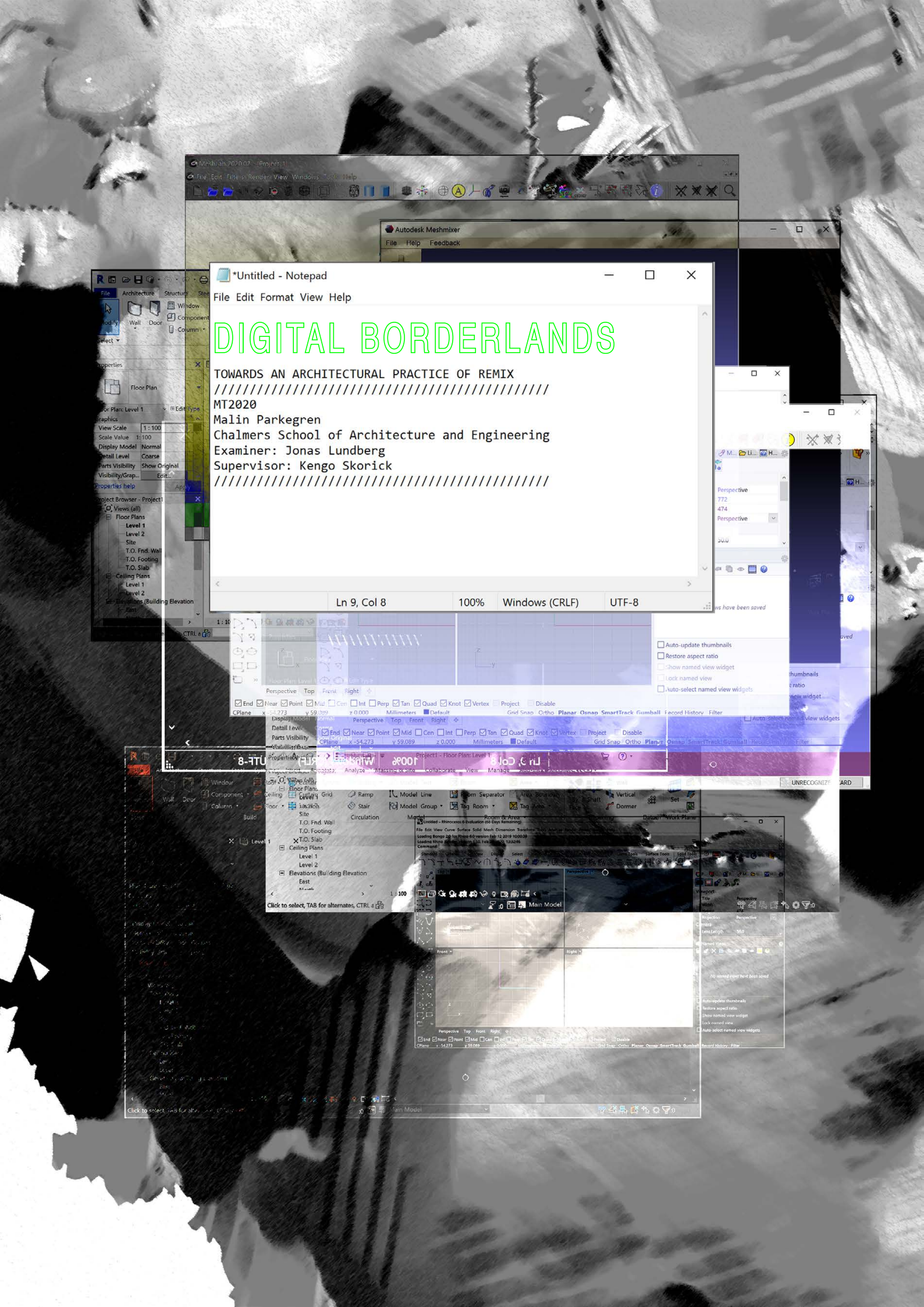
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Chalmers School of Architecture and Engineering
Examiner: Jonas Lundberg
Supervisor: Kengo Skorick
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2020
Digital Borderlands
Malin Parkegren
Chalmers School of Architecture and Civil Engineering
Examiner: Jonas Lundberg
Supervisor: Kengo Skorick
MPARC



# ABSTRACT

There is still an apparent need to orient ourselves in an age of digital technology, considering the ever-current discourse about the digital medium in the architectural field and beyond. How do we relate to this universal condition that remediates our experiences, reframes interactions, and looms over us like a conceptual cloud? When digital technology and following culture emerged, it was quickly adopted by both large industries and individuals in their everyday lives. This caused distinctive characteristics and apparent boundaries between what is digital and what is not to fade, as it quickly settled into our own realm. The thesis considers the material foundation and formation of the digital environment in a relatively fundamental manner with the aim to uncover greater insights and suggest ways of approaching an alternative digital practice.

The focus of the thesis lies on algorithm-based software tools The approach to design investigations and the use of these tools are described as creative misuse. Misuse subverts notions of intentionality built into both code and interface along with raising questions of precision in the execution of said algorithms. The method was developed to engage with digital practices and their emerging expressions while revealing alternative potential in common tools used by many practicing architects. To address and evaluate this method a theoretical foundation was developed and implemented. A design output was then produced to apply the knowledge gained from repeated iterations of the method and subsequent theoretical reflections.

Conclusions reached by the thesis demonstrate that there are many alternative ways of approaching an algorithmic practice. The investigation indicates that agency in human to non-human interactions can be attained by disrupting the perceived relationship between the aforementioned actors. Situating the architectural practice in a digital space connects it to many other cultures and expressions that share the same material conditions and ways of navigating the digital. Native ways of executing actions such as downloading, editing, and copying are shared within a number of disciplines, thus enabling the practice of architecture to connect with a larger digital culture of remix and in turn, expanding the role of the architect in the process.

**KEYWORDS, COMPUTATIONALLY GENERATED FROM THE THESIS (~14300 words)**

Annotations not included. Minimum 5 letter words. (Molch, n.d.)

| Count | Percent | Keyword |
|---|---|---|
| 159 | 2.4% | digital |
| 54 | 0.8% | design |
| 51 | 0.8% | thesis |
| 50 | 0.8% | output |
| 50 | 0.8% | these |
| 36 | 0.5% | process |
| 36 | 0.5% | architectural |
| 35 | 0.5% | computer |
| 34 | 0.5% | objects |
| 33 | 0.5% | object |
| 31 | 0.5% | between |
| 29 | 0.4% | human |
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## OVERVIEW

The thesis emerged out of a series of explorations where a methodology was developed and the scope of the research was outlined. A design project was then formed from within this investigation to communicate and reflect upon those findings.

The introductory parts of the booklet start with a shorter background presentation that tries to situate the project in a contemporary and relevant discourse followed by *Thesis Aims* and *Delimitations*. Then, an approach to the Method developed during the project is presented along with a list of terms that are frequently used in the text.

The exploration of a theme has taken precedence over an investigation of site or other common areas usually explored in early design investigations of an architectural project. This has shifted the focus towards the exploration and development of the method as well as the material expressions of that method. Instead of a design proposal in the traditional sense, the produced output is presented as a speculative imaginary that is used to illustrate digital expressions and stimulate a discussion about the digital condition and its role in an architectural practice. A related outcome of this focus has been to develop and outline a relevant theoretical framework that structures and relate the overall themes, enabling more in-depth explorations of certain topics. Placed under *Theory*, this part has been structured around five principles that reflect on more general phenomena. Many of these same points are referenced and contextualized in the *Design Output* section. This part also serves as a basis for the presentation material in a different format than this booklet.

Towards the end, a short overview of the development of method and various design experimentations is presented under *Process*. The booklet concludes with a *Reflection* consisting of many short discussions of the themes presented and developed during the project with a focus on situating them in a larger discourse.

## PRINTED MEDIA AND THE MOVING IMAGE

The cinematic media is present in many parts throughout the work, both in theory and practice. Most of the material produced during the project have been moving images and animations. It is a challenge to communicate these aspects in a loss-less way as the representation of moving media in a two-dimensional format such as this booklet. It will inevitably have to be reformatted in some way to change its composition according to the medium. At the same time, this difficulty connects and engages with various topics such as interfacing, cross-formatting and ways of remediation that are ever present in the interaction with the digital environment.

Every point in the *Theory* section have an accompanying animated GIF file that is here displayed as one or several still images. For this booklet and the thesis in general, the *Design Output* part is not presented in a typical architectural manner of plan drawings, axonometries or sections but instead through moving image sequences. This has been translated into still images that are presented in a manner inspired by comic book compositions. The comic mixes text with images and introduces a temporal sequence to these elements that have much in common with film composition. By adopting this approach, the thesis has tried to convey its presentation material in various formats and have also explored the wider field of architectural representations with alternative manners of representing space and spatial narratives.

Link to all the scenes displayed as an animated video.

# INTRODUCTION

*“The big news in neuroscience is that the computer - which is so powerful that it can slaughter master chess players, so precise it can assist in performing a surgical operation, and so mathematically and statistically talented that it can compute the human genome - is nothing like the brain. In order for a computer to function, it must eliminate "noise." A brain lives on noise. Computers use linear and localization sequences whereas the brain's neural circuits are not only loops, but loops within loops. "Reentry" of information in a neural network is a return of communication back on itself in such a way as to compose a world. The brain has a mind of its own and it maps its own activities by bootstrapping between memory and perception. The central nervous system, upon which the computer was originally modeled, depends on a far greater number of interactions than any computer can compute. For this reason the computer can be fooled, fairly easily, by a joke or a double-entendre.“*

(Ingraham, 2012)





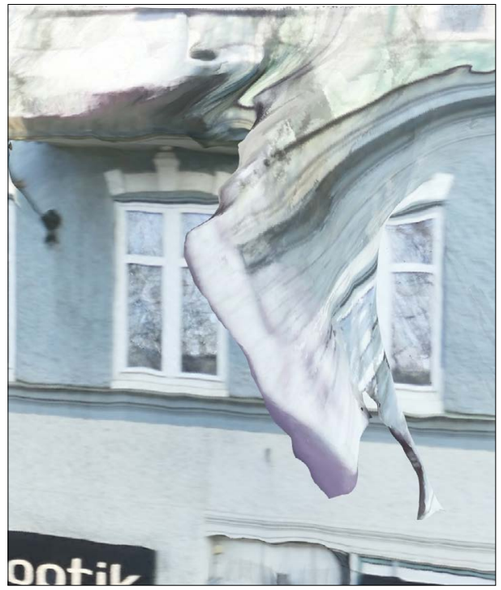
I was 8 years old at the turn of the century and as such barely remember a time when digital media was not a naturalized backdrop to daily life and work. To recount the emergence of the digital and its following adoption by society I have to turn to reference documentation to grasp it even though it was not that long ago. As I have come to understand, we are already in the era of the post-digital and the nth digital turn. The thesis suggests a more fundamental approach considering the material foundation and formation of the digital environment. There is an apparent need to orient ourselves and make sense of our practice in a digital age. How do we relate to this universal condition that remediates our experiences, reframes interactions and looms over us like a conceptual cloud? Any distinctive characteristics or apparent boundaries between what is digital and what is not faded as both the technology and culture was quickly adopted and settled into our own realm.

The thesis builds upon the trajectory recounted by Mario Carpo in *The alphabet and the algorithm* (2011) about the shift from the production of identical copies towards a “digital differentiality”. He not only reflects on ways in which the *how* and *why* of making have changed, but he also hints at the contemporary role of the maker as one with “split agency”. Lev Manovich’s *Principles of New Media* is also used as an additional framework to delineate the scope of the digital. His principles are used as a means of addressing and engaging with the digital in a tangible way as well as evaluating the experimental design phase that lies at the core of the project. The thesis does not wholeheartedly align itself with a specific flavor of contemporary digital discourse, but it inadvertently crosses paths and shares points of interest with conversations about the post-digital and post-human along with object-oriented ontology.

A common trait of the digital, agreed on by these references, is its tendency to be unstable in nature, exchanging constants with variables and pushing towards an ever more dynamic composition in all instances. It focuses on becoming rather than retaining a stable state. According to this framework, asking the question *what is the digital?* would set up an inaccurate investigation based on signification. Shifting the focus and rephrasing the question into *what does the digital do?* acts as a more apt response. This question is reflected by the work in the research part, in the final design output, as well as in the use of the theoretical framework of the project. It puts a significant emphasis on the act of making, the tools used, how input is transformed into output, and the role of the maker.

The thesis places itself on the scale of the individual user and explores their agency in this setting. The subject of research, algorithmic software, does however, not only operate on this level. Through the developed method and continuous experimentations, the thesis hopes to reflect on this relationship. The globally connected digital environment situates a design practice both on the scale of the single user but it also encompasses larger actors that provide and profit off the digitization of production.

To summarize the scope of the thesis, the focus lies on exploring the digital medium itself through the act of making in the digital context and examining medium specific expression that come out of this process. This is reflected by how the thesis work have been conducted, evaluated, and then steadily progressed.





# PURPOSE

The purpose of this exploration is to uncover various approaches of working with the digital medium to find points of entry, to fold in experiences and explore what comes out of it. This investigation can reflect on not only individual work, but also comment on how it can influence an architectural practice on a larger scale. This is addressed at the level of software algorithms but in extent, challenges the influence of corporate players such as Autodesk that provide a range of digital modelling solutions that standardizes work processes and outcomes. By doing this, alternative ways of using these tools and a general approach to algorithm-based transformations is also brought to light. Placing the interaction with digital tools to the forefront suggests a shift in the form of the creative process itself. This in turn calls to attention the continuously changing role and agency of digital creators and the nature of the work they produce as areas of exploration for the thesis.

# AIMS

To explore alternative ways of digital creation in the field of architecture.

To investigate the relationship between computational structures, human language and modes of representation.

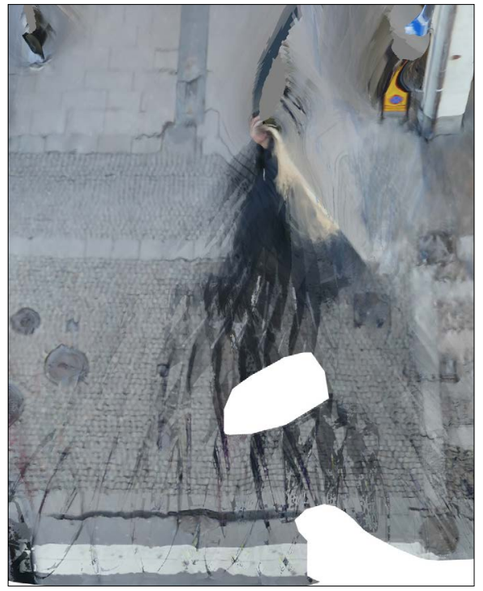
To challenge the normative use of digital tools and the homogenization of digital production they construct.

To continue the discussion and production of knowledge about the digital medium through multiple forms of representation such as architectural imaginaries and narratives.

To achieve a multifaceted montage from within the framework of the digital composite.







All images are details from models rendered by ReCap Photo. From left:
Detail from sequence captured from a tram at Östra Hamngatan, Gothenburg.
A scene from the movie *Russian Ark* (2002).
Detail from sequence captured from a tram at Östra Hamngatan, Gothenburg
Construction site seen from Götaälvbron, Gothenburg, also on tram.



# QUESTIONS

From an overarching question, a few sub-questions regarding the subject, the object and the tools of making are stated to further flesh out the aims of the thesis investigation.

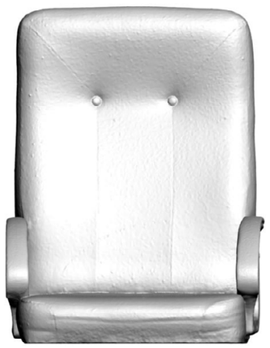
**What are medium specific conditions and expressions of digital media and how can they inform a digital design practice?**

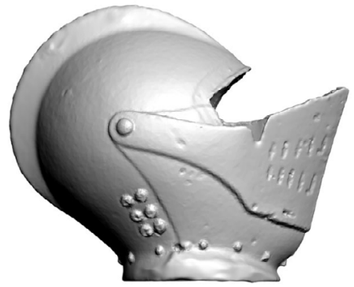
What is the role of the designer in such an environment? Can that role produce rich results even with a lack of technical proficiency?

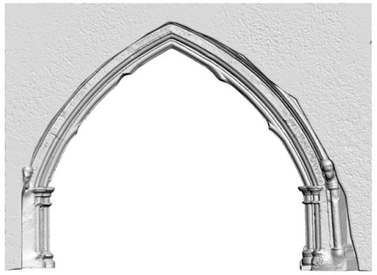
How do digital artefacts fit into the architectural framework, specifically as inspiration, reference, and input?

Are there discrepancies between the notion of what a tool can do and its actual potential?

Figure 1. Open source, 3D scanned models from the Usher Gallery and the Collection in Lincoln. Available to everyone without copyrighted limitations. A digital kind of commoning and context? (Laric, 2012).











# DELIMITATIONS

The thesis does not aim to produce a complete or whole investigation of the digital condition regarding design practice. General topics and certain tendencies have been highlighted to illustrate larger questions surrounding digital media. The use of specific software and algorithms are not based on a detailed comparison between similar alternatives but can be seen to reflect common practices and tools used in the architectural field. A few specific tools were mainly used in the thesis (ReCap Photo, Revit and Meshmixer, all owned by Autodesk), but they do not represent a complete picture of what is available or are exclusive to a digital design practice. These specific software alternatives were chosen during the design studies because they met certain criteria at the time.

Since the digital is very much conditioned by technological advancements, there are several areas closer to the cutting edge of development that are popular for research about emerging cultures, but that lies outside of the scope for this thesis. Those are fields such as big data, computational design, AI and deep-learning, along with virtual and augmented reality. They might be referenced in some parts but not further expanded.

The ways in which the five principles of digital media have been applied, exemplified, or materialized are in no way an exhaustive list of how these topics can be explored and the many shapes they can take.

The thesis has chosen to “stay digital”. Meaning that it does not attempt to produce any physical output nor portray any real-world representations. Accordingly, it has not explored any fabrication methods. This does not, however, mean that the thesis separates cyberspace from its physical materiality of computer networks, data storage and so on. Also, but on another level, the thesis places the digital in the middle of human culture and relies heavily on the cognition and semantics of digitized content and the visual vocabulary of the architectural discipline to make sense of the digital.

A final delimitation regards the scope of the technical aspects of the thesis. It treats computational tools as “blackboxes” that transform input to output through a non-human agency (Lee & Björklund Larsen, 2019). This disregards issues of accountability and authorship over code, but such a direct investigation would demand a certain level of programmatic knowledge and skill that, for now, lies outside of the broader field of architecture (and this thesis). Instead, the use of these algorithms is regarded as a collaboration between human and non-human agencies that enable inquiries into both the overarching function of the code as well as the realities produced. This middle ground attitude can also encourage a deeper investigation into conditions and cultures set by software, as well as possibilities for more varied design applications, without the notion that it requires an understanding of complex programming to find ways of interacting with algorithms.

# TERMINOLOGY

**ALGORITHM**

An algorithm can be defined in the field of mathematics and computer science as a systematic procedure that specifies in a finite number of steps how to perform a calculation or solve a given problem. This method of problem-solving is compatible with the language and structure of computers. (Marklund, n.d.)

**DATA PROCESSING**

“The process of producing meaningful information by collecting all items together and performing operations on them’, data processing allows different software to refer to data and to present it according to its relevant format” (Neuman, 2014).

**MESH**

A mesh consists of vertices, edges and faces. The simplest form is a single face but they usually consist of multiple continuous, non-overlapping faces that are triangular or quadrilateral (Remondino, 2003).

**METADATA**

“Data about data” that “emphasizes the material aspects of the data production” (Bak Herrie, 2017).

**PHOTOGRAMMETRY**

Photogrammetry is an art, science and technology that borrows methods from many disciplines in order to extract 3D data from photographs or laser scans. A software measures, records and interprets information from input imagery and produces a 2D or 3D exterior face or surface. (Autodesk Inc., 2020).

**REMEDIATION**

Remediation is the process in which different subject matters or practices are presented in a new medium or format. This theory also emphasizes the fact that new media is always related and built upon older forms of similar media. (Bolter & Grusin, 1998)

**RENDERING**

The act of computationally producing, a usually realistic, drawing of 3D objects. The objects and surrounding environment  are assigned various properties like color, transparency, diffusion, reflection and refraction (Remondino, 2003).

**SOFTWARE**

Simply put, software is a “set of instructions that direct a computer to do a specific task” (Hui Kyong Chun, 2004).

**TRANSCODING**

Converting one data format into another. It is a form of data to data conversion that causes a loss of data, most often deliberate as in file compression. (Neuman, 2014)

Opposite page. Figure 2. Google Maps 3D view over Tokyo and snippet of webpage code for the same view. Displaying the many languages of the computer. (Google, 2020)





# METHOD

The approach to design investigations in this thesis can be described in the term *creative misuse*.
A common method to use in this situation as it aims to disrupt the seemingly smooth flow of the computational process in different ways. In *Executing Micro-Temporalities* (2018) Winnie Soon uses the act of computational buffering and loss of data to explore network flows, code performativity and the computational culture dependent on steady flows of data. By using Foucault's theory of discontinuity "as a means to examine the gaps and ruptures of things that go beyond signs or representational discourse" (Soon, 2018) she can examine the invisible on-goings happening behind the inconspicuous spinning throbber that is displayed when buffering happens. In a similar fashion, and referenced in the previous section, finding ways to use the "blackbox" of a software algorithm have been a focus of investigation. As a nontechnical agent (Carpo, 2011), finding an appropriate level of intervention in the execution of code is of importance. Depending on a case to case basis, there might be a sweet spot between fruitful misuse that produces interesting and unforeseen results and the opposite, the use of an excessively destructive method that only turns out too many errors and becomes unusable.

In many cases, it is easy to spot a computational failure, nothing happens, or an error message shows up announcing that the action could not be executed. But most times the errors are not as straightforward. If a successful execution is considered to be output that corresponds to the input and intended use of the tool, the area of error would encompass everything outside of this desired result.

