design project achieves this by small, simple, multiple, simultaneous iterations, a layering of parameters, within a non-linear design process where each component of the design exploration results in it's own representation. Animation actualizes the virtual, the unreal, and the abstract concepts often difficult to understand, especially for beginning students. By introducing this level of abstract thinking early in a design education students will achieve a strong grasp of these concepts and come to appreciate the speculative and tentative nature of animation and motion graphics as an enabling force in early design studio studies and exploratory experiences.

3. Direct Representation

The animate artifact, movie, is a valuable and viable architectural condition. While movies in architecture exist often as indirect representation—as presentation or as generator of static form early in the process—animation and motion graphics can and should be media in which architecture operates. In this condition representation can be directly animate. Tim Durfee

and Terry Surjan led graduate and undergraduate studios at SCI-ARCH making use of animation as framing device for cultural and spatial parameters. From that work they made note in regards to animation that "…the way architecture is visualized and represented has latent but pervasive influence on the nature of architecture that is being developed." (Durfee, 2001)

An environment that privileges the simultaneity of manipulations in space and time incorporates phenomenology and experience into the abstraction rather than relying on methods by which we see, interpret and perceive to produce and effect. In this manner one can begin to treat animation as a singular operational strategy with implications on form and construction. This paradigm is in contrast to the valid but potentially limiting approach to animation when it is treated as a series of discrete images.

In his seminal work on film theory Sergei Eisenstein advocates a kind of architectural approach to film making; a film should have structure, and should introduce internal systems. Eisenstein's revolutionary theoretical approach to film in 1949 as a formal media to be constructed in contrast to the prevailing attitude of recording theatre is analogous to architects relatively recent experimentation into digital animation and motion graphics in the 21st century. On representing grief, Eisenstein proposes, "There is no such thing as grief 'in general.' grief is concrete; your film's characters grieve; it has consumers, when your portrayal of grief makes the spectators sorrow, too…Such considerations are obvious enough, yet beneath them lies one of the most difficult problems in constructing work of art, touching the most exciting part of our work: *the problem of portraying an attitude toward the thing being portrayed.*" (Eisenstein, 1949) Eisenstein's explicit approach to film as "form" promotes the possibility of animation as design proposal. Not a means to an end and certainly not a means to communicate an end but an end unto itself—an end that has uniquely formal and tangible implications no less. Whether "grief," "space," or "program" is the focus, a relevant attitude about the value of animations specifically to early design pedagogy begins to emerge.

The most critical point of distinction between Eisenstein's film theory and this proposal is the nature of time. Time in film is representative to a certain degree, although not always corresponding literally to real time. Time here does not correspond to time as it influences our perception of existence and the nature of place. Instead, time is the foil or parameter by which relationships are made explicit.

4. Relationship-based design learning

The project was introduced to students participating in the ARCH 150 Discovering Architecture Program, a beginning design studio. The students were given a project in which a multitude of design solutions_were generated through animation as process for a garden pavilion. The project was conceived of as a "kit-of-parts" design problem, where students were given a set of objects that they then manipulated through a predetermined set of operational parameters. For the Garden Pavilion the "parts" consisted of a given set of initial forms, such as vegetation (mass and volume elements), columns (linear elements), and walls (planar elements) that were geared toward the creation and composition of space. The initial masses were linked to a set of operations specific to each given form. The range of transformations included: translation, scaling, Boolean operations, and moving individual or groups of planes and points of the given forms. For example, columns could only be transformed vertically, but could be translated freely about the garden. Vegetation volumes and masses could be combined or differenced using Boolean operations.

The result of the animation study is a movie. This allows for the project to be not *a solution* but an *attitude about solutions*. Indeed each student provides a unique but countably infinite set of solutions as an animate condition *implied* by the repeated display of discrete images as frames. Thinking and perceiving these instances collectively to the point of dissolution of any particular instance is critical in prioritizing relationships over solutions. The perception of

individual frames is simultaneously exaggerated as instances of traceable moving figures in space, and, as an extension shapes within a frame.

Crafting a design process is important in this project. Video production and scripting of motion graphics can potentially be heavily procedural in terms of technique, making the need for a crafted design process all the more important. Animation can be most relevant to learning for early design students as the process of animation generation can be relatively efficient. In many ways harnessing what are typically considered technical obstacles in teaching animation and turning them into foils for process oriented learning can further demonstrate the integration of process and product *solution attitude* thinking.

Key framing as a technique plays a significant role. It is with this method that a serialized solution can be applied to two instances and the more holistic relationship can be discovered after the tweening process of multiple elements. Often a process of trial and error of tweened conditions marks the beginning of an animate condition. The two components of the kit-of-parts, the given geometries and their corresponding operations, were then animated with respect to two parameters: time and camera movement. The variables were animated in an animation timeline (Figure 1) that works like arranging a cast of characters. Then, camera movement was overlaid to produce a set of animations to compare with the object oriented time-only series. This allowed students to see the direct relationship between the camera, movement of objects, and time. Setting up two sets of distinct parameters, time and camera movement, allowed students to design with respect to each and compare the result of the decisions made.

