GLITCH SPACE

Experiments on Digital Decay to Remap the Anatomy of Glitch in 3D

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Abstract. This research informs of a series of experimental design practices for the understanding computational glitches in architecture which appears to be equivalently a ‘given’ as well as an ‘informed’. ‘Glitch-space’ is introduced to navigate the discussion through a spatial interpretation of digital decay. Currently glitches are only explored as forms of 2D art. We however, look to reconnect the underlying data to its digital architectural spatial form. Our methodology a systematic iterative process of transformational change to explore design emergence on the base of computational glitches. A numerical data driven process is explored using decayed files which are turned into 3D formal expressions. In this context, stereoscopic techniques are experimented, helping understand further how glitch can be performed within a 3D virtual environment. Ultimately we explore digital architectural form existing solely in the digital realm that confidently expresses glitch in both its design process and aesthetic outcome. Thus, our research intends to bring a level of authenticity with the notion of ‘glitch-space’ by discussing 3D interpretations of glitch in an architectural form.

Keywords. Digital Decay; Glitch; Digital Design Methods; Glitch-space; Data Interpretation.

1. Introduction
Glitch works and studies can be categorised through different lenses focusing on its disparate but undisconnected aspects. Some criticise glitch practices for being ”no more than a brightly coloured bubble-gum wrapper that doesn’t ask for any involvement” (Menkman 2010, 2) and for being not creative enough (Mulder & Spuybroek 2012). Glitch itself is also regarded as a stimulus to questioning
the limits we can reach in digital modelling and the predictability of digital files (Almond 2009; Temkin 2014). Glitch deepens the appreciation of human agency and creativity within the digital realm of architectural design in the way glitch humanises the computer. A glitch acts deep within our technology and comes about seemingly unexpectedly (Shipwright 2015). We can look to digital forensics, file restoration and cultural preservation (Webb & Brown 2016; ibid. 2011; Brown & Webb 2010; Kvan 2016), or we can embrace glitches as a new opportunity for a digital antique (Schnabel et al. 2016; Aydin et al. 2016).

Digital architecture within the digital realm is increasingly as important and resolved as the physical building output. As a physical building sits in our built environment exposed to weathering altering appearance, digital form sits on storage devices exposed to updates altering legibility. This brings us to question how digital architecture decays and what happens to it when it glitches. Similarly, digital decay in the form of glitch is a ‘natural’ force within the digital realm that creates new interpretations of digital information.

The unique contribution of this research is that it treats glitch in two forms; first as ‘the given’ and second as ‘the in-formed’. In contrast precedent works tend to observe the relation between these two forms in an ‘immediacy’. Two glitches are always seen on the same horizon, producing no triumphant hierarchy between each other, which is bounded to a phenomenological deadlock, whereas its subjective capture finds room to grow into static protocols. Therefore, glitch works tend to create monolithic outcome. However, the glitch itself seeks a vertical dimension and an excessive remainder between glitch as ‘the given’ and glitch as ‘the in-formed’. The present work identifies this ‘fuzzy’ and unexplored part as ‘glitch-space’ in which its sporadic nature is questioned.

2. Precedent Works

Glitch is currently explored solely in two dimension as an accident rather than a natural occurrence. Glitch can be employed as a system for 3D interpretations. In our research we harness glitch through a spatial architectural interpretation. Previous works looking into glitch effects in 3D space include ‘Mediengruppe Bitnik’s ‘The House of Electronic Arts (HEK)’ located in Switzerland, Banksy’s Ariel mermaid found in his controversial ‘Dismaland’ and ‘Good Vibrations Storage Unit’ by Studio Laviani (figure 1).

These samples are less explorative on the inventive role of glitch as an encroachment on the multidimensionality of 3D space than 2D visual disturbance. Their expressions of virtually corrupted images do not interpret glitch as an output that we search as richer meaning within the design method than merely exhibiting a corrupted elevation picture.

A precedent that is responsive to the appreciation of glitch aesthetics is ‘The Hackaton’ project led by Retsin (2014). The designer’s methodology requires a single form to systematically change to develop an unexpected final design outcome. Their design follows a simple method starting with a mesh figure and building upon this original geometry through iterative cloning, mirroring, adjusting and rotating each consequent piece of geometry. This is an additive process that gen-
erates a very unique form (Retsin 2014), adding incentive for further deploying discrete elements such as glitch.

3. Digital Decay

Our design-research recalls glitch as a methodology to design 3D spaces within the digital realm and to advance the interpretation of glitch from 2D expression to 3D interpretation. The architecture remains in the digital realm and therefore remains scale-less leaving the architectural perception of space in the eye of the beholder grounded by their previous spatial experiences. Employing a methodology of transformational change to explore design emergence on the base of glitches or decayed files, (figure 2) the aim is to generate a contemporary architectural interpretation of decayed data (Haslop et al. 2016).
3.1. DATA MANIPULATION IN JPEGSNOOP

A folder of JPEG compressed photographs taken in 2007 remained on a hard-drive storage device for 9 years. There was no editing of their binary code and yet in 2016 these files opened in wild shifts of colours and pixels seemingly completely random and unexplained new glitched perceptions (figure 3).