But if the intention shifts, the margin of error is moved along with it. Put in other words, there exists a large area between precision and complete error of execution. Investigating this area not only produces interesting output, but also reframes the way of seeing and using the tool. It demonstrates the narrow field of intentions and reveals contradictions between interface and actual code performance.

The term creative misuse is used to emphasize this approach. The methodology used during the thesis aligns with this notion of misuse, or sometimes even plain uselessness, rather than a more radical notion of disruption that implies a deeper technical intervention. Misuse, as discussed, also addresses the resulting output in relation to its intended use on a broader scale. It subverts the act of using the tool in a way that a straight out hack would not, it questions the intentionality built into the tool and the purpose of the interface from within instead of a forceful kick coming from the outside.

For examples and to see the development of this form of approach, a more detailed explanation of Autodesk ReCap Photo and variations of input can be found in the process section towards the end of the booklet.





5 seconds,
77 frames,
15 fps

Figure 4. (MINSEO ( 민서), 2018) Example of transformation according to the method. From an image sequence to a model output. See more details on this process in the Design Output section and Process.

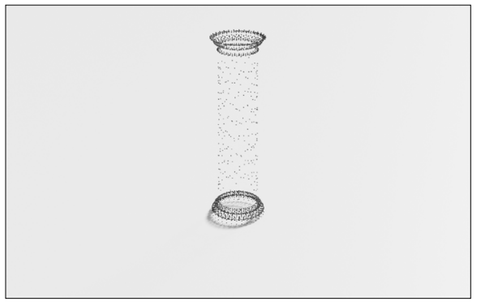

# THEORY

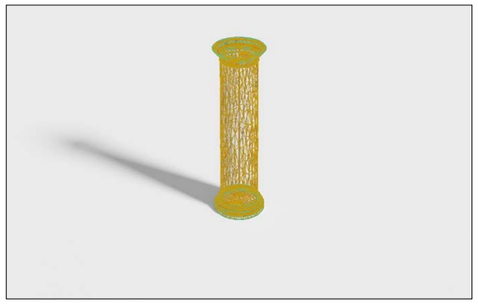
## INTRODUCTION

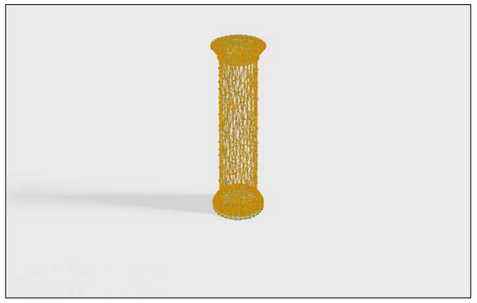
The thesis has been concerned with distinct expressions and idiosyncrasies of digital media. What is a digital practice? Can algorithms leave material traces? Do data structure design output? Questions like these have driven the research in hopes of discovering points of friction and disagreement in the use of digital tools by architects. By subverting the expectations of functionality and precision that we hold in computation, we can start to discern unexpected capabilities of non-human agencies. By engaging with and unpacking the tools of the modern trade, we can not only form a resistance against forces that might dehumanize us in the long run, but also see immediate potential in algorithms by inserting human intention. Algorithms do not only offer a multitude of possibilities in computational practice, but they all have built-in constraints that can be utilized. This approach is developed further in later parts, both as a practice of intentionally misusing software, as well as exploring the digital composition as remix culture.

Lev Manovich's five principles of digital media have been used to outline a framework and provide the thesis with a cohesive language. He describes what he calls new media, or a new language of digitally structured and mediated cultural content, in his book from 2001 called *The Language of New Media* (Manovich, 2001). Even considering the rapid expansion and technical progress of digital media, his inquiries and principles still hold relevance and the theoretical framework presented here is often referenced in literature about the digital landscape today. These principles have been used as overall comprehensive categories but then simplified, edited, or expanded in parts to accommodate topics and investigations conducted during the project. Manovich uses his terms in a much less structured way than what is described here and more as umbrella terms to explore various digital phenomena. The principles presented here are later used as a base for design applications.











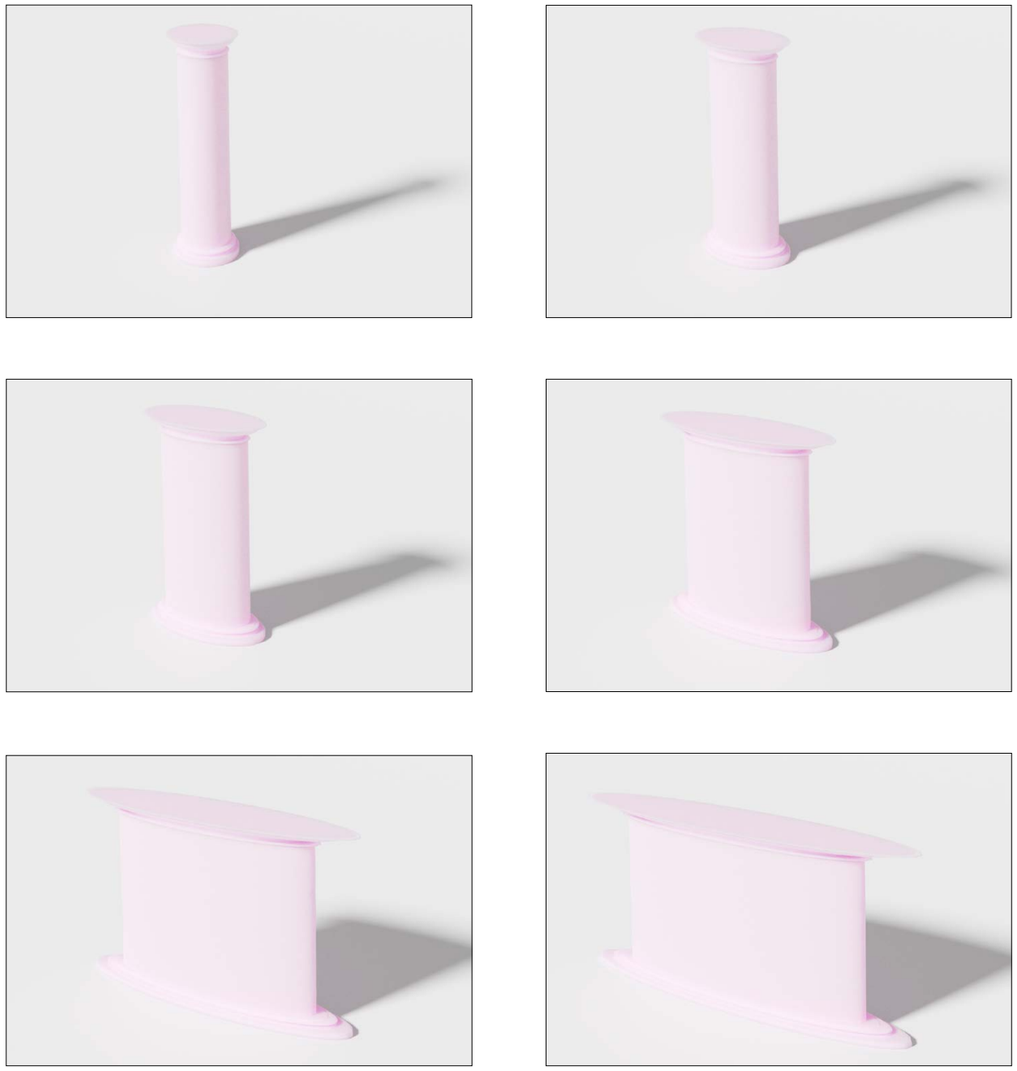
# 1. NUMERICAL REPRESENTATION

**1.1**

**A 3D model is made up of data that describes the position of coordinates in space.** Vertices are attached to these coordinates. Edges connect the vertices to form faces. These surfaces make up a digital representation of form (Remondino, 2003). As such, there is no such thing as a mass (in the physical sense) but only surfaces joined together. This basic composition of objects (models, artefacts etc.) as data, give rise to ways in which digital elements interact, behave and are structured. A very apparent illustration of this can be found in point clouds, and the process of turning them into "solids".

**1.2**

**Since data is numerically represented and can be described mathematically, by extension it is also subject to algorithmic manipulation,** “media becomes programmable” (Manovich, 2001). A digital object can be edited, copied, transformed, updated or deleted.







**1.3**

**All analog objects must be digitized, in order to be represented digitally.** Everything created on a computer already emerge in numerical form. Non-native digital objects on the other hand, must first be sampled and then quantified in code in one format or another to exist as a digital object. Many real-world objects that are digitized are originally seen as a united “whole”. The process of representing it in computer space divides it up into discrete units, pieces of data that tries to represent the entirety of the object (Manovich, 2001). A stone might be a conglomerate of smaller stone parts which is also made up of even smaller building blocks. But that structure is stable in a way that the digital representation and its discrete units are not.

# 2. MODULARITY

**2.1**

**Digital elements and behaviours are collections of smaller parts.** “Media elements, be they images, sounds, shapes, or behaviours, are represented as a collection of discrete samples (pixels, polygons, voxels, characters, scripts)” (Manovich, 2001). These modules keep their individual identities while making up larger assemblages. The different elements are modular to save space and computational power, but it also enables parts to be separately edited, manipulated or exchanged. The digital strives for every constant to be replaced with a variable.

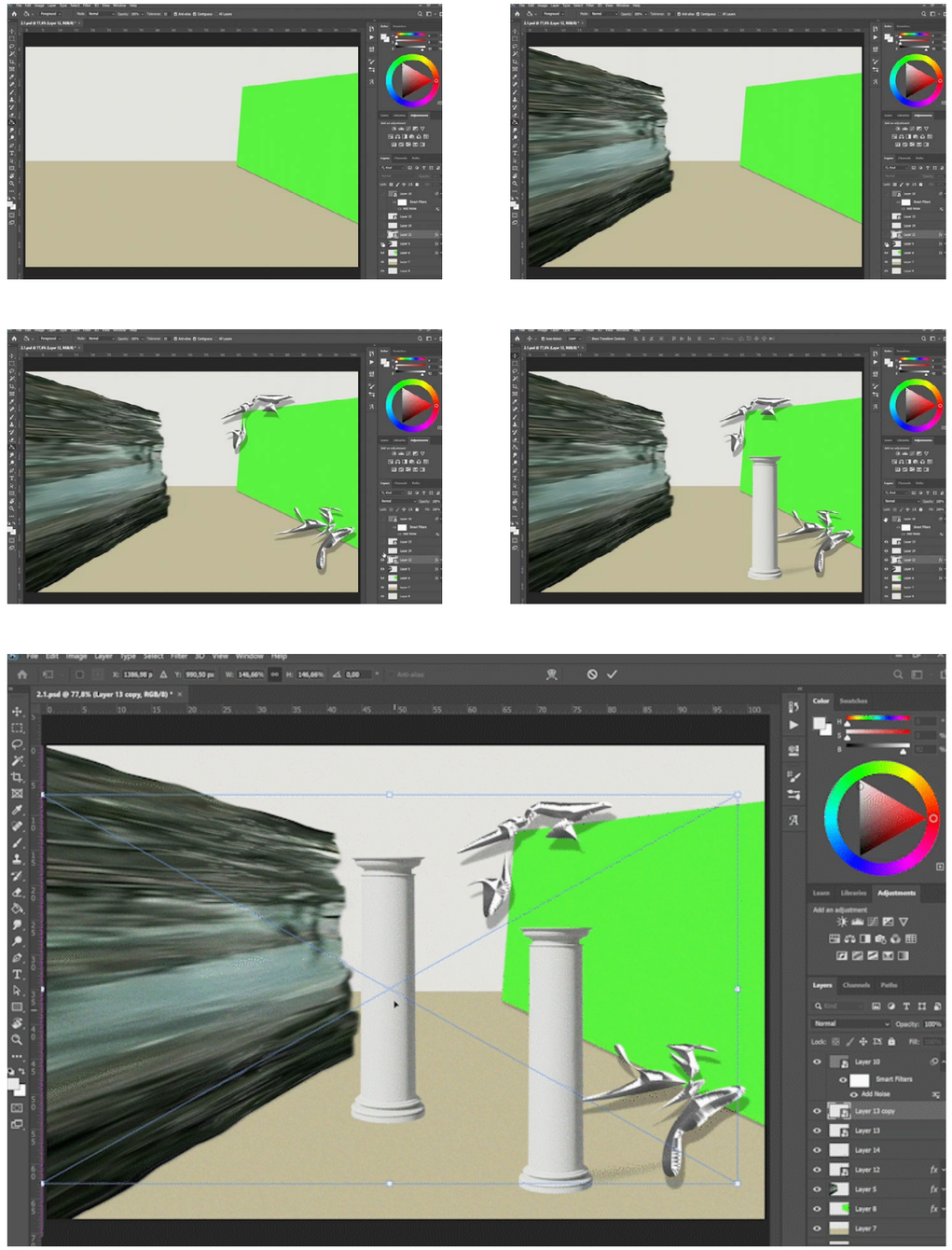
**2.2**

**The composite is thus the native way of creating digital artefacts.** Digital compositing refers to the act of combining moving or still images into a single sequence. This process has its roots in cinematic techniques of the 20th century and has since become the norm of modern filmmaking that utilizes digital editing tools (Shaviro, 2010). The term can be extended to include a wider variety of visual and audio oriented artistic practices. Contrary to the common practice of collaging, where a disjoint between parts are often desired, the seamless and imperceptible assemblage of images into a smooth whole is instead strived for in digital compositing. CGI, special effects, or some simple Photoshop editing all rely on this layering and flattening of information to generate the often sought after “reality effect”, especially present in digital architectural representations.

The lack of conflict in the composite, even between different media that “are placed next to each other without any attempt to establish contrast, complementarity, or dissonance” is an aesthetic strived for on Internet platforms, as well as in the digital environment (Manovich, 2001). The reduction of medium specificities and correlating qualities discourages creative and transgressive practices which lead to an active abstraction of the general perception of data. In later parts of the booklet, especially in the design output, compositing as an architectural assemblage is explored applying the concept of montage to diversify expressions of the digital composite.







Sequence displaying the editng of a simple digital composite in Adobe Photoshop.

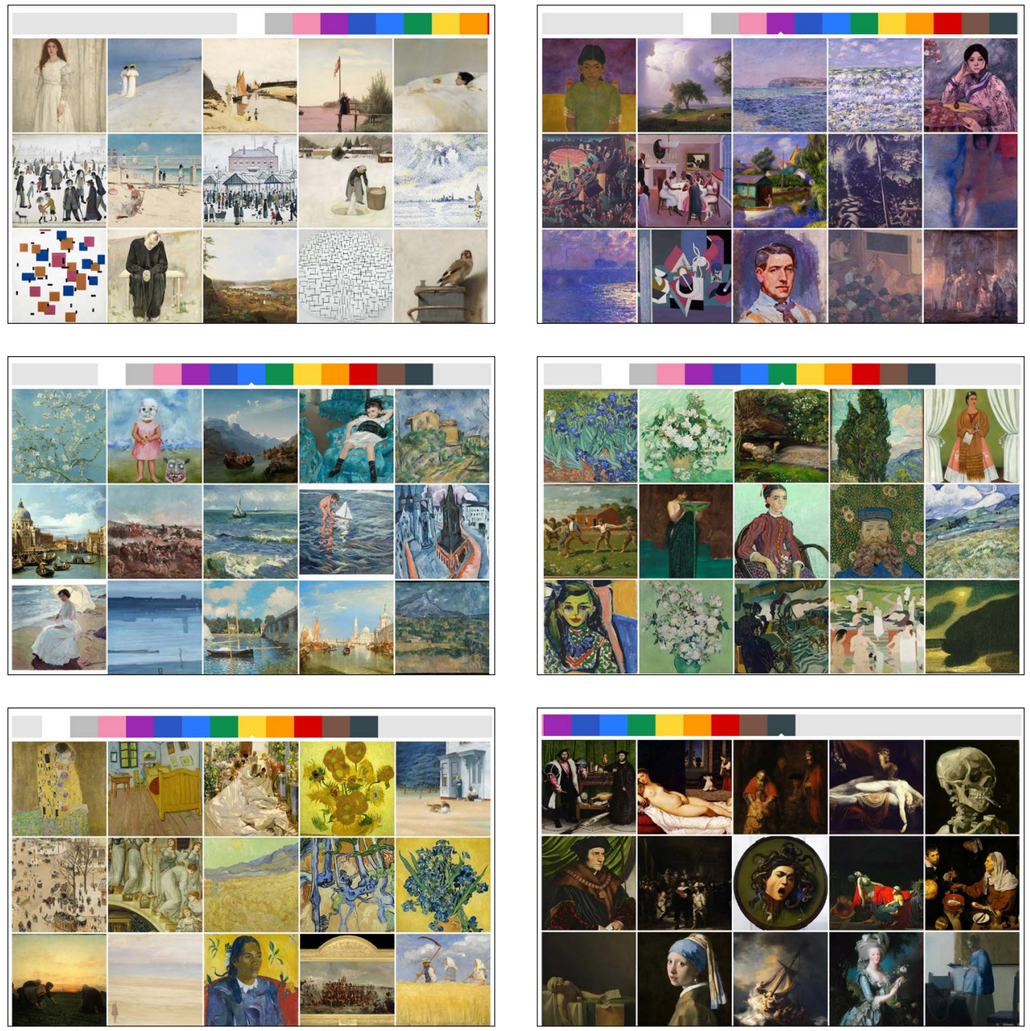


Figure 4. Database that orders artworks according to color.
(Google Arts & History, n.d.)

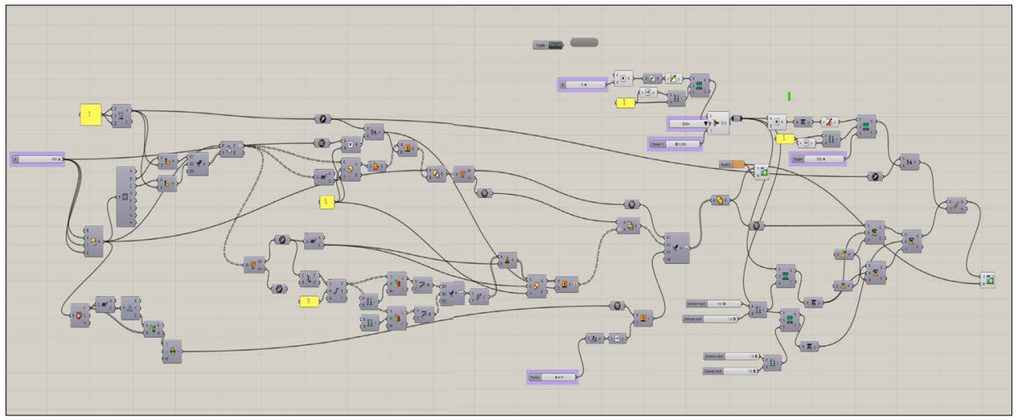


**2.3**

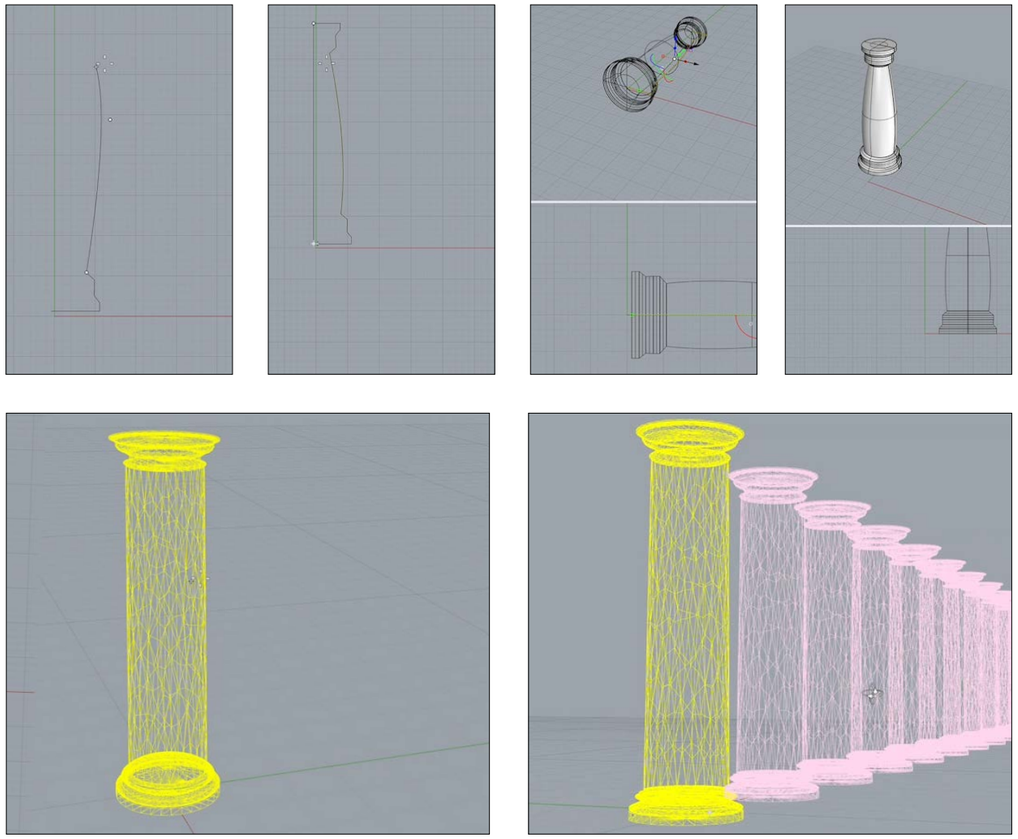
**Modules are organised as a collection of structured data.** They are not coordinated in any form of narrative, hierarchy, theme, or other kind of formal organization but according to a flat database where each item possesses the same significance as any other. There are of course many variations of databases such as hierarchical, relational, or object-oriented, but from the point of the user who queries the collection of data entries, they are very similar (Manovich, 2001).

This non-linear and non-hierarchical way of structuring data allows the discrete units and modules to freely move across networks. The Internet might be the best example of this. It displays the potential but also the mess this form of aggregation can generate. Without any distinct or overarching way of ordering and displaying content, any pristine piece of data is soon caught in the circulation across platforms and is made to fit into site specific database formats. The modularity of the Internet offers the same material authority to art spaces, technology hubs and social sites in the same way as it situates government platforms right next to chat bots and spy cams.

