Deviating from Convention: Finding Opportunities in Errors

In order to ruin an object or process, there must be an existing appreciation for the form or expected outcome.

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INTRODUCTION

Within the discipline of architecture, new knowledge opportunities arise from critically examining current methods of design and making. The following research concentrates on deviating from architectural conventions by means of ruination—the destruction of familiar formal typologies culminating in unexpected design outcomes—in order to discover novel design techniques hidden within current conventional tools and practices. Ruination effects, specifically within digital modeling software and digital fabrication techniques, expand the capabilities of architectural design processes. By investigating errors and glitches within these tools as opportunities for exploration, new territories of scholarship in teaching and learning can be pursued.

While the idea of ruination (to ruin) often has a negative connotation, it does not necessarily culminate in destruction, but can instead be an opportunity for query and invention. Instances of chance ruination, such as the fuzzy picture resulting from a worn out VHS tape, a visual or audio disruption caused by a scratched DVD or CD, or the frozen screen of a record scoring video game, are all moments of unexpected visual punctuation stemming from digital and mechanical interactions. They offer the viewer a momentary glimpse of unpredictable and uncontained digital output, a pure element of digital source material created by the machine or software. When harnessed as a design tool, the digital glitch becomes a new method for comparing an original to a deviation. It offers two examples of a set of parameters with completely different constructs—the intended whole and the unintended glitch—made up of the same parts, but completely independent.

This paper will present a series of preliminary studies specifically looking at the effects of ruination, or the engineered glitch, on digitally rendered three-dimensional surfaces and complex geometry. These forms are often used in the design of architectural models and the software has become an integral part of design education. By altering what is perceived to be familiar, the intentional glitch of a digital model allows architectural designers and students to manipulate a form without adhering to preconceived ideas of aesthetics, purpose, or convention. The glitch itself can then be broken down into viable design tools and processes which allow the designer to work in logical, yet creative ways. The transition from original to glitched iteration of a model can lead to new conventions of order, arrangements, and symmetry, or a shift in the template for how architecture should be experienced. Through the ruination process, an assessment of the original source material can occur while simultaneously questioning the effectiveness of the object or composition to perform aesthetically.

A HISTORY OF GLITCHES

The discourse of architecture is no stranger to challenging history or convention. In the 1980's some within the discipline looked to philosopher Jacques Derrida for inspiration by integrating his principals of Deconstruction into the conversations of design and theory.[1] The idea of challenging unitary conventions and their longevity has explicitly and implicitly informed the majority of the discourse within bottom-up design, emergence, and generative design of the past three decades. In his book Architecture and Deconstruction, Mark Wigley effectively contextualizes Derrida's notion of Deconstruction by saying "deconstruction has no prescribed aim, which is not to say that it is aimless. It moves very precisely, but not to some defined end".[2] During the last 25 years, it can be argued that the essence of Deconstruction has been the fundamental starting point of generative design strategies tested through computer software and coding.

Parallels can be formed between the thinking behind Deconstruction and the behavior and qualities of ruination. For example, the fuzzy picture resulting from of a worn out VHS tape, an unintentional glitch, could stem from a loss of data, a rearrangement of data or even the addition of new data. What is most important is what emerges from this process of disjuncture. The clarity and legibility of the original whole is fragmented into a new arrangement or composition, sometimes with or without a hierarchical legibility. Even after the original composition is fractured, fragmented, disjointed and rearranged, the resulting organization is comprehensible in an alternative format. As with most glitches, the reconstituted composition reveals qualities which were latent prior to the glitch.

In most circumstances, the organizational logic of a glitched image is the byproduct of the relationship between the objects and voids within the composition. Sometimes only concentrated areas of difference, sections of noticeable change, contrast, similarity, etc., can be seen in a democratized fashion where no legible hierarchies are evident. The real opportunity lies in the conditions which prompted the ruination to occur and how the emerging composition can reveal certain qualities or pose particular questions regarding the original composition.