The JPEG compressed code does not change over time; it is the computer’s ‘perception’ of this code that shifts. These new interpretations give us rich visual information surrounding natural digital decay rather than forced intentional glitching techniques. The glitched digital files discovered become a starting point to engage in a design through discovery process.

We used both the digital code and the visual interpretation of these files to engage a digital design process employing glitch as a means of generating digital architectural form. We began with JPEGsnoop, a freeware developed by Hass (2015) to extract information from one digitally decayed file. The program displays the jpeg compression system of a minimum coded unit grid (MCU grid) overlayd on top of the legible image (figure 4, left). We noticed that there is a direct visual relationship between this gridding system and the way in which the glitched pixels are arranged in the glitch interpretation of the file (figure 4 right).

Using a tool called ‘Restart Marker’ within JPEGsnoop we can extract specific datasets for each square within the MCU grid. E.g. Equation 1: Position Marker @ MCU= [1, 2] (1,1) Block = [3, 5] YCC = [104, 0, 0] Position marker data is employed as numerical datasets specific to each separate MCU square while the
MCU grid is employed as a visual ordering system. Using the position marker numerical data unique to each cube, we can start to manipulate the cubes to result in 300 individual one-off interpretations of digitally decayed code.

3.2. CODE TO FORM

*Grasshopper3D* as a computational spatial generation and design instrument enables us to define a custom code, turning decayed data files into 3D spatial outcomes. The employed design systems and custom codes have an appreciation for unexpected outcomes that the glitch brings about (figure 5).

![Figure 5. Data from JEPGsnop into Grasshopper (left); glitch data defining cubes (right).](image)

Glitch is a sudden occurrence of reinterpretation in that moment of time. The architectural outcome at this point stands as a static interpretation of glitch. Cloning (2010) writes that “computer code (like human language) may theoretically exist in a timeless transcendental realm, but in order for it to intersect being, it has to be read by and run on something – a person or a computer. The glitch foregrounds and problematizes this myth of pure transcendental data, of pure and perfect signal. The glitch is a perpetual reminder of the immanent, real-time embodiment of executed code.”

3.3. DATAMOSHING MOMENTS IN TIME

Datamoshed stereoscopic 3D animation is resultantly introduced as a means of understanding how glitches work in movement in time within the digital realm. Stereoscopy works by presenting two offset images to the left and right eye, the brain then combines these views to create a perception of depth illusion. This works in a similar way to digital decays shifting of perception in the way a glitch ‘tricks’ the computer by reinterpreting the visual perception of binary code (figure 6, left). ‘Datamoshing’ is the process of removing the key frames from a compressed video ‘DataStream’, causing the motion-vector data to not understand where the first clip ends and the next clip begins resulting in a merging of clips in a distorted and glitched way (figure 6, right).
This project deploys stereoscopic techniques and animation which are not the focal point but merely a tool to enhance the datamoshing employed to express an idea and deepen an understanding of glitches happening in digital time and space (figure 6).

Through datamoshing in stereoscopic 3D, it begins to be legible that glitch can be performed in three dimensional space and how it effects the digital dimensional space. David OReilly, who created the Adventure time episode ‘A glitch is a glitch’, states that working in 3D digitally is constant communication between software and idea while “it’s weird NOT to acknowledge that everything is fake and animation is basically an optical illusion ... it’s just something that happens in the translation process from brain to screen” (Rourke 2013).

3.4. DIGITAL STEREOSCOPIC GLITCH SPACES

Stereoscopy techniques employed in the previous experiment work by having a left and right offset of the original form, left being red and right being cyan. Red and cyan are chromatic opposites allowing the brain to merge the two offset of opposing colours into one neutral form (Figure 6). Here we question how stereoscopic colours and methods can be employed into digital architectural form to obscure our interpretations in the same way a glitch obscures the computers interpretations of digital code.