Hito Steyerl (2013) describes this disintegration of constructed boundaries and circulation of data as “the poor image”. “The poor image is a rag or a rip; an AVI or a JPEG, a lumpen proletarian in the class society of appearances, ranked and valued according to its resolution. The poor image has been uploaded, downloaded, shared, reformatted, and reedited. It transforms quality into accessibility, exhibition value into cult value, films into clips, contemplation into distraction. The image is liberated from the vaults of cinemas and archives and thrust into digital uncertainty, at the expense of its own substance. The poor image tends towards abstraction: it is a visual idea in its very becoming” (Steyerl, 2013). The modularity of the Internet makes it a ripe field for objet trouvé. Not only do objects come already entangled in imagery, symbolism, and history but the database destabilizes these aspects and flattens out any hierarchy between them, liberating new ways of use and further manipulation. Materially, these objects have most likely deteriorated, losing any metadata that constituted its original context (Bak Herrie, 2017) and so, also inviting a new agenda.



3.1 Figure 5. Grasshopper script by modelling a 3-way wooden joint called Kawai Tsugite. Example of an automated design process. (Horikawa, 2018)



3.2 Illustration of the many steps involved creating an object in a 3D modelling environment frowm scratch (first row), as opposed to downloading, importing and arraying a ready-made component (second row).





# 3. AUTOMATION

**3.1**

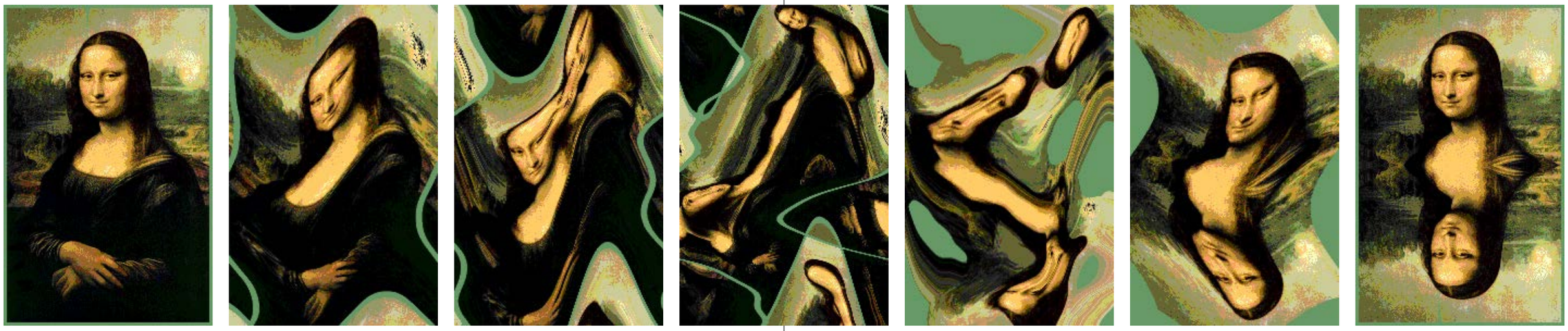
**The first two principles allow for the automation of many operations involved in digital creation and manipulation.** This allows human intentionality to be removed from this process in part (Manovich, 2001). All 3D modelling programs come with tools, templates, filters, or simple algorithms for easier and more effective use. Actions can be scripted for more streamlined workflows and more complexity can be included with add-ons. Using these automated actions create accountability over code (Lee & Björklund Larsen, 2019). Manovich uses the term “non-transparency of the code” to describe the role of undisclosed algorithms. “A code may also provide its own model of the world, its own logical system, or ideology; subsequent cultural messages of whole languages created with this code will be limited by its accompanying model, system or ideology” (Manovich, 2001).

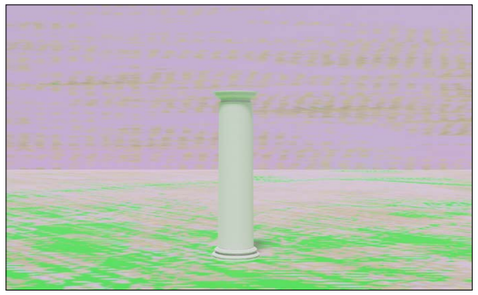
Koetter and Zeifman (2015) note that most software applications such as those for 3D modelling, rendering, scripting, CNC fabrication and post-processing of documentation were not created with architects as their primary target group. They suggest that this can be read as that these tools are already being used in a non-intended way. A method that this thesis also shares but exaggerates in its application. The role of Autodesk as a provider of software solutions catering towards architects as well as other professional fields, is specific to this thesis.

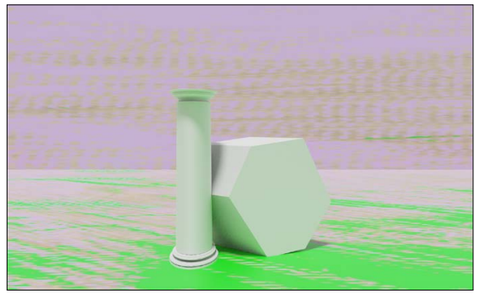
**3.2**

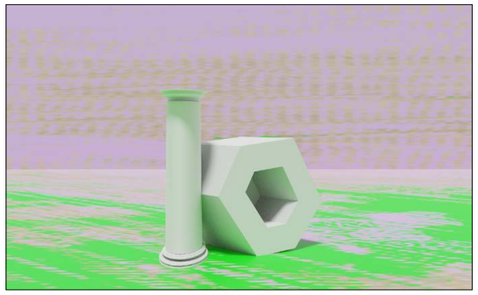
**Accessing and reusing existing digital content is easier than creating new.** Automation naturally leads to even more automation, scripting a design will provide an entirely modular and dynamic system rather than drawing the same thing from scratch and redo the entire process to make changes. In the same manner, generating new data from existing data is the mode of operation in the digital age. This has to some extent expanded the role of the designer to include curation of content. In this thesis, almost nothing form-wise is manually created. The contents come from a wide variety of formats, from short movie sequences to software library components. This content is then remediated and manipulated by an even greater number of “found actions”. It is not only the content that reflects the digital product, but also the actions of transformation as well as the act of putting it all together through digital compositing. All these parts are conditioned by the digital medium and its way of structuring meaning and interaction. Input is curated, reworked, and presented as output. This is a position the architect has to reflect upon, as the design process becomes ever more digitized, and even the products of our work, physical space and massing, become represented in various digital formats.

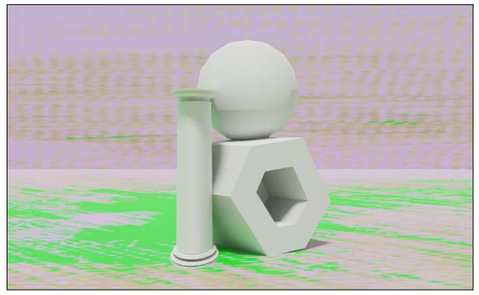
Figure 6. Mona Does Mitosis, originally a moving GIF file. (Stephan, 2010). A continuation of Marcel Duchamp's work where he drew a moustache and beard on a postcard of Mona Lisa and named the piece L.H.O.O.Q. The borrowing and reworking of previously made artefacts are put in a context of derivative work.

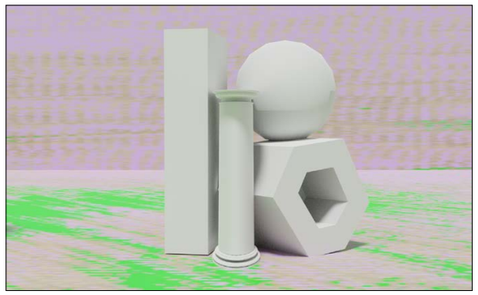


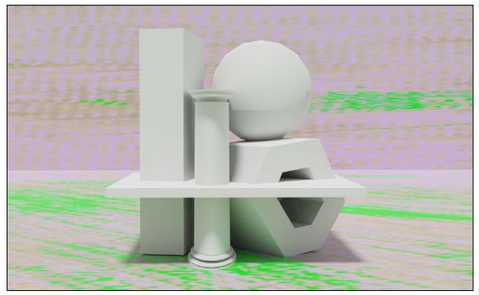


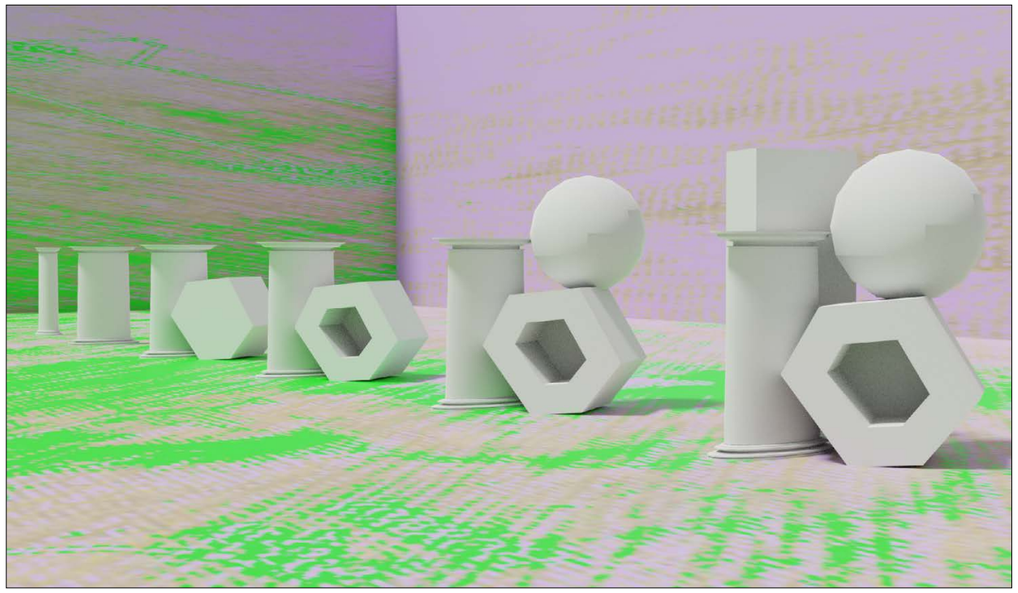














# 4. VARIABILITY

**4.1**

**A digital object is not a fixed entity but can exist in multiple places and in endless variations at the same time.** This can be traced to a technological development that aimed for customization rather than the production of identical copies. Remediation of data depends on it to be modular and the process is helped along by automation. Variation of the same source data can be made to interact and be presented in different ways depending on context (Manovich, 2001).

This principle has been explored in architectural design as well. Two examples of this are *literalism* and *differentiality*. Differentiality relates the same set of data to variation of form output and emphasizes the relationship between data and expressions of said data. In this way, cohesiveness in shape and appearance can be achieved because the elements are still interconnected. This can then be expressed in a series of objects with a family resemblance (Lynn, 1998).

Theories of linguistic literalism can be used to further expand on this topic. “A literal expression has its own singular signification, which is direct and particular. Thus, literal expressions are not metaphorical, analogical or indexical; in other words, what you see is what you get” (Neuman, 2014) By transforming or transcoding a set of data, multiple manifestations in different formats can be created and each of them sets their own context without a link to outside signification. “In the last two decades, architects who deal with digital procedures have set algorithmic procedures, let the computer run its course, and allowed architecture to emerge out of the algorithmic process” (Neuman, 2014). A different but relating example is the File-to-factory (FTF) approach. FTF is a process in which the digital model contains all the necessary information. This data can be sent directly to a fabrication device that can output the final form. Not only does this bypass large sections of the construction process but in effect positions the model and the physical output in a literal relationship.

This page:
Figure 7. Flatware Prototypes (Lynn, 2007). Same dataset expressed in various forms creating a series.

Opposite page:
Snippet of a g.code file. An FTF "drawing". In this case, code generated from a 3D model in Ultimaker Cura sent to a Creality Ender-3 3D printer.







```
;FLAVOR:Marlin
;TIME:40790
;Filament used: 17.0926m
;Layer height: 0.2
;MINX:77.611
;MINY:66.266
;MINZ:0.2
;MAXX:157.378
;MAXY:168.559
;MAXZ:83.2
;Generated with Cura_SteamEngine 4.5.0
M140 S50
M105
M190 S50
M104 S200
M105
M109 S200
M82 ;absolute extrusion mode
; Ender 3 Custom Start G-code
G92 E0 ; Reset Extruder
G28 ; Home all axes
G1 Z2.0 F3000 ; Move Z Axis up little to prevent scratching of Heat Bed
G1 X0.1 Y20 Z0.3 F5000.0 ; Move to start position
G1 X0.1 Y200.0 Z0.3 F1500.0 E15 ; Draw the first line
G1 X0.4 Y200.0 Z0.3 F5000.0 ; Move to side a little
G1 X0.4 Y20 Z0.3 F1500.0 E30 ; Draw the second line
G92 E0 ; Reset Extruder
G1 Z2.0 F3000 ; Move Z Axis up little to prevent scratching of Heat Bed
G1 X5 Y20 Z0.3 F5000.0 ; Move over to prevent blob squish
G92 E0
G92 E0
G1 F2700 E-5
;LAYER_COUNT:416
;LAYER:0
M107
G0 F6000 X106.443 Y88.468 Z0.2
;TYPE:SKIRT
G1 F2700 E0
G1 F1200 X106.735 Y88.595 E0.01059
G1 X107.356 Y89.314 E0.04219
G1 X107.545 Y89.553 E0.05232
G1 X107.77 Y89.821 E0.06396
G1 X107.68 Y89.976 E0.06992
G1 X107.496 Y89.789 E0.07865
G1 X107.058 Y89.456 E0.09695
G1 X106.828 Y89.328 E0.1057
G1 X106.443 Y88.468 E0.13704
G0 F6000 X106.979 Y88.264
G1 F1200 X107.661 Y89.054 E0.17176
G1 X107.859 Y89.305 E0.18239
G1 X107.938 Y89.401 E0.18652
G1 X108.284 Y89.808 E0.20429
G1 X108.085 Y90.066 E0.21513
G1 X107.833 Y90.522 E0.23246
G1 X107.768 Y90.7 E0.23876
G1 X107.522 Y90.377 E0.25226
G1 X107.146 Y90.016 E0.2696
G1 X106.719 Y89.717 E0.28694
G1 X106.515 Y89.608 E0.29463
G1 X105.786 Y87.978 E0.35402
G1 X105.621 Y87.674 E0.36552
G1 X106.979 Y88.264 E0.41477
G0 F6000 X107.222 Y87.933
G1 F1200 X107.969 Y88.799 E0.45281
G1 X108.242 Y89.142 E0.46739
G1 X108.814 Y89.815 E0.49677
G1 X108.68 Y89.944 E0.50295
G1 X108.387 Y90.336 E0.51923
G1 X108.161 Y90.77 E0.53551
G1 X108.008 Y91.235 E0.55179
G1 X107.926 Y91.933 E0.57516
G1 X107.926 Y92.021 E0.57809
G1 X107.878 Y91.846 E0.58412
G1 X107.71 Y91.386 E0.60041
G1 X107.469 Y90.96 E0.61669
G1 X107.163 Y90.578 E0.63297
G1 X106.798 Y90.251 E0.64927
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G1 X106.206 Y89.9 E0.67217
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G1 X103.259 Y86.396 E0.83182
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G1 X99.808 Y85.597 E0.95265
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G1 X99.514 Y84.94 E0.97663
G1 X99.307 Y84.6 E0.98987
G1 X99.02 Y84.204 E1.00613
G1 X98.891 Y84.077 E1.01215
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G1 X99.996 Y84.57 E1.05265
G1 X100.386 Y84.865 E1.06892
G1 X100.642 Y85.011 E1.07872
G1 X101.616 Y85.499 E1.11495
G1 X107.222 Y87.933 E1.31822
G0 F6000 X107.465 Y87.603
G1 F1200 X108.28 Y88.547 E1.3597
G1 X108.547 Y88.883 E1.37398
G1 X109.368 Y89.849 E1.41614
G1 X109.286 Y89.916 E1.41967
G1 X108.959 Y90.233 E1.43481
G1 X108.692 Y90.602 E1.44996
G1 X108.494 Y91.013 E1.46514
G1 X108.371 Y91.451 E1.48027
G1 X108.326 Y91.933 E1.49637
G1 X108.326 Y93.145 E1.53668
G1 X108.23 Y93.158 E1.5399
G1 X107.841 Y93.221 E1.55301
G1 X107.492 Y91.952 E1.59678
G1 X107.333 Y91.525 E1.61194
G1 X107.102 Y91.132 E1.6271
G1 X106.806 Y90.786 E1.64224
G1 X106.454 Y90.496 E1.65741
G1 X106.101 Y90.292 E1.67097
G1 X105.902 Y90.197 E1.67831
G1 X105.055 Y88.305 E1.74725
G1 X104.833 Y87.907 E1.76241
G1 X104.546 Y87.554 E1.77754
G1 X104.201 Y87.257 E1.79268
G1 X103.809 Y87.024 E1.80785
G1 X103.51 Y86.902 E1.81859
G1 X103.132 Y86.775 E1.83186
G1 X103.044 Y86.754 E1.83486
G1 X102.722 Y86.533 E1.84785
G1 X102.375 Y86.336 E1.86113
G1 X101.96 Y86.147 E1.87629
G1 X101.519 Y86.032 E1.89145
G1 X101.091 Y85.997 E1.90573
G1 X99.501 Y85.997 E1.95862
G1 X99.381 Y85.572 E1.97331
G1 X99.173 Y85.148 E1.98901
G1 X98.966 Y84.808 E2.00225
G1 X98.696 Y84.441 E2.01741
G1 X98.366 Y84.127 E2.03256
G1 X97.986 Y83.875 E2.04772
G1 X97.568 Y83.694 E2.06287
G1 X97.048 Y83.52 E2.08111
G1 X97.101 Y83.441 E2.08427
G1 X97.168 Y83.318 E2.08893
G1 X97.261 Y83.195 E2.09406
G1 X97.875 Y83.229 E2.11451
G1 X100.166 Y84.167 E2.19685
G1 X100.287 Y84.293 E2.20266
G1 X100.823 Y84.654 E2.22416
G1 X101.775 Y85.132 E2.25959
G1 X107.465 Y87.603 E2.46591
G0 F6000 X107.707 Y87.272
G1 F1200 X108.588
Y88.293 E2.51077
G1 X108.852 Y88.624
E2.52485
G1 X109.942 Y89.907
E2.58084
G1 X109.848 Y89.974
E2.58468
G1 X109.538 Y90.226
E2.59797
G1 X109.24 Y90.52
E2.61189
G1 X109.002 Y90.865
E2.62583
G1 X108.835 Y91.249
E2.63976
G1 X108.743 Y91.658
E2.6537
G1 X108.726 Y91.933
E2.66287
G1 X108.726 Y93.468
E2.71392
G1 X108.63 Y93.512
E2.71743
G1 X108.294 Y93.553
E2.72869
G1 X107.55 Y93.674
E2.75376
G1 X107.106 Y92.058
E2.8095
G1 X106.957 Y91.666
E2.82345
G1 X106.737 Y91.31
E2.83737
G1 X106.452 Y91.002
E2.85133
G1 X106.115 Y90.753
E2.86526
G1 X105.929 Y90.654
E2.87227
G1 X105.597 Y90.496
E2.8845
G1 X104.69 Y88.469
E2.95836
G1 X104.483 Y88.104
E2.97232
G1 X104.211 Y87.785
E2.98626
G1 X103.884 Y87.524
E3.00018
G1 X103.383 Y87.282
E3.01868
G1 X103.005 Y87.155
E3.03194
G1 X102.854 Y87.12
E3.0371
G1 X102.777 Y87.048
E3.04061
G1 X102.524 Y86.881
E3.05069
G1 X102.177 Y86.684
E3.06396
G1 X101.795 Y86.513
E3.07788
G1 X101.387 Y86.417
E3.09182
G1 X101.091 Y86.397
E3.10169
G1 X99.146 Y86.397
E3.16638
G1 X99.099 Y86.019
E3.17905
G1 X98.969 Y85.621
E3.19297
G1 X98.831 Y85.356
E3.20291
G1 X98.624 Y85.016
E3.21615
G1 X98.373 Y84.68
```

**4.2**

**To build upon this principle, digital objects can be described as hypermedia.** Objects are hyperlinked throughout a network instead of being hard-wired together. Linking objects together rather than separating or copying instances keep editing capabilities in place. The modular, the composite and the database all fit together to maximize automation, control, and variation.

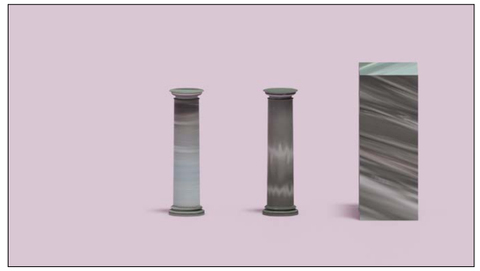
Pillars are linked so what one does, the other follow.

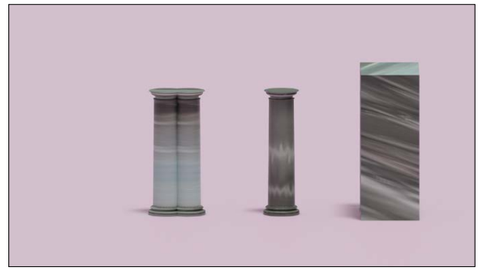


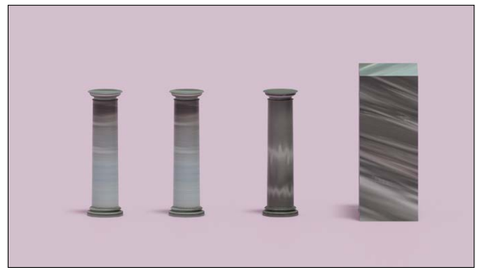
**4.3**

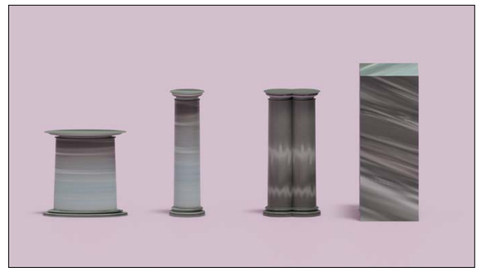
**There are two main types of transformations,** one is a transformation of the same data. The other is to generate new data from already existing data. In both cases, the original data remains intact. Contrary to a physical transformation, like making a canoe out of a tree trunk, the original object will still exist in a digital environment. Data must be intentionally deleted or circumstantially corrupted to be erased.