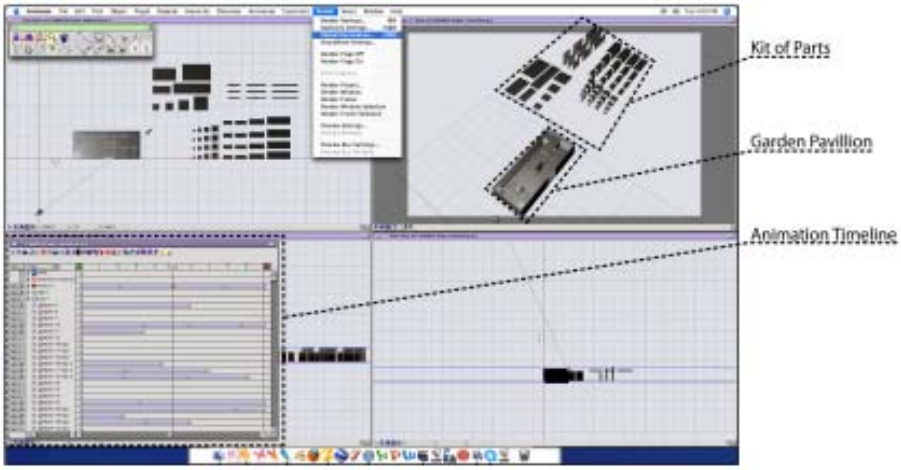

Figure 1. *Screen Capture ElectricImage workspace – Luc Wilson*

Students gradually develop fluency with the broad spatial implications involved with employing these *kit-of-parts* relationships, correspondences and parametric relationships can be directly manipulated and applied to animation. Modifications to the animation can now be made with precise control, such as directing variables related to sine wave equation controllers set to modify various geometries. Figure 2 demonstrates multiple geometric conditions flexible in the kit of parts. Correspondence can be controlled directly by consistently modifying the period of the related functions. This type of image is regularly output directly from the animation interface of the formZ software. Movement of geometries is controlled either by the direct input of variables into multiple sin functions (as is this case) or through manual adjustment of these lines (each representing one tracked condition) with key frames. Tracks are colour-coded by axis. Complex non-linear cause-driven relationships can be noted by the relationships in amplitude of functions. Transformative processes can be repeated to create the animation. Time becomes the canvas on which these relationships are overlaid and overlapped and repeated. These relationships can create unexpected solutions. Blurring the interface with output is conceptually interesting. forcing one to relate the interconnectedness between process and product, i.e., this

is derivative, this is working, this is display, this communicates, describing the technical foundations of animation. It is beginning and end.

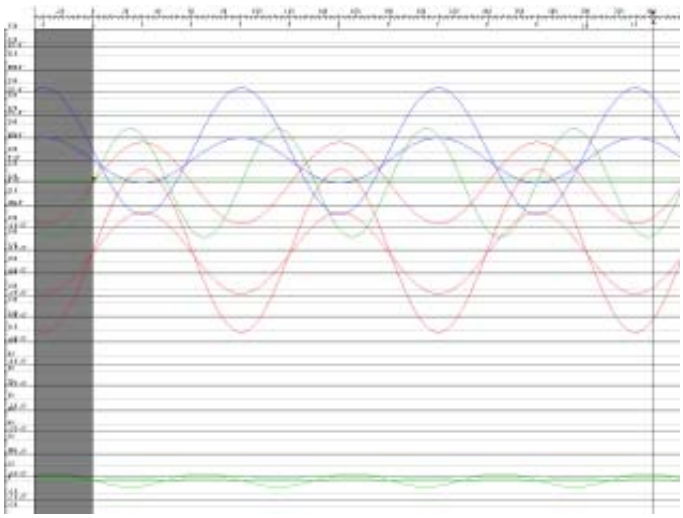

Figure 2. *Geometric Relationships of Kit of Parts – Carl Lostritto*

Consider, for example the consistent definition of two overlapping garden spaces within the walled-off garden site from which this diagram was taken. One space is constant in dimension but adjusts position and level and type of enclosure. The second space consistently defines an edge of the first space and fluctuates in proportion and dimension with the geometry of a face that is subservient to the position of the first space. It is necessary for some of these parameters to vary *with* each other at others it is necessary to vary *against* themselves. Requirements such as the mandatory continuity of some volumes as well as the area of the site limit the extreme at which these volumes can be pushed. Screen captures from the animation are shown of this particular condition in Figure 3.

Figure 3. *Screen Captures from Working Animation – Carl Lostritto*

5. Conclusions

Using animation as a way to emphasize process and design thinking in the foundation design studio shows great promise. The students are excited and engaged by this work. The possibility to find ways for simple manipulations of geometry and representation simultaneously holds the greatest potential as we work to develop the project for future implementation. We will develop a project that has physical and digital components that can be developed in tandem with the animation component acting to connect the studies in the expression of space and time. This will allow us to compare and contrast the varied approaches to design teaching and make valuable insights.

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