Blender as an open source 3D modelling program has the ability to export a specific output format resulting in a modestly unsophisticated codec using just vertices and faces. Digital 3D files are commonly incredibly inflexible in terms of code manipulation due to exceptionally constricting codec systems. Exploiting this discovery, we employ a code simplification process by separating each unique MCU cube created in Grasshopper into separate Rhinoceros3D files. We now have all 300 cubes in separate files that we put through the code simplification process of importing and exporting OBJ through Blender resulting in 300 unique OBJ file digital 3D forms. Next each individual file is manipulated through hex code find and replace systems based on their ‘X’ and ‘Y’ co-ordinates in the original MCU grid layout in a program called Hexfiend, once for red where ‘Y’ is replaced with ‘X’ co-ordinate in the binary code: e.g. every ‘7’ replaced with ‘4’, and again the cyan manipulation where ‘X’ is replaced with ‘Y’ e.g. every ‘14’ replaced with ‘7’ (figure 7). This creates a unique left and right offset per cube in the same way stereoscopic offset works, though the offsets are being determined by the cubes position in the original MCU grid plan instead of the conventional inter-axial separation of ‘6.5’.
An appreciation for unexpected outcome returns when manipulating the bones of the form through code variations as shifting numerical data is a blind process until the form is reopened. This laborious process results in three unique shifted perceptions for each individual form in the MCU grid of 300. We combine each set to create an unimaginable architectural interpretation of digital decay processes. When the forms are viewed with the anaglyph red and cyan glasses on the perception of space and depth is distorted creating a chaotic interpretation (figure 8).
We found that textured forms have somewhat similar effects to that of natural glitches activated throughout the datamoshed animation in the way we experience tension and release in clarity and confusion. Where there is glass, we perceive a window; where there is metal, we imagine a rusty street alleyway; the piping looks to be a jungle gym or climbing ladder of sorts and the concrete is perhaps a large apartment complex. Where forms relatability to our known physical environments is ambiguous, our perception is blurred. In these moments of confusion, the brain almost skips and jumps along the forms to the applicable moments of clarity. It is this tension and release of confusion and clarity throughout the chaotic digital environment that enhances the communication of the behaviour of a glitch through 3D space.

4. Glitch as ‘the Given’ and as ‘the In-Formed’

At the beginning of our experiments, we observed that the encountered glitched photos are rich in ‘information aesthetics’ that precipitates a decline in ‘information perspicuity’. This causal relationship between aesthetics and meaning is not the focus of this research, but the becoming of glitch as ‘the in-formed’ that meanwhile escapes from an algorithmic protocol of numerical data as ‘the given’. The acceptance of glitch that requires the ‘prioritisation’ of the aesthetic in excess of the algorithmic is prevalent. The comfort zone of such aesthetic understanding exacerbates the first problem by veiling it behind the glitched “candy-coloured” visual outcomes.

In his essay “Are Some Things Unrepresentable?” Galloway (2011) distinguishes data as ‘the given’ and information as ‘the in-formed’ by employing the metaphor of falling autumn leaves. Since falling leaves are randomly scattered, they have no information unless somebody forms them, for instance, to spell out a word. Then the leaves gain information which is a word originating from Latin as ‘put-into-form’, whereas data literally means ‘the things having been given’, i.e. ‘the givens’.

In JPEGsnoop, glitch was initially treated as ‘the given’ which was actually sitting on a grid in relation to the pixel distribution of the 2D image, i.e. ‘the given’ was simultaneously ‘the in-formed’. The symbiotic relationship between the two forms of glitch was then broken down into further individual pixel units. This exercise led us into 3D conversions of autonomous units where a second problem emerged.

Stereoscopic experiments allowed us not only to explore the notion of ‘glitch-space’ in 3D but also remap it, yet, without orientation. Further research is planned to continue with glitch in immersive virtual environments technologies in order to provide more insight onto these issues. However, we aim to find a new vertical dimension arising from the dual ontology of glitch placed on the same horizon. Transforming from being ‘the given’ to ‘the in-formed’, glitch wants a multitude space to exist which is not permitted by the monochromatic channel imposed by the indentured protocols of the algorithm.

The insufficiency of critical approaches bounds glitch to signification under the broad influence of semiology on architecture. Undertaking a challenging at-
tempt to provide an ontology of glitch-itself, our research looks into the autonomy of glitch towards a theory of glitch-space that emerges from its dichotomised ontology between 2D and 3D. However speculative it may sound, our approach does not totally abandon representational aspects of glitch as an immediate expression of the real. Rather, by using available methodologies and tools, it makes state of the art data interpretations that are instrumental to the challenging task of understanding ‘glitch-space’.

5. Conclusions

Digital architectural projects that explore digital spaces allow for a freedom of expression that references reality while also designing the unimaginable. The formal outcome of the here presented design process is an interpretation of glitches happening deep within our digital realm and architectural workflows.

Therefore, digital decay expresses what we cannot comprehend, catalysing the reinterpretation of glitch as a means of designing digital architectural space. This is not reality to virtual where we digitally model something that is built in the physical, nor is it virtual to reality where we digital model something that could be built in the physical. This means of designing is just virtual to virtual where we reinterpret the constraints and natural forces impeding our architectural workflows through digital architectural design.

Our research works with numerical data driven design experiments to interpret and understand glitched data and digital decay through architectural form. Today all stages of architectural design are produced through pixel arrays and digital workflows with both the physical building within the built environment and the digital model within the digital realm existing. With both being exposed to constraints and forces impeding architectural production and maintenance we look into how our digital architectural digitally decays.

The research contributes to the glitch research community by advancing glitch from its 2D representational expressions into 3D digital spatial interpretations. The multidimensionality of the underlying data that is visualized through a glitched 2D image on the computer screen is extended via a contemporary spatial architectural representation to match the original data. Computational architectural design methods allow for a responsive and adaptive re-representation employing current technologies and understanding of architecture. The here reached architectural expression of glitch questions the limitations of digital modelling and deepens the appreciation for human agency within digital creative workflows bringing authenticity to digital decay through contemporary interpretation of the glitched data through design.

References

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