The two pillars in the middle illustrate the transformations. The left pillar itself is changed. The right pillar's shape is used to create a change in another object.









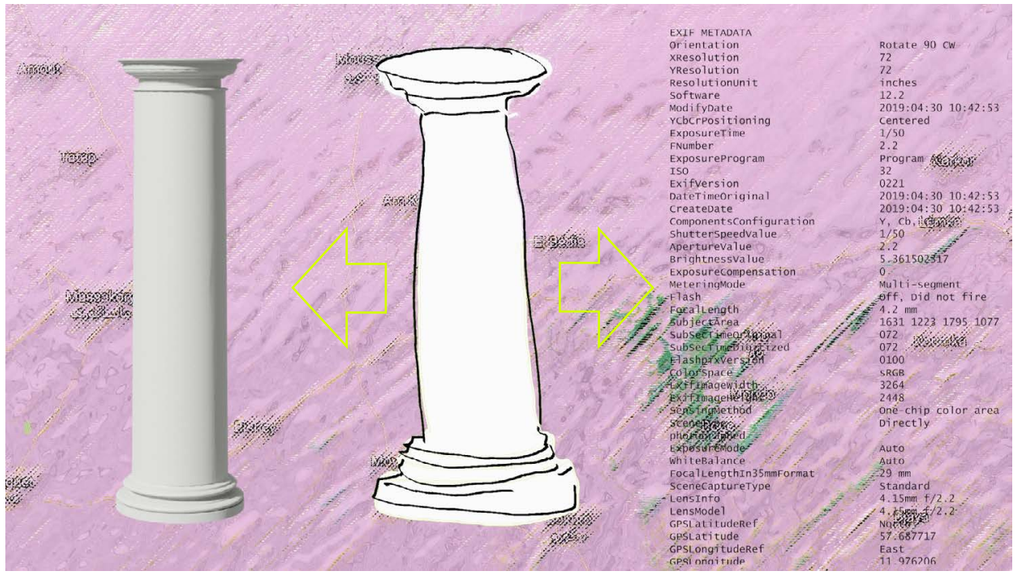
# 5. TRANSCODING

Manovich does not use the term transcoding as it is used in computer sciences. Instead he uses it to demonstrate the two sides of digital culture: the cultural layer of human language and the computer layer of programmatic logic. These layers can be considered separately, but what is distinctly digital will escape attention since both sides interact and merge to create a synthesis of digital expressions. He lists categories that fit in the cultural layer such as different types of narratives and story-telling techniques and contrast them to the ontology of the computer layer “process and packet; sorting and matching; function and variable; computer language and data structure” (Manovich, 2001). These examples show how cultural concepts become reframed according to the computer’s semantic framework.

Three instances of how transcoding in this form expressed itself during the design experimentation phase of the thesis is presented here in hopes to situate this principle in an architectural context.



The cultural layer easily recognizes the picture in the middle as a pillar. The computer recognizes the file’s metadata or other information such as pixel data and color.







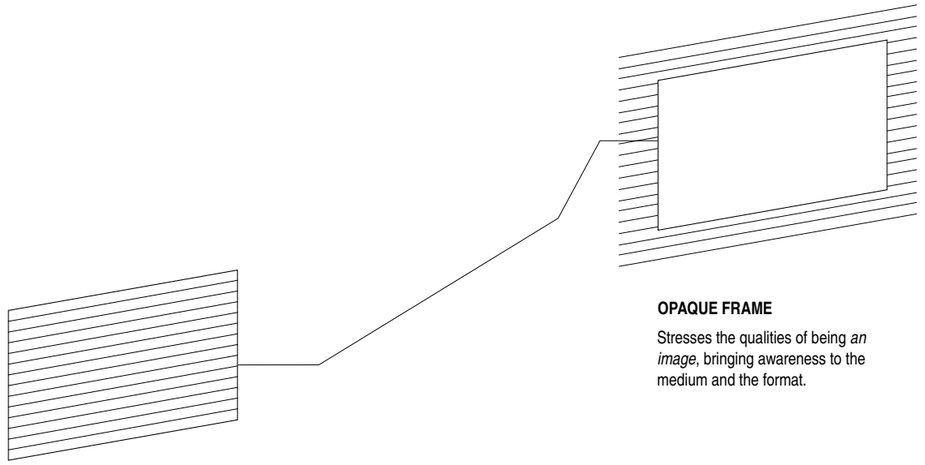

**5.1**

**The contemporary digital interface has much in common with traditional cinematic framing techniques.** The interface is the boundary where different components meet and exchange information. The interface discussed here refers to where computer language and structure is translated into human signs and signals. In a cultural setting, the term interface is often used when discussing the screen and how information is visually communicated through graphic elements (the interface encompasses more senses such as sounds but visual aspects will be mainly discussed). The computer’s own language would be completely illegible to most humans and is therefore reformatted to become comprehensive. But in doing so, it imposes its own interpretations of both the content it is displaying as well as providing a way of thinking about the computer itself. “In short, far from being a transparent window into the data inside a computer, the interface brings with it strong messages of its own” (Manovich, 2010).

The metaphor of the window as a frame into different worlds is a theme used in film theory. Looking at cinema provides a layer of spatial qualities to the otherwise flat computer screen. A movie director intentionally frames the interaction with movie-space. Depending on that intention, the screen is situated in a way as to either bring awareness to it or it is moved to back of the mind to highlight what is shown on it. Elsaesser and Hagener (2010) explore this relationship, “the notion of the window implies that one loses sight of the framing rectangle as it denotes transparency, while the frame highlights the content of the (opaque) surface and its constructed nature, effectively implying composition and artificiality”. The computer works in the same way of naturalizing the interface of software. The normalization of 3D modelling applications can be demonstrated by the incorporation of “computer-lingo” of common action commands such as extrude and array into natural ways of discussing architectural form. Given, these terms were derived from modelling practices in the first place but have come to conjure up very digital connotations. It is also an example of how the cultural and the computer layer have blended old and new meanings into a new way of thinking about these topics.

The articulation of the interface, the creation of a smooth digital experience, is similar in technique and function to the immersiveness of the cinematic window. This in turn is also applied to the digital composite. Ten windows such as web browsers, video streaming, a word processor etc., all with chaotically differing contents in them, can somehow all exist next to each other on a computer screen. The interface tries to lessen any feelings of abrasiveness and dissonance between them and succeeds in this. Manovich also draws parallels between film and interface. Cinematic ways of seeing the world and narrating experiences lie close to a generation brought up in an environment filled mass-media and television. “In short, what was cinema, is now the human-computer interface.”

This mode of pushing native digital expressions to the background or reframing them in easy digestible ways, works against the intentions of the thesis, and led to engaging with with both film and animation as input and as a manner of displaying design. The role of the interface in a digital practice often escapes attention, but working with a cintematic approach might shed some light upon this matter. Ágnes Pethő (2011), calls it *intermediality*, when cinema positions itself by either specific techniques or other means outside of itself on the border to other media. Not losing what makes it cinema, but disrupting it enough to shift intentions and framing into awareness. Similar effects can be reached by utilizing many different formats, remediating objects and behaviours as well as introducing them to foreign environments.



**TRANSPARENT WINDOW**

*A window to the world*, we perceive what is communicated without much awareness to the framing of it.

**OPAQUE FRAME**

Stresses the qualities of being *an image*, bringing awareness to the medium and the format.

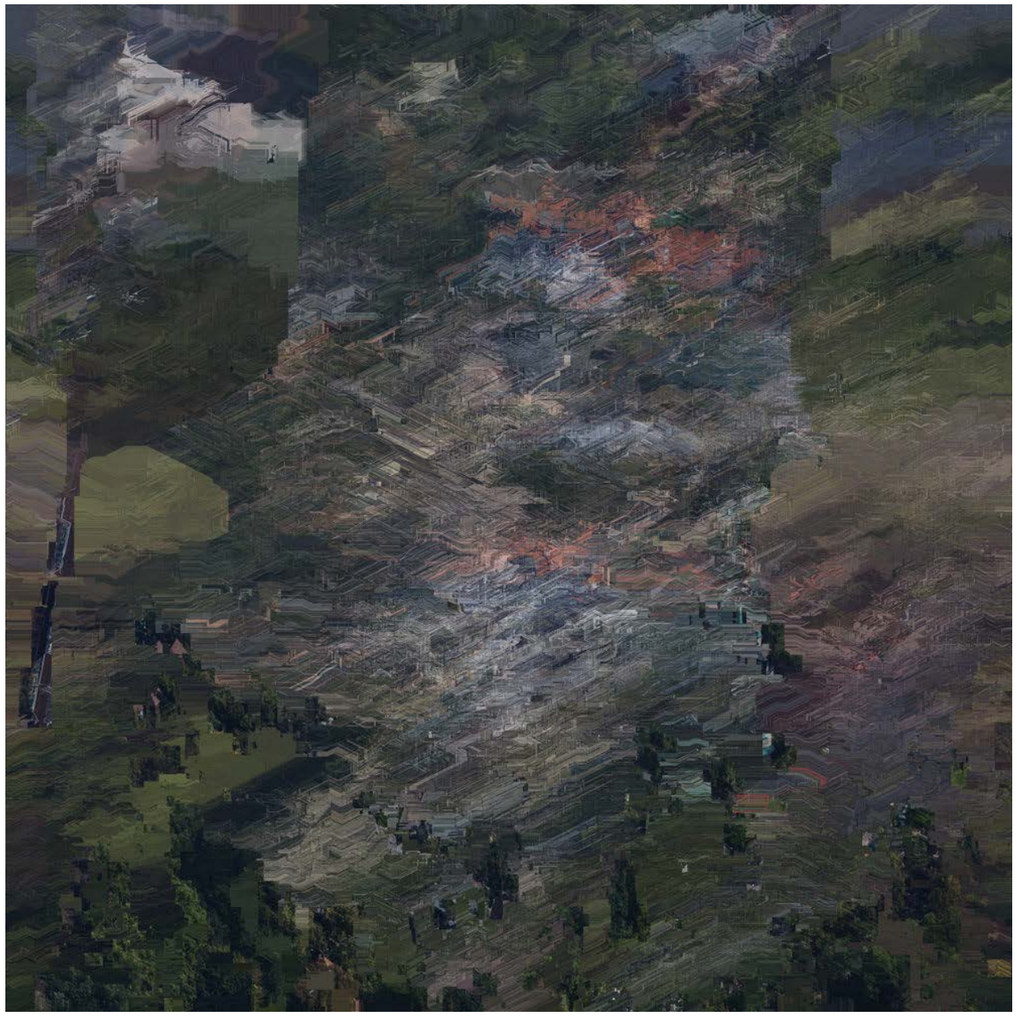
**5.2**

**Glitches are digital abstractions.** Glitch, or the act of glitching (Menkman, 2012), is used here to illustrate an area where the boundaries of transcoding not only meet but gets blurred. Glitch art as an intentional aesthetic, interferes with the concept of transcoding by displaying computer language as human signs, switching or intersecting both function and meaning between the computer layer and the cultural layer. (Note that intentional glitching has little to do with actual computational errors and that this practice takes place on the level of interface.) By glitching a known image or phenomena, ties are cut with its signifiers and context. This happens on a scale; a glitch is recognized because it contains known elements that can be distinguished alongside the disorienting components.

A central part of the thesis revolves around misappropriation of software, turning unsuitable input into unexpected output. During this process, recognizable input is processed and reworked by the computer that restructures it according to the algorithm's configuration. Since this process was intentionally skewed, the output also reflects this. The transformed object can still be traced visually to its precedent but has gained new characteristics that has shifted it into a new state. This state does not align with the intended use of the software either, since that was the intention all along. The output object generates an uneasy alliance between our recognition of the object in relation to its old state, while at the same time recognizing its new features without any apparent usefulness for them. It falls in the same area as a glitch but not including the same aesthetic disruptions.

The transcoding limbo created by reformatting, reworking, and remediating cultural input is examined and expressed in several ways in the design output section.

Figure 8. Sample from an artwork of composited drone footage of a park, processed by a machine vision based algorithm creating an effect of painterly associations. (Rehm, 2015)







**5.3**

**Are there ways of creating a montage from the digital composite?** The montage technique was developed by the Soviet film director and theorist Sergei Eisenstein who promoted it as the creative agent in the cinematic editing process. To put it simply, montage is the act of putting two or more contrasting shots next to each other and by doing so combining and juxtaposing them to create an effect that is greater than its separate parts. He puts it in more explosive terms, "montage is conflict" and establishes film editing as a "series of explosions in an internal combustion engine" (Solomon, 2019).

Manovich claimed that the composite is the ruling logic of both the creation of digital artefacts as well as how the interface is structured. The composite and the montage stand in contrast to each other, as one is seen to flatten any conflict, while the other uses those exact oppositions to express something more than the sum of its parts (Shaviro, 2010). In line with the thesis' intentions, the concept of transcoding was put in relation to the composite and the montage.

As discussed in point 5.2, destabilizing the balance between the cultural and computer layers can act to subvert the obscuring smoothness and flattening of expression that is pervasive in the digital composite. By using the concept of transcoding, an approach can be found to actively work towards a montage.

The concept of a montage is illlustrated with Japanese kanji where each component hold a meaning and idea. When combined, these form a new meaning and a newword. *"*Two hieroglyphs of the simplest series is regarded not as their sum total but as their product, i.e. as a value of another dimension, another degree: each taken separately corresponds to an object but their combination corresponds to a concept. The combination of two 'representable' objects achieves the representation of something that cannot be graphically represented. *... 'montage is not an idea composed of successive shots stuck together but an idea that* DERIVES *from the collision between two shots that are independent of one another "* (Solomon, 2019)

口 鳥 鳴

mouth bird chirp, sound

耳 門 聞

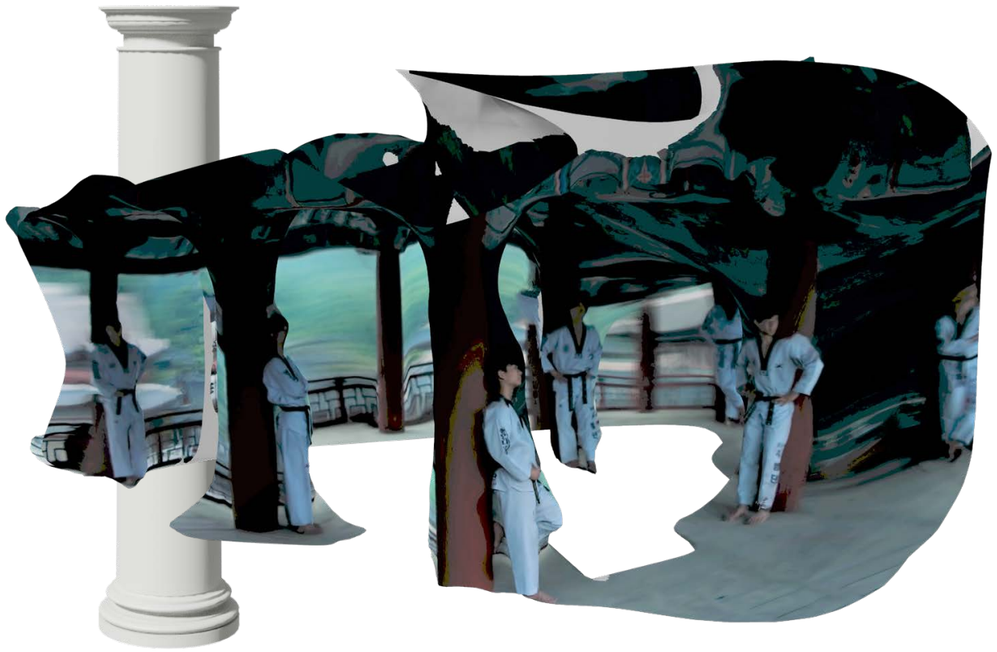
ear door listen

止 几 凪

stop wind calm

# DESIGN OUTPUT







**INTRODUCTION TO DESIGN ELEMENTS**

The following section of the booklet contains a sequence of images narrated to highlight design elements and to reflect on their emergence and context in relation to the five principles of digital media. The methodology of the thesis set up multiple steps transforming various kinds of found media, both downloaded from the Internet as well as assets from software libraries. These were then composited, some further transformed, in a variety of ways to explore the principles of digital media and ways of working. The elements are divided into two main categories, labeled *the ReCaps* and *the Revits*. The ReCaps are made from found moving media on the Internet, reformatted into usable input, put through the process of photogrammetry using Autodesk ReCap Photo and made into either a meshed 3D model or point cloud. The Revits are components (or in proper terms, families) exported from the 3D modelling and BIM-compatible application Autodesk Revit. Revit is a tool for the production of building documents and as such, components in Revit are very “realistic” representations of architectural objects.

These two categories are used and juxtaposed to explore the transcoding aspect of architectural representations. From the standpoint of optimization of the digital workflow, using software in useless ways will produce useless results. The basic idea of photogrammetry is to scan real-world objects, to quantify them and be able to represent them as accurately as possible in a digital environment. The performance of this process is judged by its precision in achieving this task. In misusing the software, output is produced that also misaligns with the standard workflow of the design process. Digital objects are just representations of, or references to, physical equivalents. But when misaligning this relationship, the digital object falls somewhere closer to the glitch effect previously discussed. In the case of ReCap, the 3D models still retain a sense of recognition of the set that the scene was taking place, but have at the same time gained attributes that create a clear distinction from those specific “real-world equivalents”. These glitchy effects would be considered unwanted and useless in a typical setting. Since the interface and formatting of the setting reflect this strictness, the actual use and potential of such a misaligned object lessens dramatically. Glitch in both cultural form and computer language is often produced to appear in the final form of an artefact but to generate it as a first step in a multistep digital process is another matter.

One of the uses for photogrammetry is to introduce a sense of scale and sometimes times texture to a digital environment that lacks these features. As this method distorts the scale of the models among other things, it introduces the difficulty of how to use them in a creative process, turning them into syntactically ambiguous objects. Where do they fit in as a part of an architectural assembly, such as a model or drawing, if they are not concrete enough to be viewed and used as a discrete object or abstract enough to be a medium for creative interpretation? The design output presented on the next few pages suggests a bit of both. But to do so a contrasting element had to be introduced, the Revits. To use preexisting content rather than producing new material aligns with the digital logic. The Revit components provide a formal language and scale that the ReCaps lack. The Revits and the ReCaps are combined, contrasted, and juxtaposed in different ways in the scenes to explore how transcoding can be expressed as a design situation.

## PHOTOGRAMMETRY

What is presented here are insights into details of camera technique and certain ways of framing a space that one has to look for to use as input for photogrammetry as this will provide a foundation for the categorization of the models. Further detailed experiments into the process of photogrammetry can be found under the section *Process*.

For the process to work, a space or object is needed to provide context as 3D coordinates interpreted by the software. Movie space can roughly be divided into three categories: real physical locations, built sets and special effects. Contrary to what first might be expected, scenes with computer generated elements work fine in most cases as these try to match and blend into the surrounding environment. Camera settings such as depth, distortions in perspective etc. need to be constant in all of the frames. The most important point to look for in a sequence is movement of the camera. Variations in camera position in relation to a subject will provide enough depth data to produce a model. There are many types of techniques found in cinema where the camera is moving. For the most “accurate” models, a revolving shot is ideal. Through many iterations of trial and error, it was found that a parallel tracking shot generates decently detailed models in a consistent manner. Tilting and zoom-panning shots did not provide enough depth data to render more “spatially correct” models but still produced output. For what spaces and objects that are present in the scenes there are also requirements, but not as strict as technique when it comes to reaching execution or no execution.

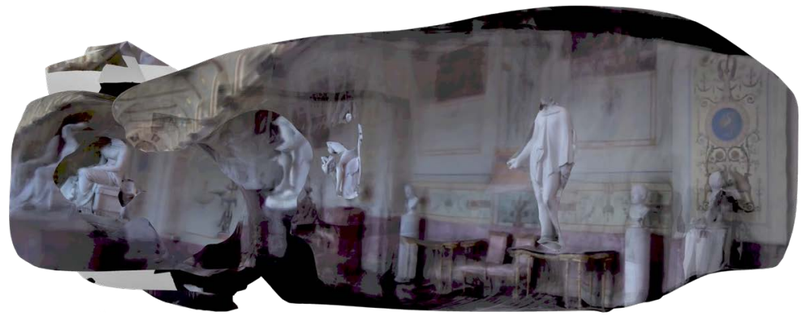
These methods were consolidated under the name the *Architectural Sweep* to look for when browsing possible source material. The Architectural Sweep consists of a lateral or perpendicular tracking motion of the camera, preferably in combination with minimal movement of an object within the frame. This is not to be mistaken with a kind of panoramic sweep that revolves around from a fixed point. The camera’s position as well as the space depicted must move somewhat in unison, or the camera can revolve *around* a fixed point.