THREE DIMENSIONAL GLITCHES

The process of ruination can be tested through a variety of scenarios and techniques. A glitch, for instance, can be a means of creation through the alteration of digital information within a virtual environment. Glitches can be brief instances or continuous occurrences. They are the result of an error within a system that may or may not correct itself. Certain qualities and effects within the digital output might occur as a unique event only when a glitch is present. An image or object can be obscured, rearranged, distorted, deleted or even inverted using slight variations in the source code. These transitions bring into question which specific qualities of the digital source are being affected. As an iteration from an unaffected to affected object, the glitch can highlight the fact that other forms can also perform or accommodate a particular function as well as the original. They act as a virtual challenge to Louis Sullivan's famous statement, "…form ever follows function, and this is the law. Where function does not change, form does not change…"[3] As deviations occur over time within a glitch sequence, a multiplicity of iterations can provide alternatives to a given problem or condition without a finite limit, demonstrating multiple forms generated to accomplish endless functions.

The glitch is a generative design tool, creating multiple variants of a familiar and accepted typology. It generates geometry without the obligation to adhere to the standard conventions of construction such as material, physics and construction trades. To study the effects of glitches on varying types of geometry, two tests were executed. The first test began with a primitive sphere. Due to the uninterrupted nature of the sphere's curvilinear geometry, it was an ideal shape to examine the immediate effects of the glitch on a uniform surface. The second study looked at how the glitch would affect an articulated geometry with a more complex structure. How would geometry of differing complexities respond to the compromised code? Would the glitch effects be lost within the intricacy of an already complex form? Ultimately, the test sought to illustrate the change from a conventional and recognizable object to an unrecognizable or augmented object made of the same multitude of parts and surfaces.

A coded language, inherent to all digital objects, defines the object's internal structure. In the first glitch demonstration, the code was an explicit set of instructions necessary to create the primitive sphere and translate it into a three-dimensional object in the modeling software, like the digital-DNA of an object existing in the virtual realm. The coded language generated by the digital file of the original sphere was imported into a text editing software where it could be manipulated. The primitive sphere was composed of a mesh geometry made up of a triangulated surface structure; the XYZ coordinates of vertices, textures, normals and faces. To execute the glitch, the coded language was altered by rearranging the existing text, deleting or copying parts of the text, or adding completely new text. With each manipulation, the altered code changed the internal structure of the digital form.

Even with full understanding of the contents of the coded language, it is difficult to predetermine the outcome that the text alterations will have on a digital model. Often, this is the largest criticism of glitch based design: where is the designer in the process? To give the designer a way of managing the changing attributes of individual iterations, a taxonomy of results can be catalogued in order to identify certain effects that tend to occur when the code is altered in particular ways. In this case, the emergent result of the text editing allows for a new interpretation of the sphere's geometric logic and figuration. Deviations in the sphere's surface topology show ways in which porosity, texture and the interior volume can be explored through the deconstruction of the object's components.

After editing, the sphere developed an identifiable orientation in the way the original surface structure responded to the glitch. Two points, directly opposite one another, became clearly legible against the disrupted surface. The code manipulation manifested in areas of concentrated surface deletion. Though the surface was impacted, the legibility of the sphere's profile and figuration was maintained while the resulting geometry stayed within the sphere's original boundaries and did not cross the exterior envelope. The deviation prompted the reconfiguring of the interior and exterior of the sphere's envelope into a digital artifact which is neither a stable void nor solid. The glitch process in this instance generated an alternative way of defining space, an outcome which could be translated to more architectural forms, elements, and models.