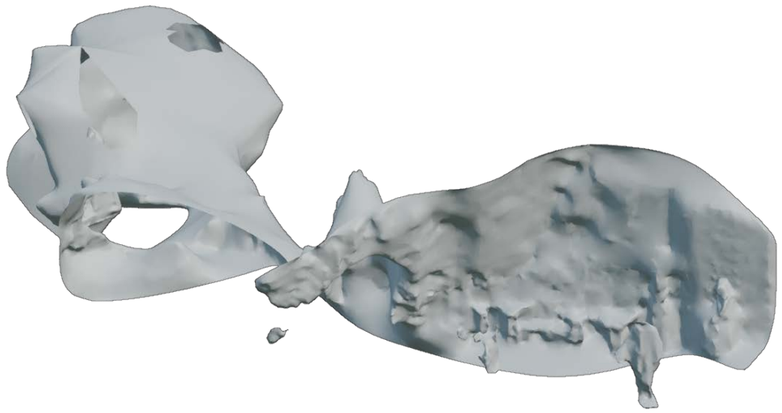




## MORPHOLOGY

Through the thorough investigations of ReCap Photo, a large number of models were produced. When that number reached close to seventy it was deemed as enough to provide a base for classification. Could a pattern or other cohesive formation be discerned? What was most striking in the models were the visual resemblance to the settings of the scenes they were derived from when they were presented in a rendered state with UV mapped colors. This initially led to an investigation based in setting and subject of the film scene, but it did not provide a strong enough relationship to the model output. Instead, the models where divided into five groups based on the overall *form* of the model and named after their specific features and composition. These categories correlate to the variations of technique used to capture the scene referenced in the previous paragraph. Many models fit into several categories but have been assigned one. The models that were produced during the course of the investigation is also the same ones used in the design output.





**BODIES**

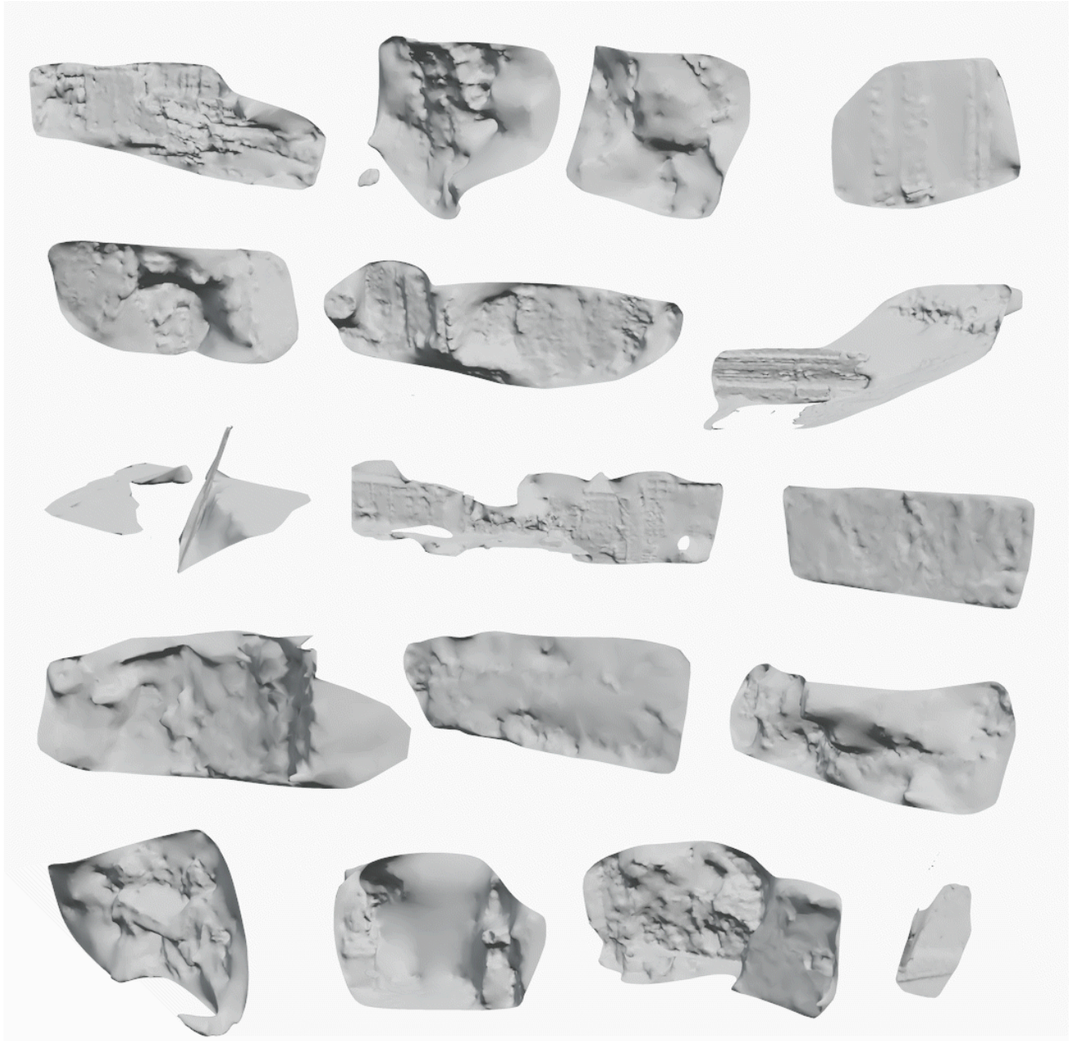
An autonomous shape most often in contrast to a ground plane or otherwise isolated from the environment. The camera does a full or partial revolving gesture around the object. Out of the categories, these are most aligned with a proper output.





**SCREENS**

A vertical surface that often takes the shape of a rectangle that is wider than it is high. No clear front or back side. There are several technical aspects behind this shape, like the result of a forwards or backwards panning shot or that a hazy environment such as fog is present the scene. Other factors can be reflective surfaces and shifting lighting conditions.



**DISJOINTS**

Models consisting of several fragmented pieces not attached to each other. The result of large contrasts in depth of the objects in frame such as a clear foreground and distant background, lack of connecting surfaces between such objects or a sudden appearance of an object in the middle of a scene.

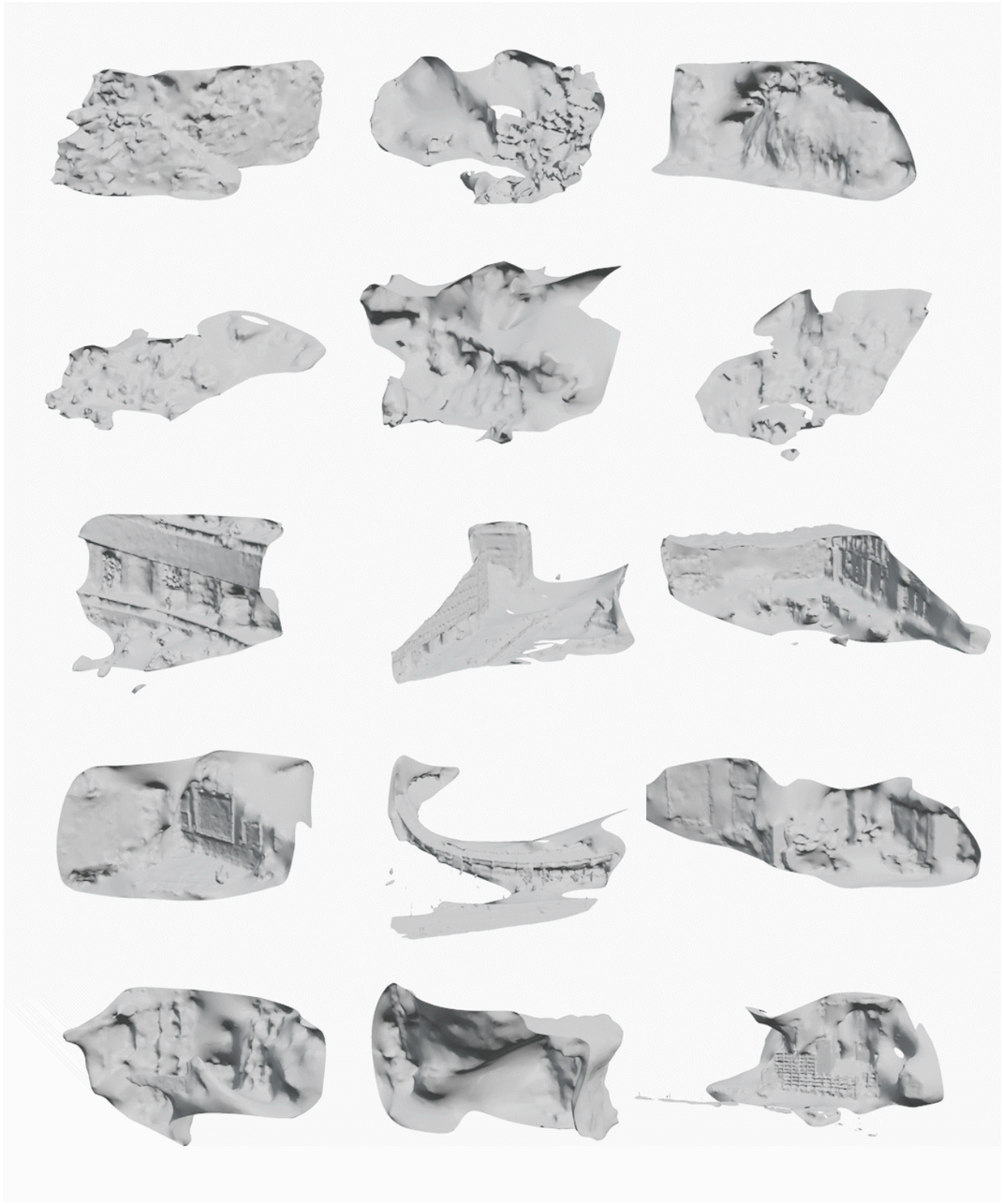






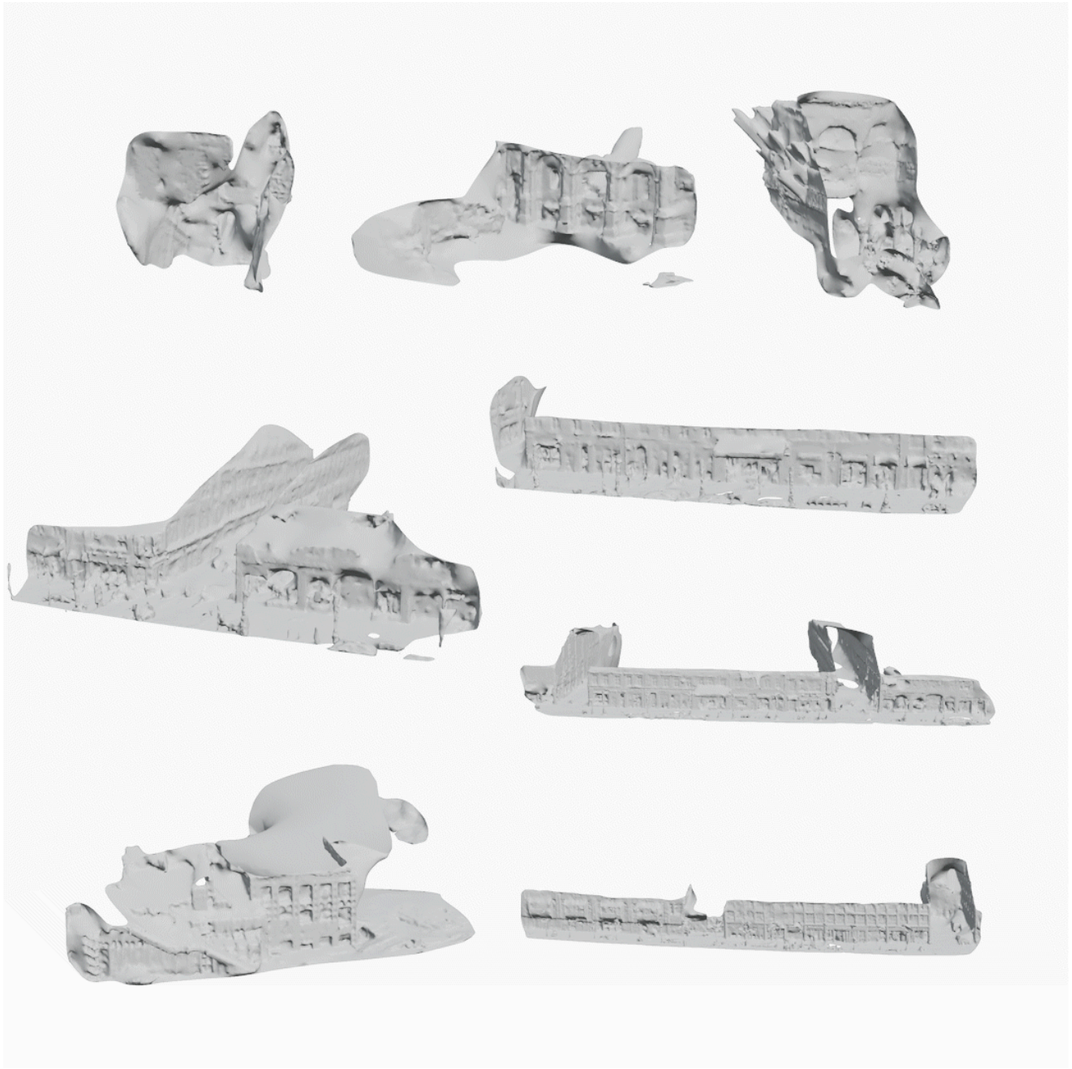
**DRAPES**

The model gives off the feeling of a cloth being draped over a sharper object. The shapes often slope in one direction, away from the camera. This form results from a relatively short camera movement in a vast space such as an outdoor shot. With this kind of sweep, a large area is covered in a fewer number of frames resulting in a kind of “stepping stretch effect”.



**EXTENSIONS**

These models can be described as a vertical plane with protruding bulges of varying depth pointing in the same direction. This category is also the result of a combination of technique and framed subject. A parallel panning shot capturing a cohesive front part with holes in it, such as a wall with open windows, but without enough information of what is inside the windows. The algorithm can not calculate the depth of such a cavity and thus stretches those parts away from the camera position.





# TEMPLE OF DEMATERIALIZATION

**TEMPLE OF DEMATERIALIZATION:**
**AN ARCHITECTURAL COLLAGE**

This design output was produced a means to explore and communicate the theoretical topics that the thesis revolves around. It was also a way to engage theory with form by incorporating elements that was produced during the experimentation phase. The goal in the beginning was not to produce any formal output, but the further the thesis progressed, an apparent need to find a vehicle that could communicate a more cohesive project arose. *The Temple of Dematerialization* was conceived as a concept that could address these various needs. The temple is divided into five scenes that each correspond to one of the morphological categories previously presented (bodies, screens and so on). This is to reflect on the focus on theme rather than site. By not having a set context such as site, it is difficult to evaluate one expression as more fitting than another.

The five scenarios enable five unique approaches to utilizing the ReCaps as well as many opportunities to explore digital transformations of different kinds. Each scene is given a general theme based on the ReCap category that guides the design decisions within that scene and the type of Revit components used. The idea of a temple might conjure up images of a unified plan drawing. Despite this, the scenes are distinctly separated into entities. The scenes are instead presented as a collection. Rather than a sequence of physically connected spaces, they act as a cinematic sequence of sets. This takes advantage of the composite's spatial ability to create a continuity from stitching together elements and dissolving boundaries. “The designer of a virtual world is thus a cinematographer as well as an architect” (Manovich, 2001).

The temple is not used as a programmatical concept but more in the vein of symbolic architecture. A temple attempts to materialize specific ideas about the world. It embodies principles and order into tangible places, spaces, and objects. Since the main objective for creating this output is also to let the digital condition take form, it seemed like a fitting alternative.

Materializing the digital is somewhat of a contradiction, as is making a digital temple. The digital project in itself is dematerialization. Quantifying matter and relationships into data enables the free and dynamic form of the digital environment which stands in stark contrast to “meatspace” (Manovich, 2001). The dematerialization aspect also hints at the fact that this will not be an architectural representation that aims to be built in a real-world setting.

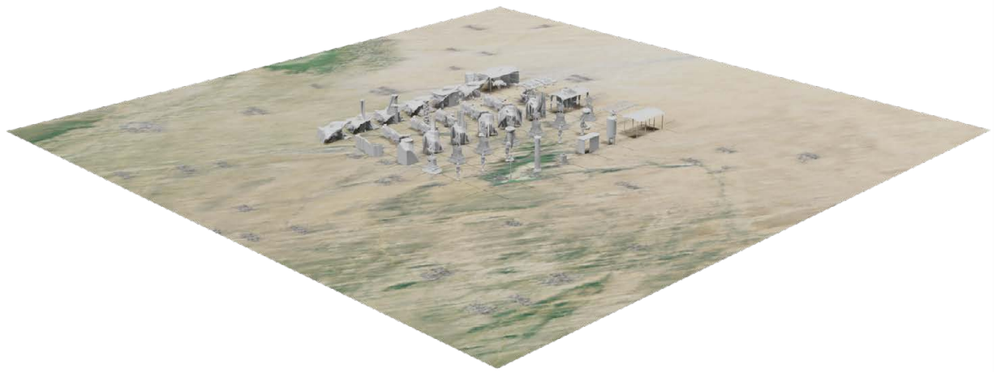
The collage is used to embody the remix, the composite, and the montage. A collage enables literal interpretation while at the same time communicating discrete intentions. The collage brings a tradition of disruption while still operating within the non-linearity of the database. It is the common arena and battleground of the composite vs. montage.

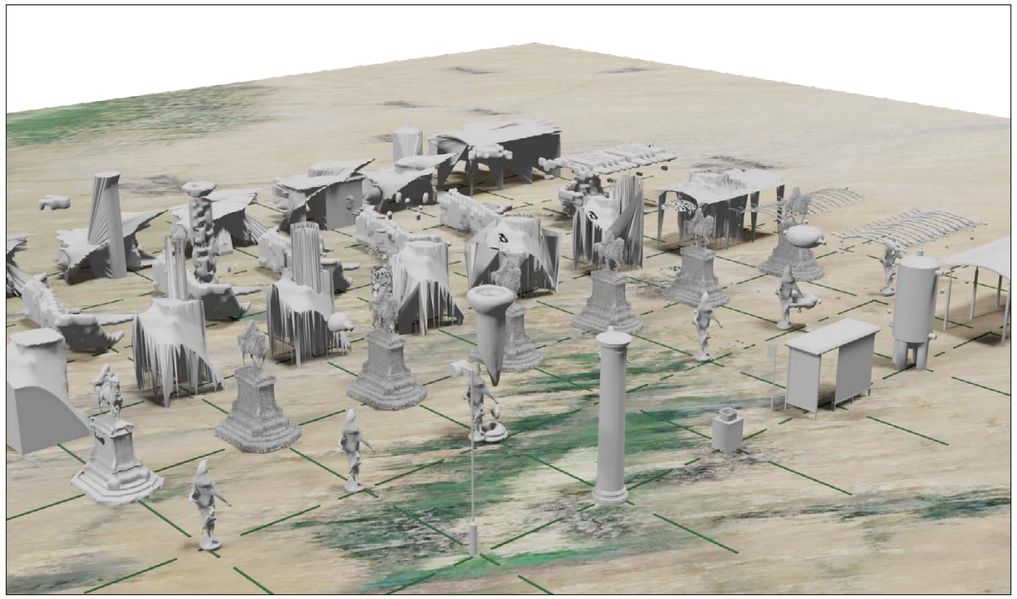
Link to all the scenes displayed as an animated video.

SCENE 1

**THE COURTYARD**

The Recap surfaces in this scene are the *Bodies*, inspiring the overall theme of freestanding objects. Freestanding object has been interpreted as an architectural object that is more or less freestanding in its form even though it might be interconnected through other systems. The scene opens to a clearly defined set, a square of 100m x 100m. In the middle of this set, a grid can be distinguished. An object is placed in each of the intersections of the grid. In the courtyard the collection introduces us to the ways of the surface and mesh. A digital object is not a mass, it is made up of a number of points that connect lines and make up faces.

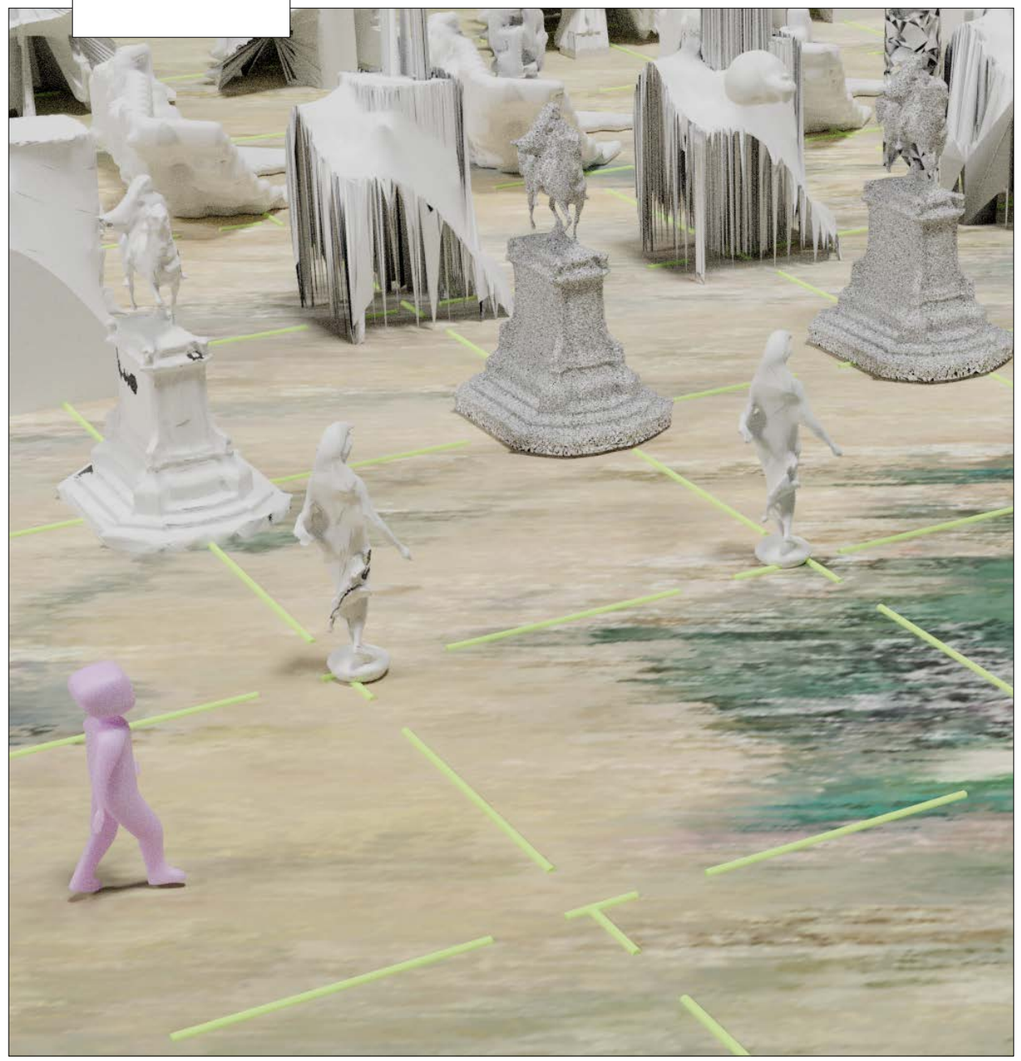


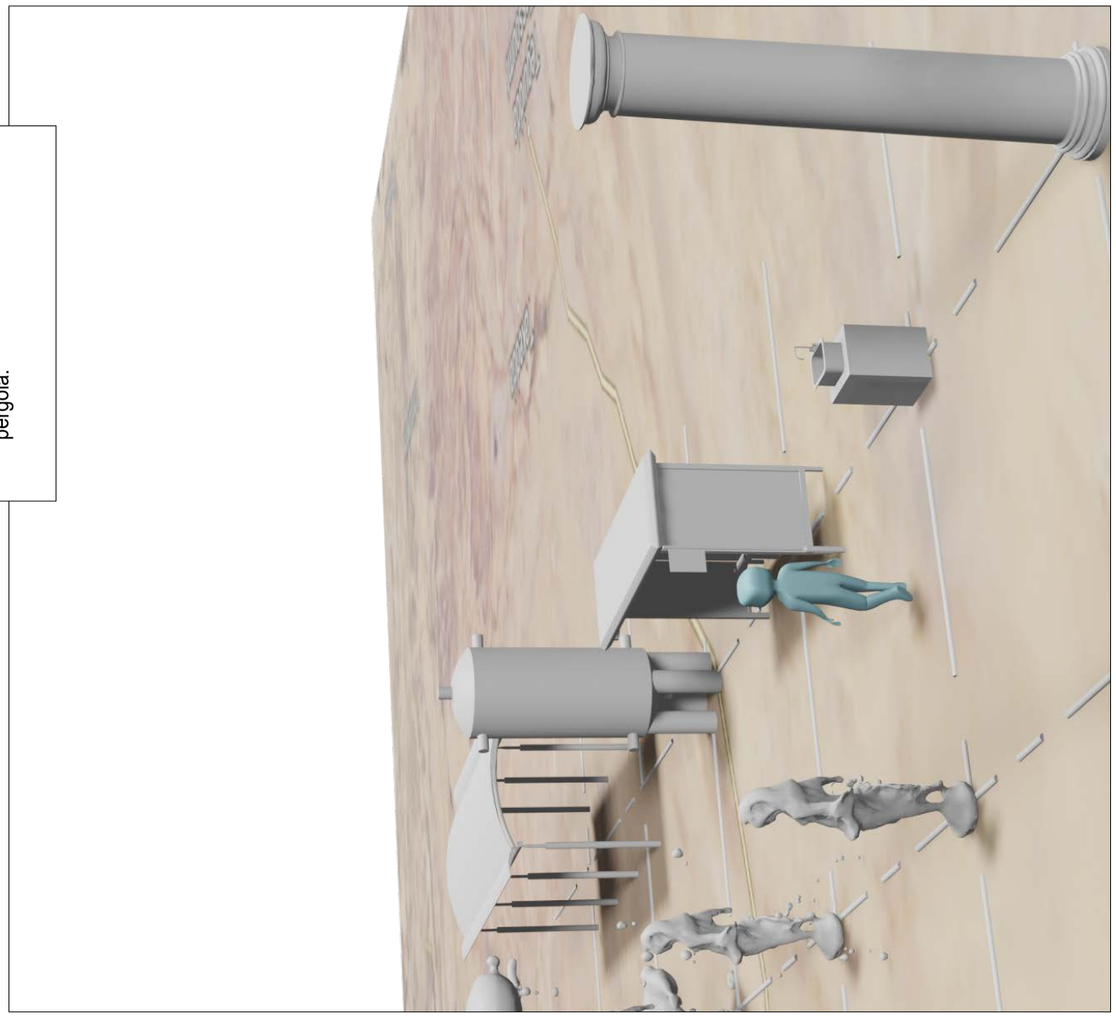






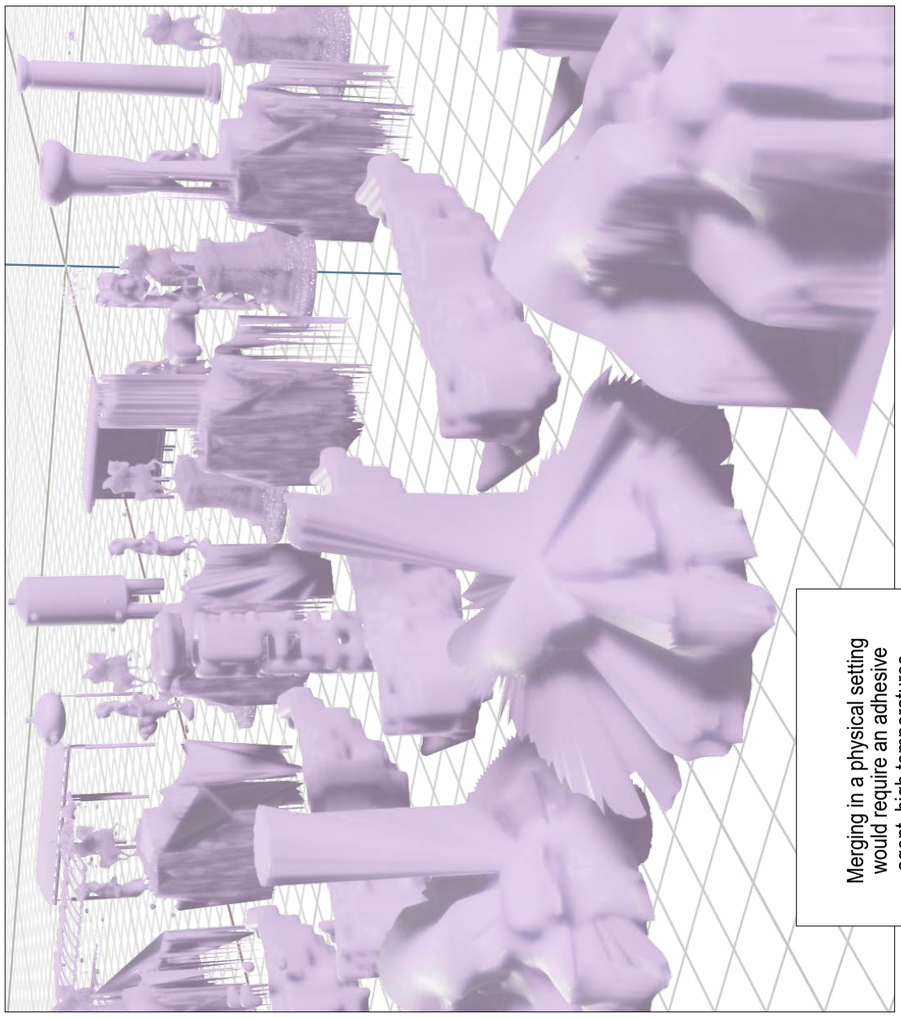
From the intersecting point without an object two axes stretches in each direction.





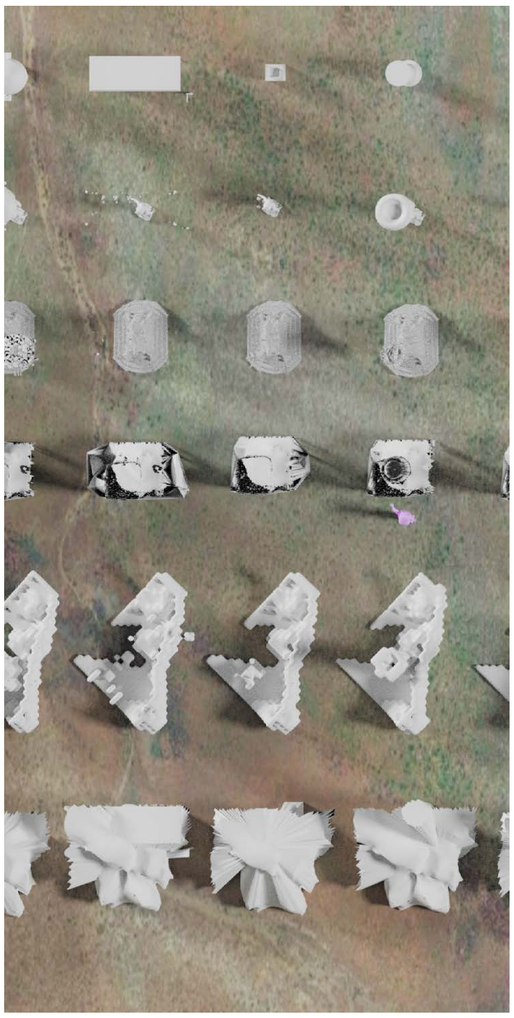
On the right in a similar order, simplicity towards complexity, stand familiar objects. A streetlight, a bus stop, and a pergola.

On the left side we can spot the ReCaps, aligned from the simplest form towards a more complex version.

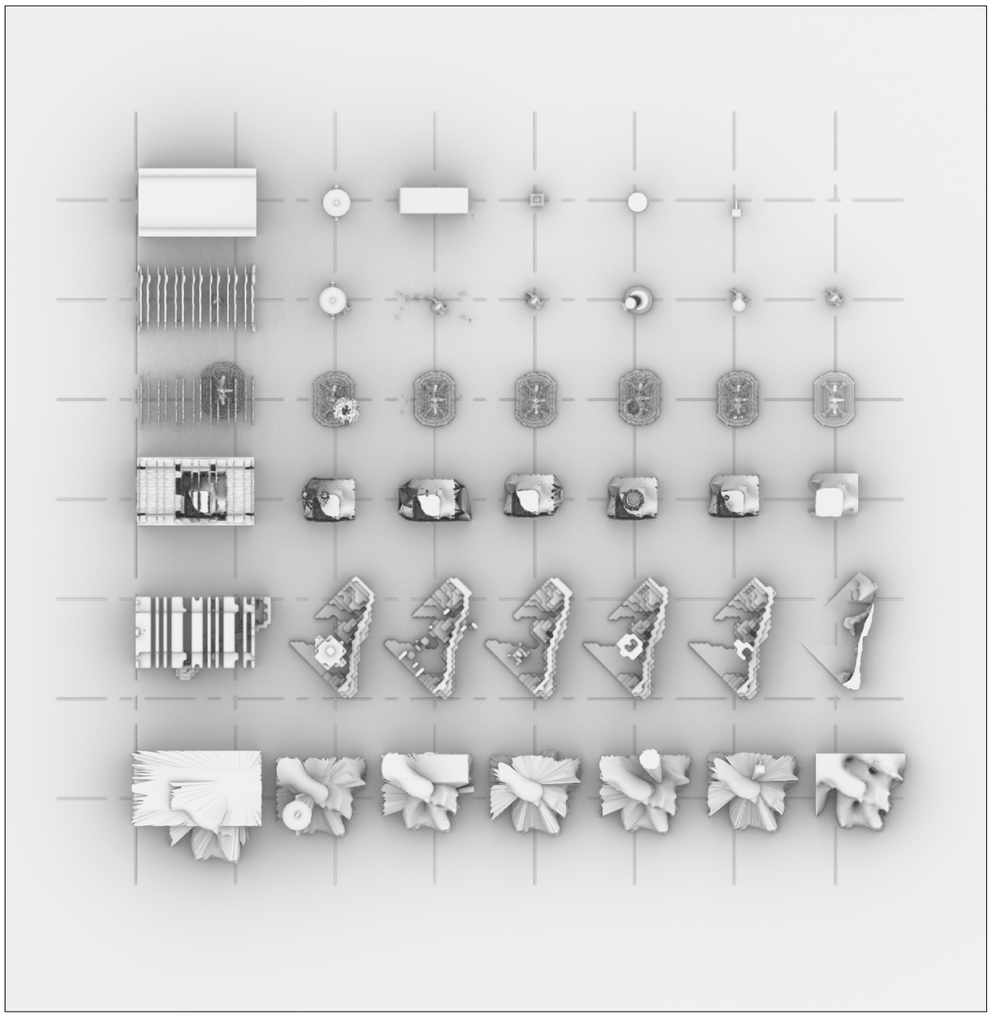


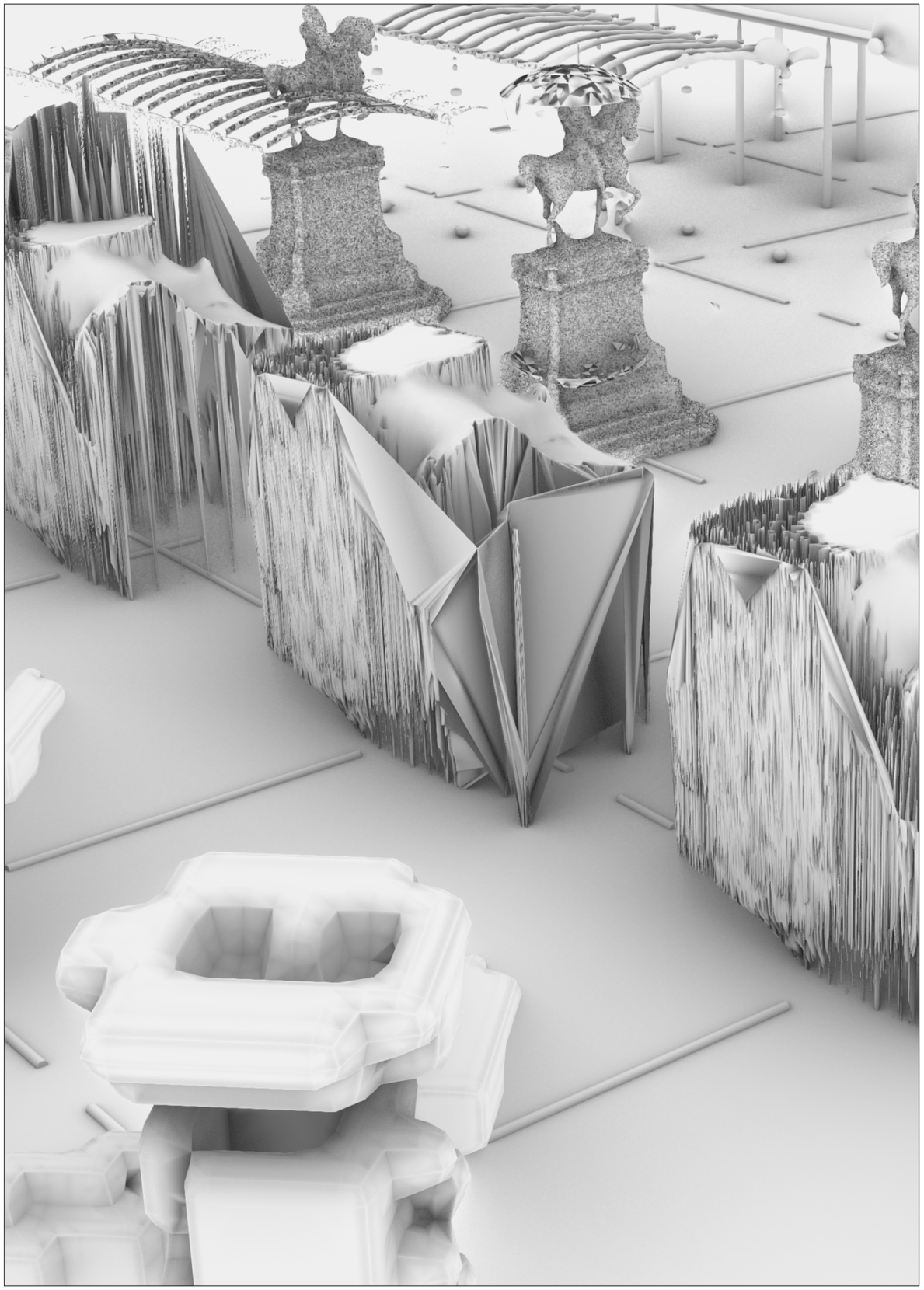
Merging in a physical setting would require an adhesive agent, high temperatures, maybe dangerous equipment and skilled craftmanship. It would be very laborious and require high motivation.



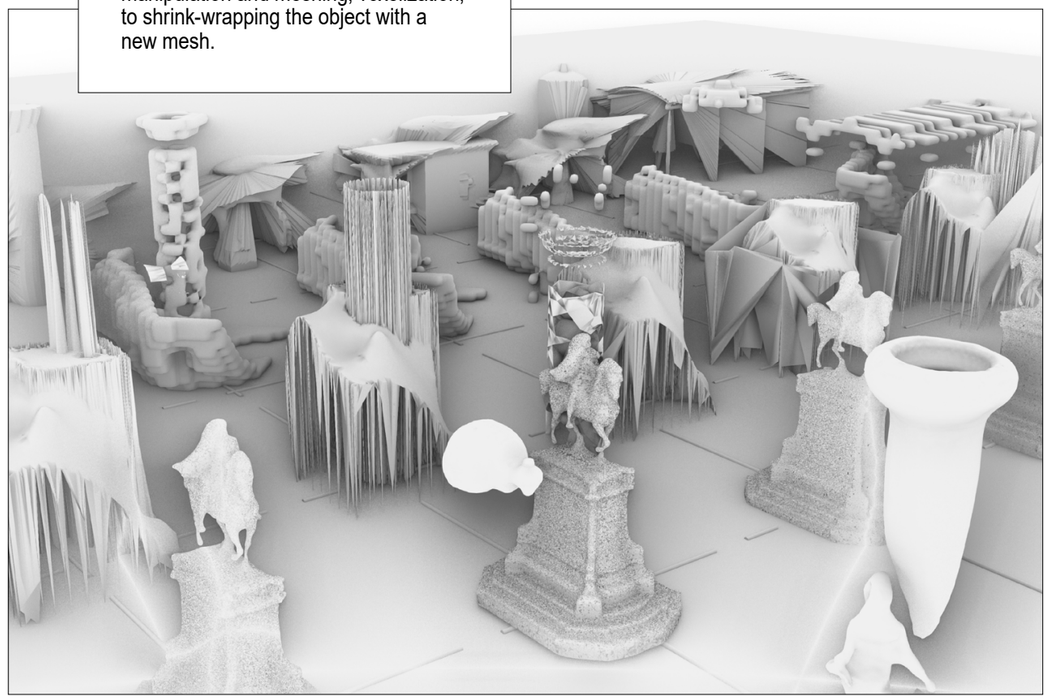


In each intersection of the grid, two objects from both sides meet and merge. One and one continues as one.





Here, on the other hand, a plethora of executable algorithms will help us. There are a few various approaches that can be considered when merging two objects other than manually merging them. These range from Boolean operations, point cloud manipulation and meshing, voxelization, to shrink-wrapping the object with a new mesh.



Voronoi Filtering

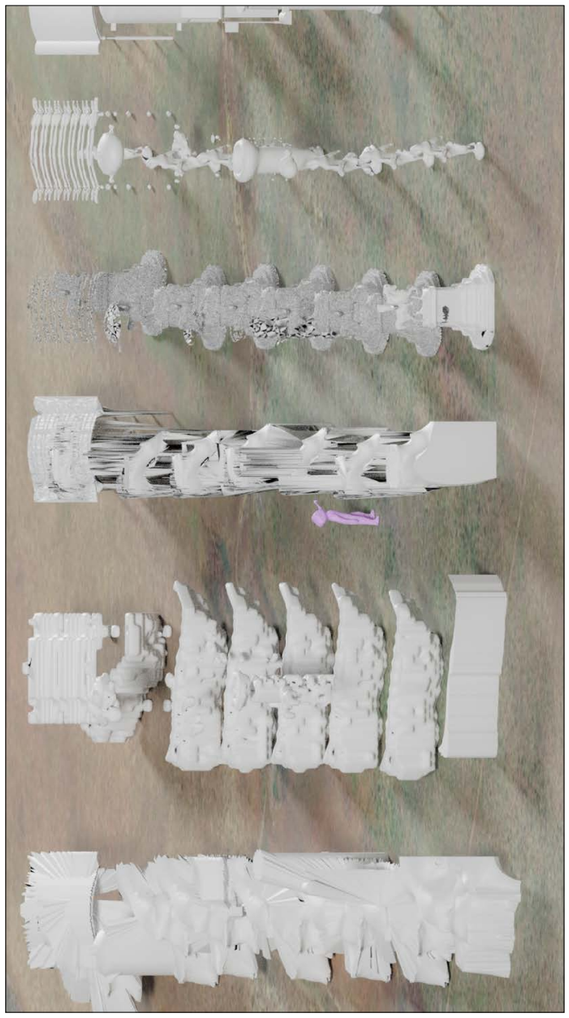
*Compute a **Voronoi filtering** (Amenta and Bern 1998) with Qhull library (http://www.qhull.org/).*

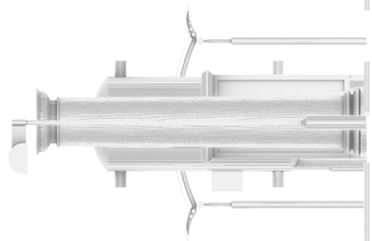
*The algorithm calculates a triangulation of the input point cloud without requiring vertex normals.It uses a subset of the Voronoi vertices to remove triangles from the Delaunay triangulation.*
*After computing the Voronoi diagram, foreach sample point ses the two farthest opposite Voronoi vertices.Then tes a Delaunay triangulation of the sample points e selected Voronoi vertices, and keep only those es in witch all three vertices are sample points.*

Surface Reconstruction: Screened Poisson

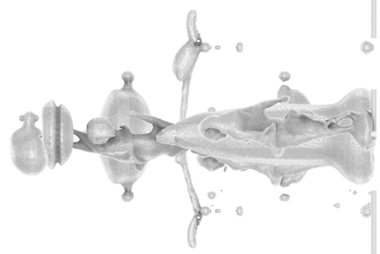
*This surface reconstruction algorithm creates watertight surfaces from oriented point sets.*
*The filter uses the original code of Michael Kazhdan and Matthew Bolitho implementing the algorithm described in the following paper:*
*Michael Kazhdan, Hugues Hoppe,*
***"Screened Poisson surface reconstruction"***
*ACM Trans. Graphics, 32(3), 2013*

***WARNING:** this filter saves intermediate cache files in the "working" folder (last folder used when loading/saving). Be sure you are not working in a READ-ONLY location.*

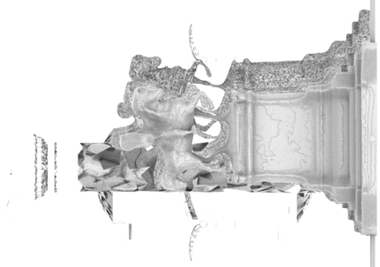




Axis of ReCaps.