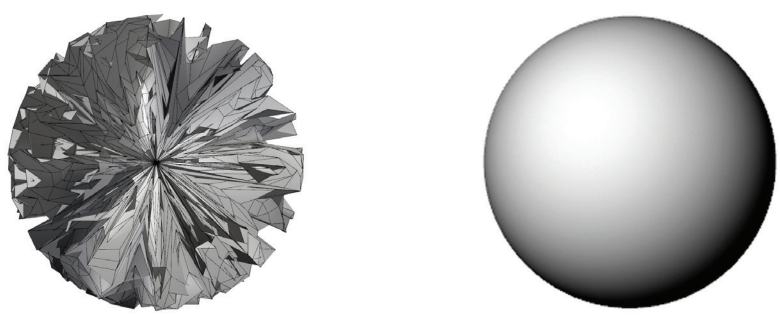
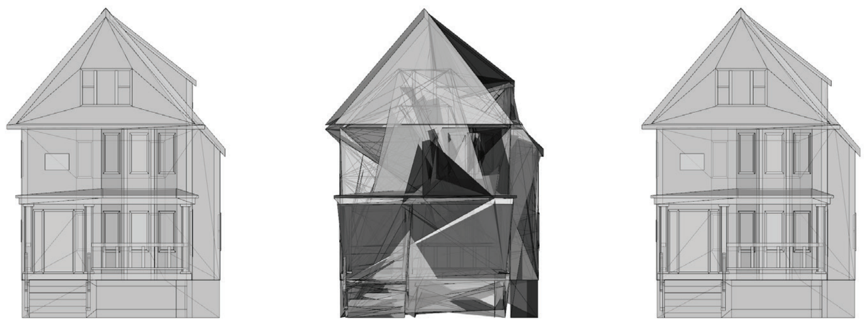


Figure 1: Digital Glitch of Sphere, *image by author.*

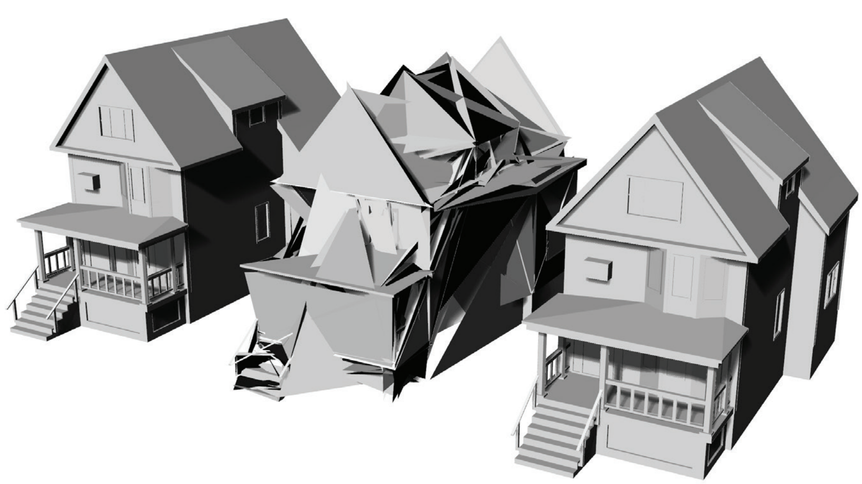
1

To further explore the effects of glitches, the second test utilized a more complex and familiar object such as a recognizable building structure. The iconic shape of the traditional American home consists of a pitched roof slicing through the top of an orthogonal volume with openings of varying sizes punched into vertical planes, allowing for the hypothetical passage of a breeze, light, or occupants. Though it exists as an undeniably recognizable Western symbol for "house", it can be argued that the appropriateness of this formal typology may not be viable for all social, economic and climatic environments. How might a procedural glitch applied to this iconic shape provide an alternative for comparison?



2

The results from the complex model test exhibited a more dramatic response to the altered code. Unlike the glitched sphere, the geometry for the house did not adhere to the limits of the original model's profile. The interior volume of the house was parceled and divided irregularly, in contrast with the conventional orthogonal separation from room to room. The slicing and dividing of spaces demonstrated by the glitched house can be used to raise questions concerning how program and function defines the activities in a dwelling. In this case the dwelling itself is being reconceived without consideration for the usage of the space or conventional building styles. By taking the programmatic bias away from the designer, the glitch is able to redefine what it means to live in a house or use a space. Rather than catering to uniformity in how residential dwellings are conceived and constructed, the altered convention can lead to a dialog on domestic living.