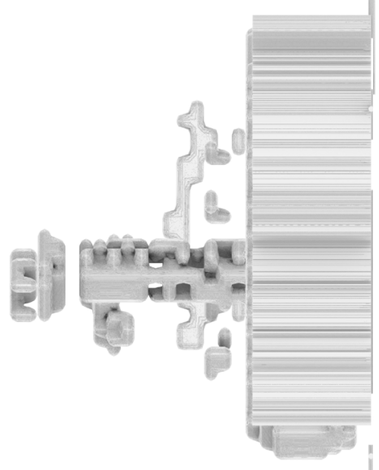


Surface reconstruction with a screened poisson algorithm in Meshlab.

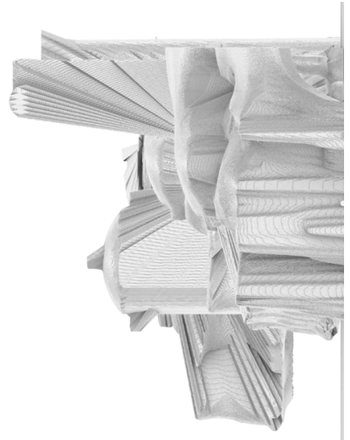


Voronoi filter to triangulate a mesh in Meshlab.

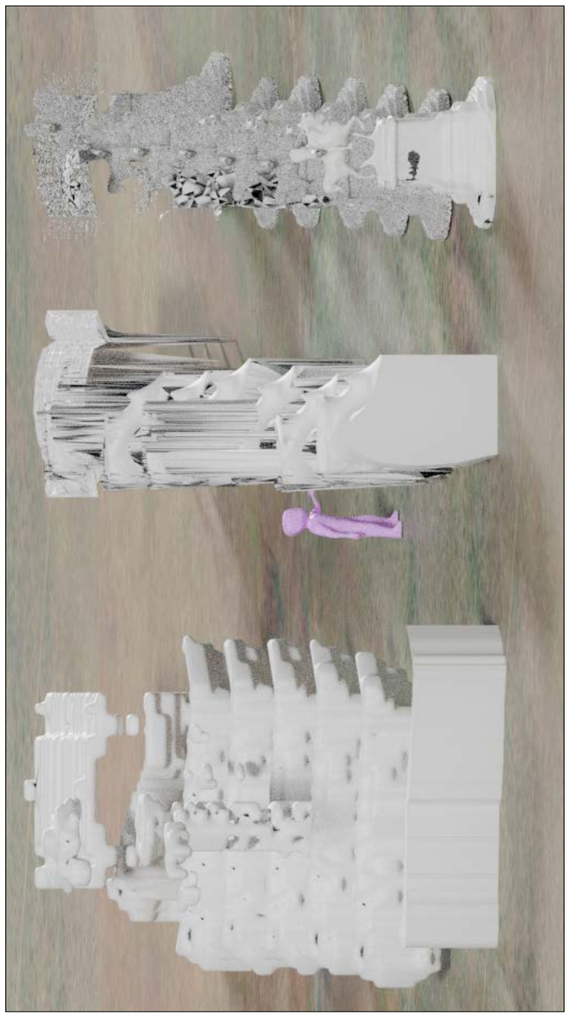
Creating a mesh with a Delanuay triangulation from a point cloud using Grasshopper.



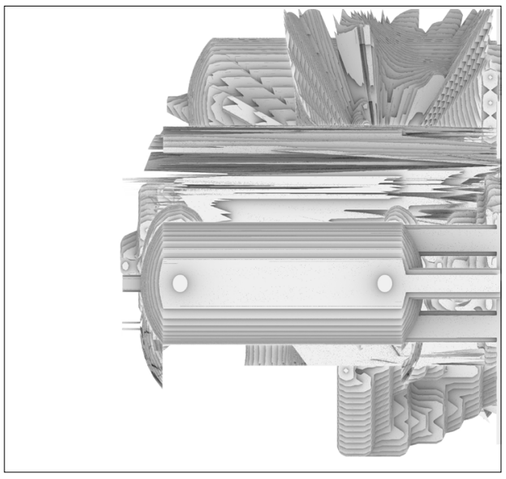
Meshing a voxel cloud in Grashopper using Volvox and Weaverbird.

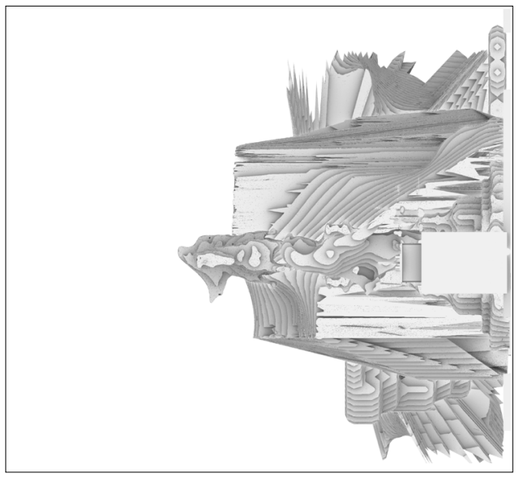


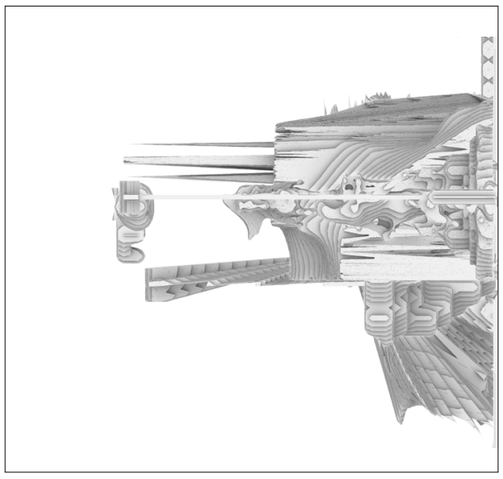
Using the mesh created when shrink-wrapping the two models using a deform algorithm in Autodesk Maya.

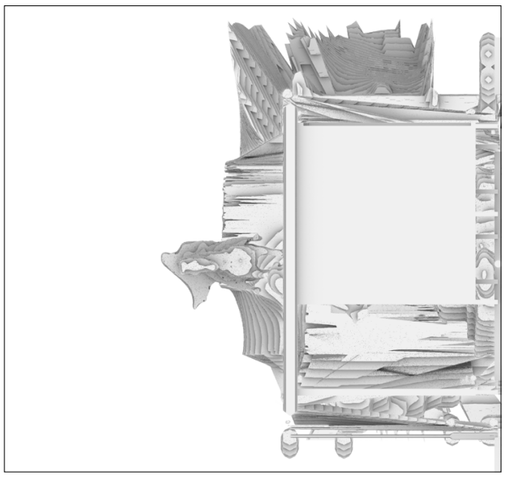


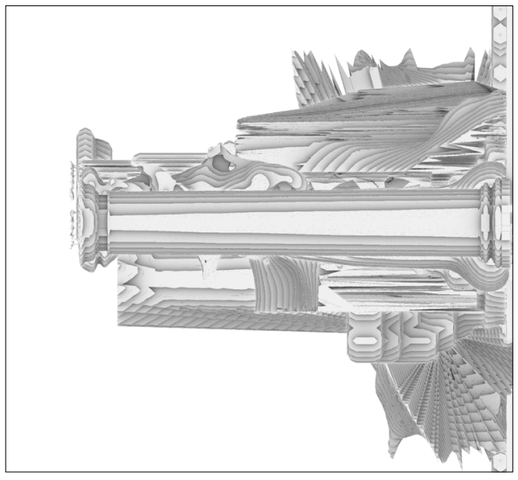
None of these solutions are polished or optimized, just pushed just past the limit of successful execution. By this act of transformation, the nature of the points as discrete objects rather than the larger assemblage into forms emerge. The points restructure and reimagine the objects. The expansive network takes precedence over the hierarchical relationship of shape and meaning.

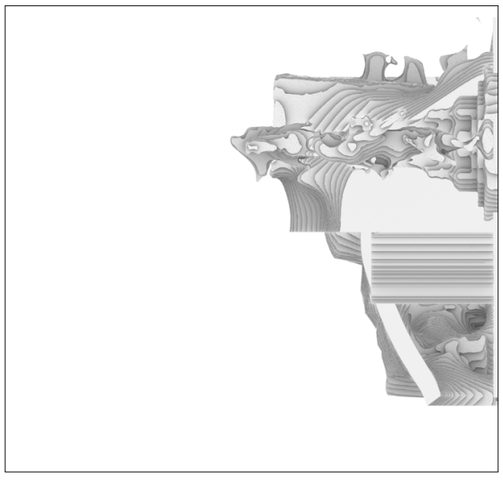










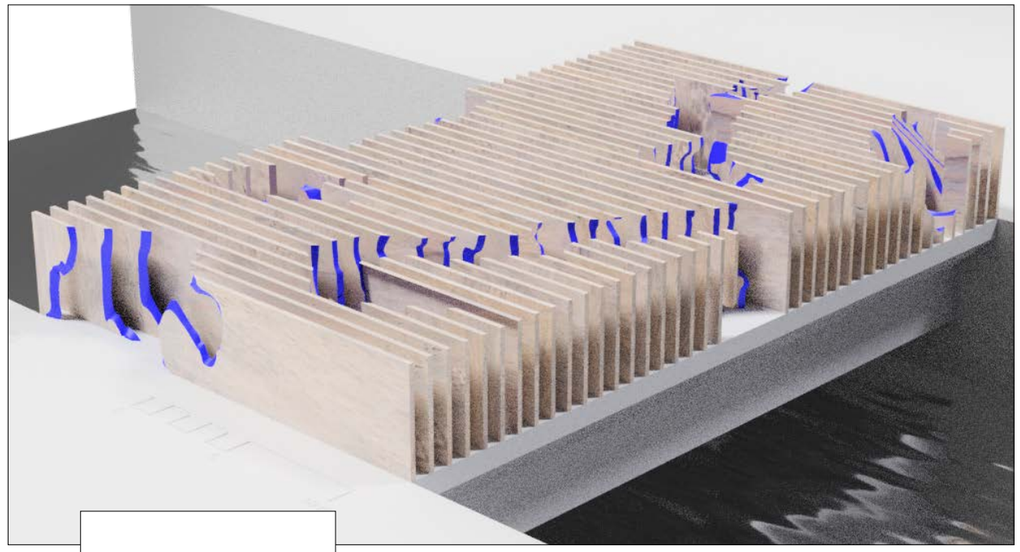



**THE CROSSING**

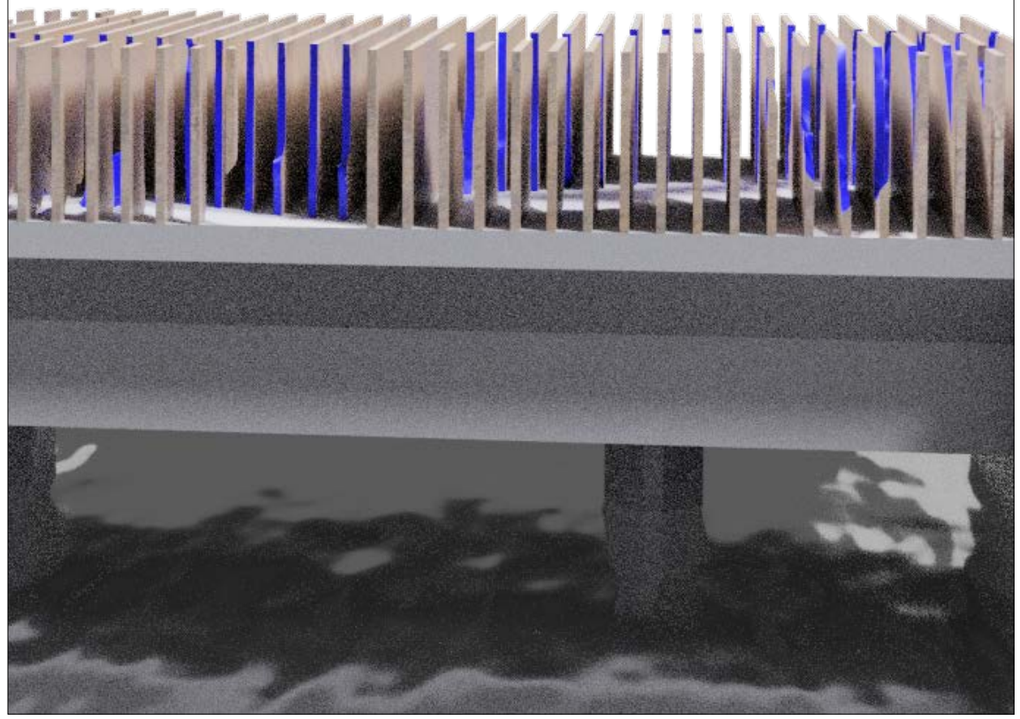
The theme of this scene is the partition. The partition shields and guides movement. The ReCap surfaces are the *Screens* and they find their counterpart in Revit as walls. The Crossing sets up a starting point on one side, leaving the bridge as the only means of crossing the gap to the other.

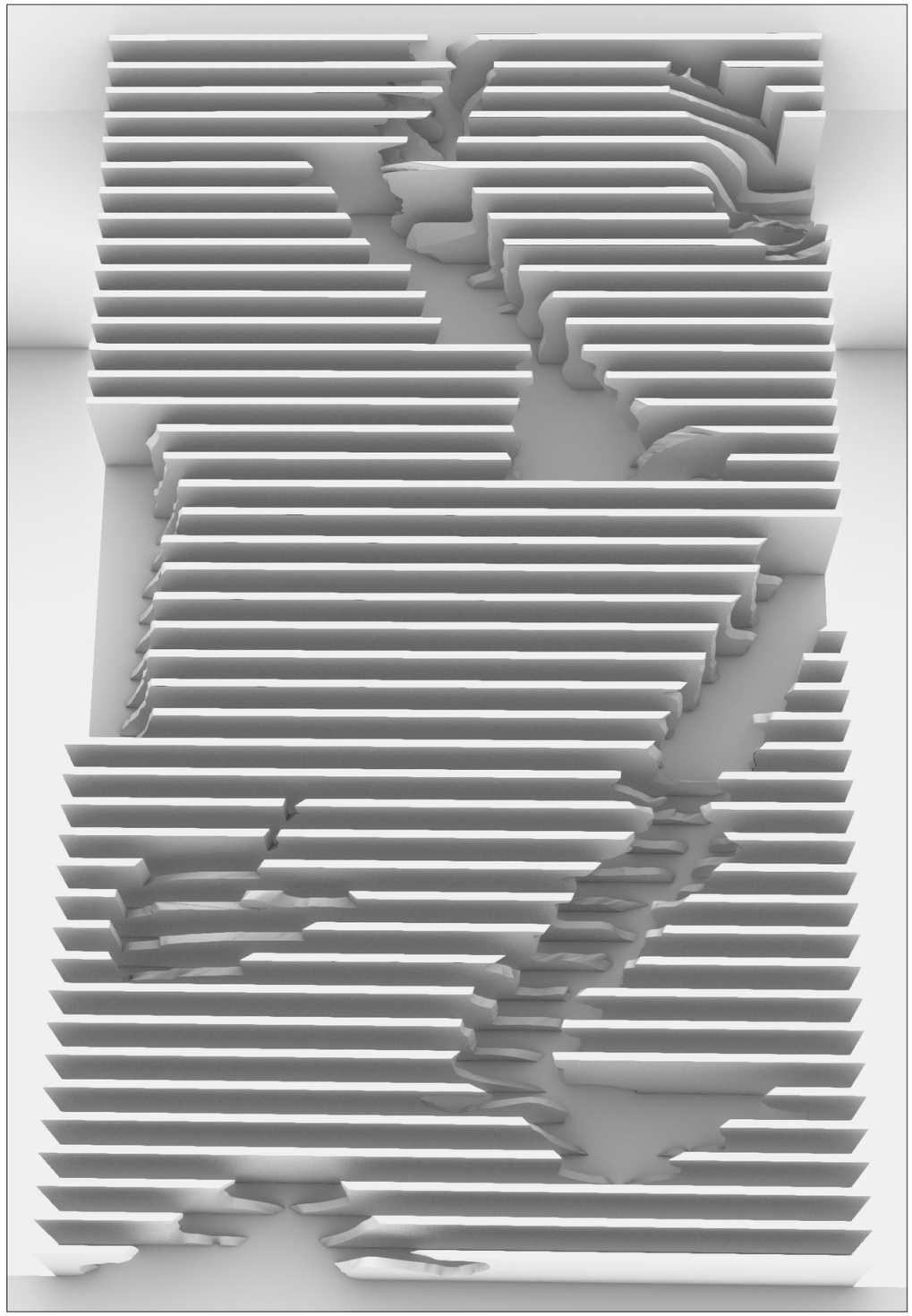






On this bridge, wall after wall form a barrier. Here the screens are used as cutting objects to enable movement across the divide. A passage through the otherwise impenetrable set of obstacles is created from the cuts.

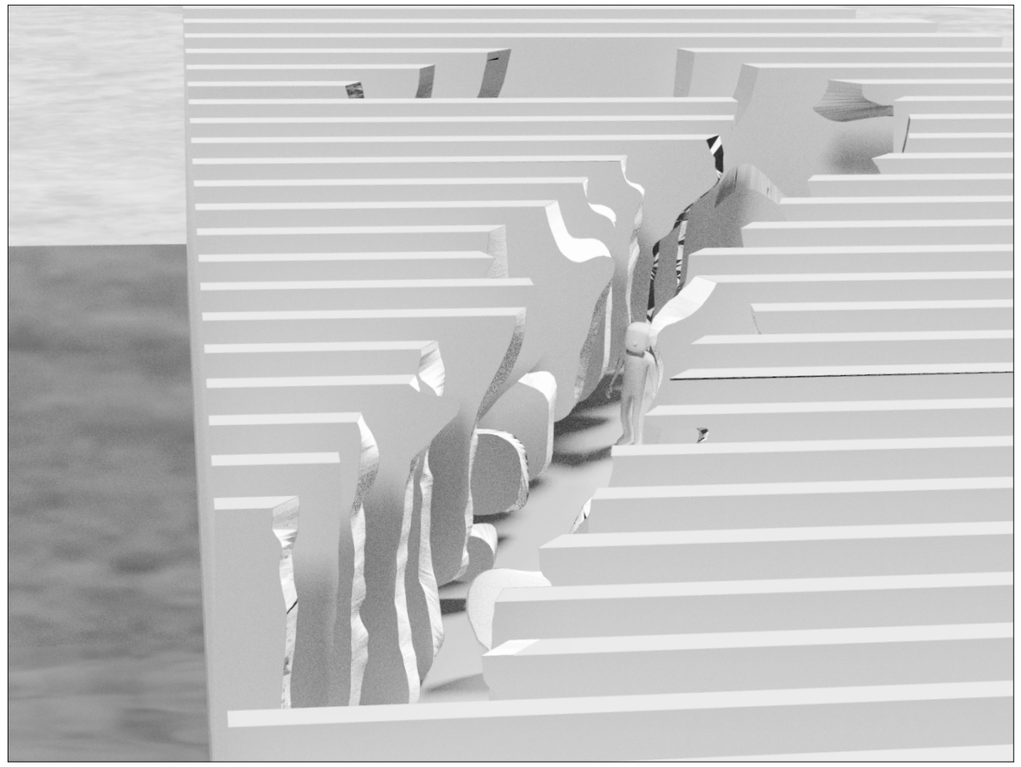




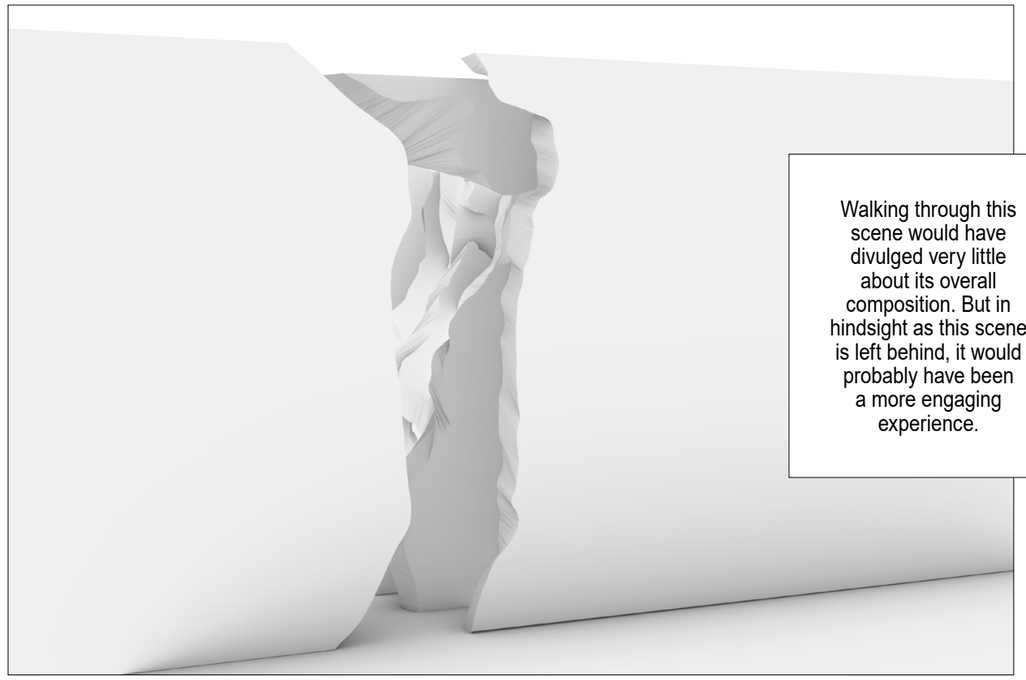
Digital surfaces have no correlation in a real-world setting. Surfaces exist as an attribute to a mass. There are no freestanding surfaces. With this treatment these two oppositions can meet.