3

Figure 2: Digital Glitch of House Model-Elevations, *image by author.*

Figure 3: Digital Glitch of House Model, *image by author.*

BREAKING TOOLS

Ruination from convention can also be explored with physical materials and tools. It is traditional practice to embrace the intended purpose of a tool or a piece of equipment, but rather than using tools solely for their utilitarian functions, there are hidden opportunities for generating ideas and query which can be uncovered when the tool is used in a creative, or possibly wrong, manner. How might a 3d printer be used in ways other than for additive fabrication?

Rapid prototyping, or 3d printing, is a method of producing physical objects through the additive printing of a digital model. There are many different types of printers based on size, print material and method of printing which generate a form following a digitally rendered pattern. Some printers generate an object by extruding or depositing a heated plastic material into a preconceived shape, while others convert liquid resin into a solid 3d object, or introduce a binding material into a powder in order to produce the object. All have the ability to deviate from the intended function of the machine by compromising the original data file or the function of the machine to create expected outcomes. Similar to the process of working with glitches, the errors or effects from printing cannot be fully predicted, but can be replicated and harnessed as a design tool. There is a tendency for certain effects to occur. By becoming acquainted with the tool and its process, the user can set the condition for the error response to appear, and through multiple iterations and refinement, a generative design method can be achieved which embraces ruination as a valid design process.

To explore the possibilities of pushing the tools beyond their intended use, the digital source model can be augmented to reflect a glitch. In the case of 3d printing, there are a number of factors which determine whether a file will be printed correctly. As in the previous examples of the sphere and the house manipulations, the digital model used in the printing process is comprised of a mesh geometry, or a triangulated surface. If the model contains any "dirty" geometry, the likelihood of the digital model translating to a poor or faulty three-dimensional print is very high. Errors in the printing process can manifest when the faces within the triangulated mesh are directed in opposing directions or intersect each other, and also by fissures along the surface geometry. These, along with other potential errors, will produce varying effects in the printed physical model.

In the case of powder 3d printers, poorly constructed digital models can lead to physical objects where the areas consisting of "dirty" geometry are not printed. Emergent effects of disrupted form can be produced depending on the distribution of bad geometry throughout the digital model. For example, if a digital model containing both clean and bad geometry is printed, the extent in which the bad geometry would affect the rest of the model would be difficult to predict. The ratio of printable geometry versus compromised digital construction is only evident after the printing process is complete, creating a situation for exploration and research.

EDUCATIONAL OUTCOMES

Many beginning level students want to predict how designs will be experienced; they have a false notion that architecture determines and dictates how people experience a space through emotion, interaction and navigation. The glitch eschews predetermined ideas of space usage and forces the designer to invent a space by using only formal elements. In the glitch design scenario, the virtual user of the space will determine the program after the design is generated. This challenges the permanence of a design by allowing it to be used for many different types of activities or experiences.

The glitch iteration can propel students into this mindset. It can highlight the importance of generating ideas without prejudice, ignoring conventions of correctness or beauty, and

BIBLIOGRAPHY

Balmond, Cecil. *Informal*. Prestel, 2007.

Chard, Nat and Kulper, Perry. *Pamphlet Architecture 34: Fathoming the Unfathomable*. Princeton Architectural Press, 2013.

Dunn, Nick. *Digital Fabrication in Architecture*. Laurence King Publishing, 2012.

Fogelman, Rozita. *ASCII Graphic Glitch Art: Graphic Art – Technology + Art + Design*. Create Space Independent Publishing Platform, 2013.

Flachbart, Georg; Weibel, Peter; Betsky, Aaron; Bourman, Ole; Deutsch, David; Diller, Elizabeth; Fleischmann, Monika; Kolatan, Sulan; Mac Donald, William; Mitchell, William J.; Oosterhuis, Kas; Rashid, Hani; Scofidio, Ricardo; Shaw, Jeffrey; Strauss, Wolfgang and Zoller, Peter. *Disappearing Architecture: From Real to Virtual to Quantum*. Birkhauser Architecture; 1st edition, 2005.

Gage, Mark Foster. *Aesthetic Theory: Essential Texts for Architecture and Design*. W.W. Norton & Company, 2011.

Iwamoto, Lisa. *Digital Fabrications: Architectural and Material Techniques*. Princeton Architectural Press, 2009.

Kolarevic, Branko. *Architecture in the Digital Age: Design and Manufacturing*. Taylor & Francis, 2005.

Kolarevic, Branko and Klinger, Kevin. *Manufacturing Material Effects: Rethinking Design and Making in Architecture*. Routledge, 2008.

Krapp, Peter. *Noise Channels: Glitch and Error in Digital Culture*. Univ. of Minnesota Press, 2011.

Krauel, Jacobo and Jay Noden. *Contemporary Digital Architecture: Design & Techniques*. Barcelona: Links, 2010.

Lally, Sean. *The Air from Other Planets: A Brief History of Architecture to Come*. Lars Muller, 2013.

Leach, Neil. *Designing for a Digital World*. Chichester: Wiley-Academic, 2002.

Lynn, Greg. *Animate Form*. Princeton Architectural Press, 1999.

Moradi, Iman. Glitch: *Designing Imperfection*. Mark Batty Publisher, 2009.

Moussavi, Farshid. *The Function of Form*. ACTAR, Harvard Graduate School of Design, 2009.

Muller, Alois Martin. "The Dialectic of Modernism." In *Architecture in Transition: Between Deconstruction and New Modernism*, edited by Peter Noever. Prestel, 1991.

O'Donnell, Caroline. Niche Tactics: *Generative Relationships between Architecture and Site*. Routledge, 2015.

Reas, Casey and McWilliams, Chandler. *Form+Code in Design, Art, and Architecture*. Princeton Architectural Press, 2010.

Sullivan, Louis H. "The Tall Office Building Artistically Considered", *Lippincott's Magazine*, March, 1896.

Wigley, Mark. *The Architecture of Deconstruction: Derrida's Haunt*. MIT Press, 1993.

creating multiple iterations in order to identify a more successful design. It can also help them avoid bubble diagrams or blocked spatial organizations which occur when the overall figure and profile of the building are determined early in the design process, or when the figuration of the building is predetermined based solely on the conventional logic of required square footage for each programmed space.[4] The benefits of students working within digital environments allows for uninhibited virtual play. Digital fabrication translates the testing of ideas generated from the play into the physical world.

An example of a real-world application of glitch and error techniques in digital modeling software would be to use the process as a method for rethinking the shape and structural efficiency of a wall. The deviation techniques would allow for the exploration of how structural failure could be used in new and opportunistic ways, and could lead to redefining what a wall is and how it is made. The inherent link between the digital model and the physical output as a three-dimensional object would facilitate material testing. This can be applied to many traditional components of architecture.

CONCLUSION

The computer is a tool requiring a designer to determine its use and function. Technological experimentation, like the purposeful introduction of a glitch or error into a system, allows for a dialog between person and computer. The glitch has a logic which must be understood in order to create a result that also can function as an alternative design. The glitch is not a productive tool if it cannot be realized and utilized by the designer to achieve a valid outcome. By observing and rationalizing the effects produced by glitch behavior, the systematic logic of the glitch can be deployed through other digital media or design processes.

Architectural education can easily drift into learning environments built upon vocational knowledge that is rooted in repeated application. Though beneficial in many ways, it does not push students to question the knowledge they are receiving. By establishing and reinforcing an environment where students create knowledge, in comparison to simply regurgitating information from an instructor, the foundation of innovation and entrepreneurial learning can take hold. Constant speculation can stimulate inquiry while simultaneously impact learning, work patterns, and the organization of content and people.

All of the preliminary case studies were initiated with the intent of identifying the potential input and possible expansion of knowledge existing within current tools and techniques. The glitch creates an environment which allows for comprehension and exploration of inconceivable or unpredictable patterns. It is within the unknown that new knowledge potential can be found and opportunities pursued.

ENDNOTES

1. Muller, pg 9–14.
2. Wigley, pg 29.
3. Sullivan, pg 403–409.
4. See Lally, 2013. In his example, the stacked duck and stuffed pig diagrams illustrate how the interior delineation and parceling of program of a design reverts back to what is familiar to the designer, or known to be conventionally correct.