In each scene the ReCaps are treated in a different way. The cuts on the walls leave imprints of the amorphous surfaces behind.

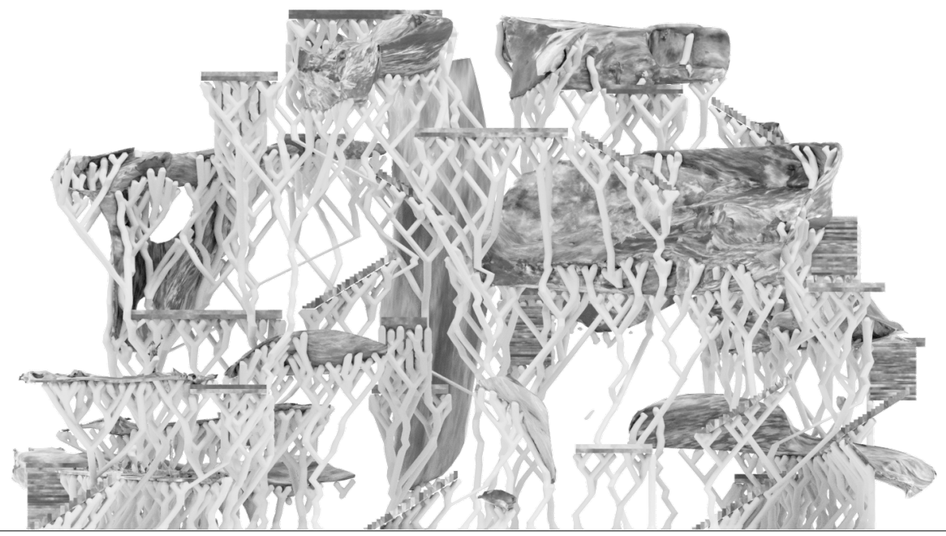


Walking through this scene would have divulged very little about its overall composition. But in hindsight as this scene is left behind, it would probably have been a more engaging experience.

SCENE 3

**THE GARDEN**

What is first perceived as a large forest-like cluster is upon closer inspection a collection of objects suspended by a multibranching structure.



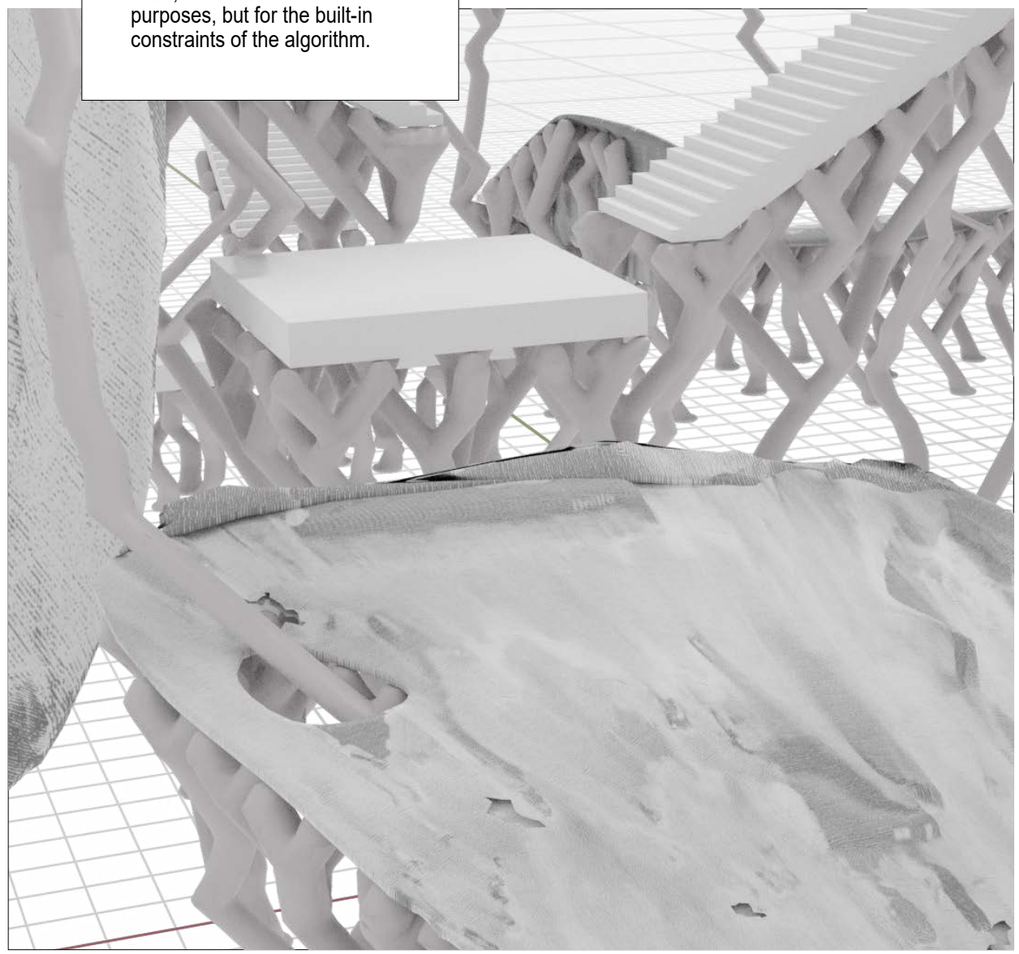




The ReCap objects here are the *Disjoints*, models that were split into several parts presenting the theme connections. The disjoints are not level as most of the other groups, creating a variation in height. Stairs and slabs are used as Revits to provide scale and orientation.

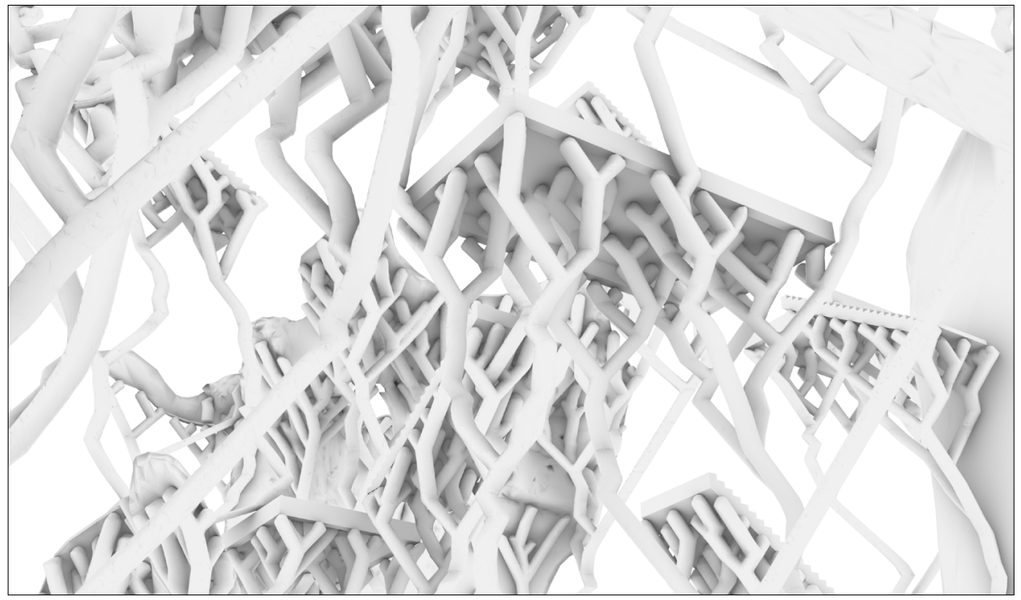
If the first scene relied heavily on continuous transformations of the same data, this scene, instead, have generated new form based off input data. The various objects are assembled, then imported into the Autodesk application Meshmixer.

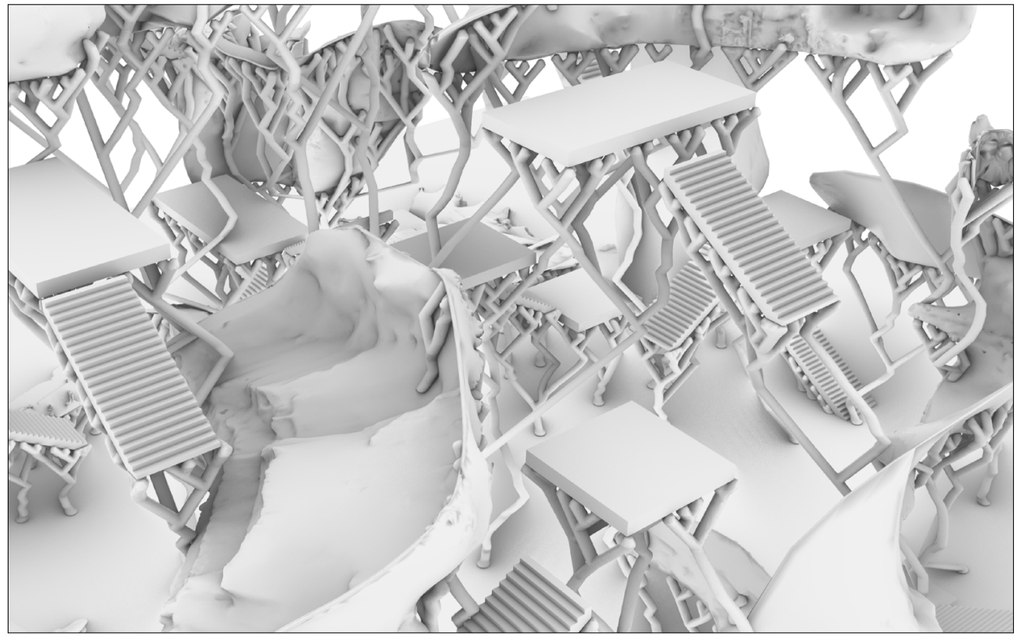
Meshmixer is a 3D modelling software specializing in mesh-modelling and preparation for 3D printing. It produces branch-like structures which function as supports for the model when it is 3D-printing. This function is used, not for actual fabrication purposes, but for the built-in constraints of the algorithm.

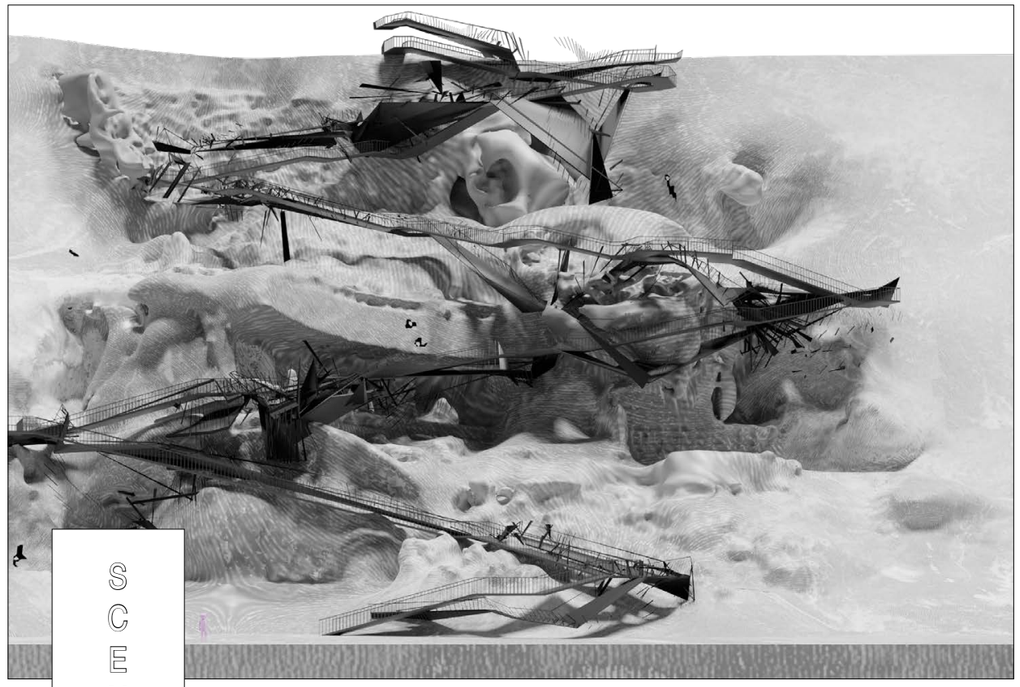




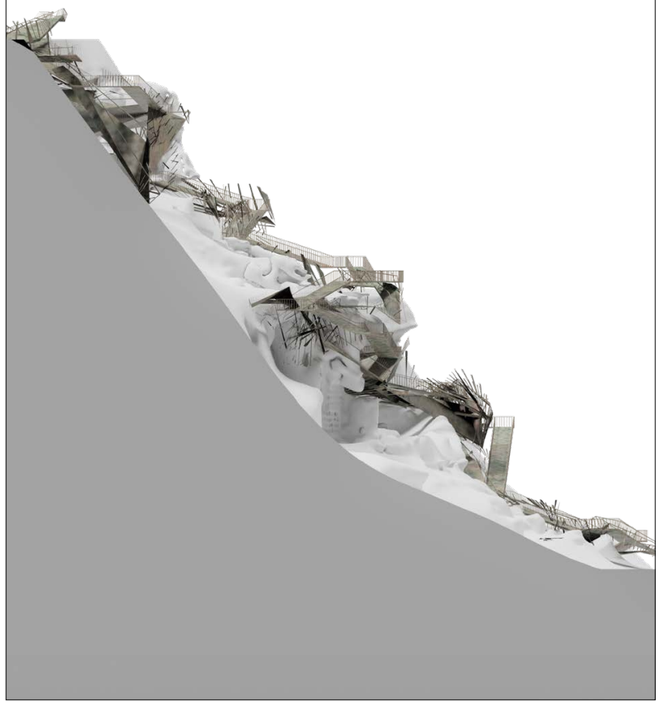
The ReCap meshes in this scene are made into solids. They still keep their most recognizable features but have an added thickness. Since the surface only has one side, that side is both the back and front side. The colour of the surface is thus displayed on both sides equally. When made into a solid, the models gain an inside and outside or back and front. This can be seen in the treatment of colour.







SCENE 4



**THE WAY**

A steep wall is the first thing that meets the eye. A dangerous and maybe impossible climb lies ahead.

The category presented in this scene is the *Drapes*. The theme based off the forms are continuous surfaces. Most of them have a slight incline or stepped slope leading to the treatment of the ReCaps in this scene. The models were exported as point clouds and assembled edge to edge creating a large mass. The point clouds were then meshed to create a collective surface.





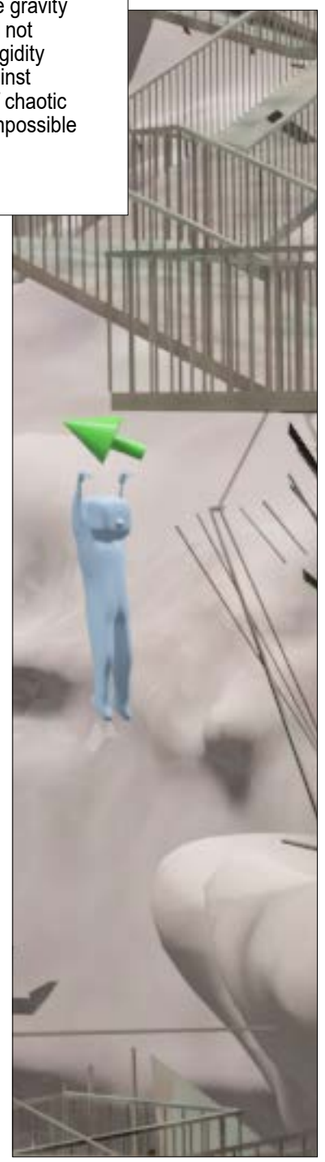
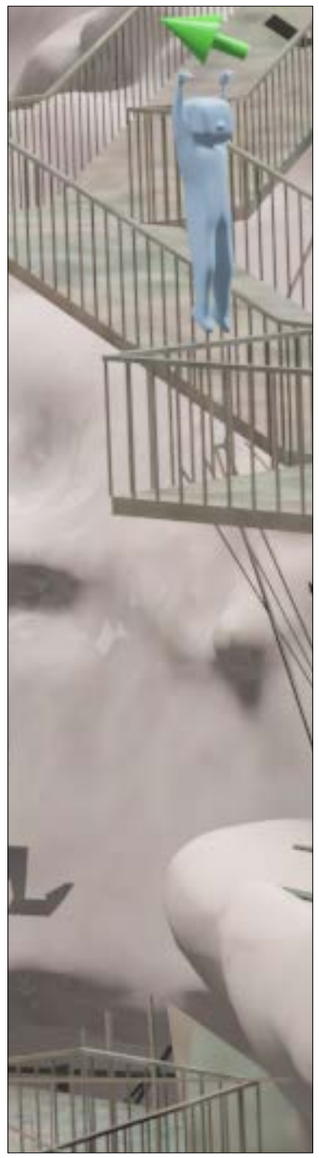
To provide a scale to this massing, and keeping with the theme, a continuous ramp was added.

With this addition, the contrasting attributes of the two model categories turned one into landscape and the other into a ridiculous detour.

As a general approach to each scene, something has to *happen*. A transformation is incited by the combination of objects, form is generater from objects etc. The idea was to flow the ramp along the side of the mountain.

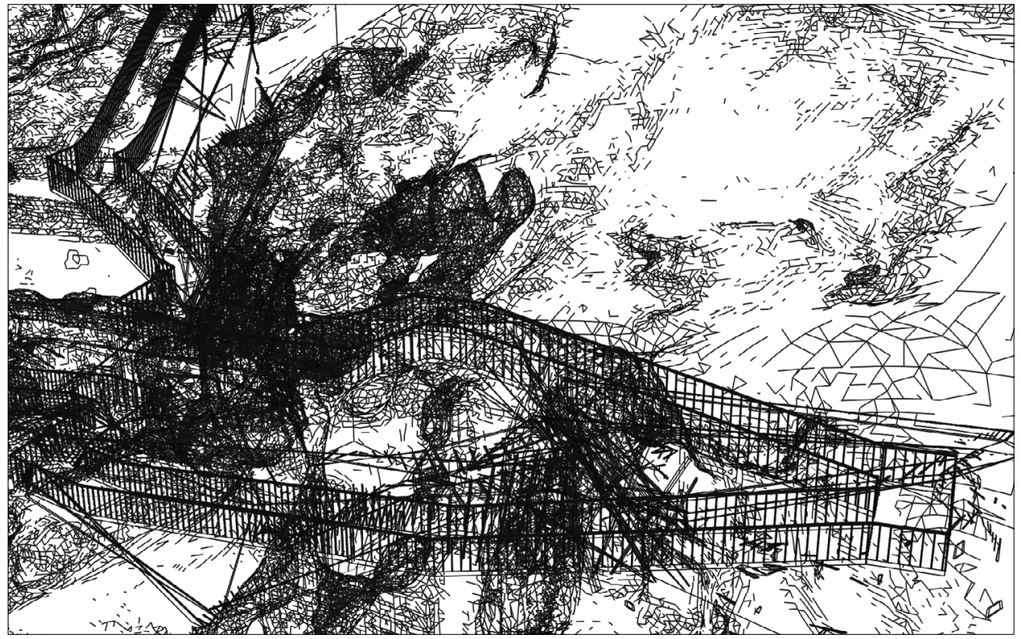


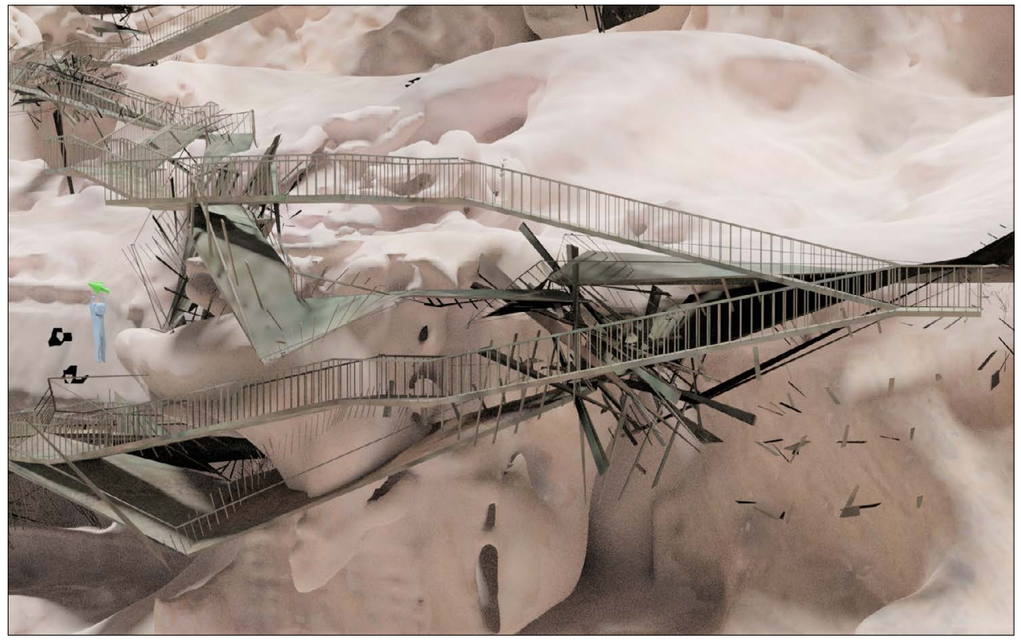
Taking the very rigid logic of the ramp and forcing it to align with the gravity of this mountainous thing did not go as planned. Turning the rigidity and function of the ramp against itself turned into a tantrum of chaotic shapes creating an almost impossible ascent.

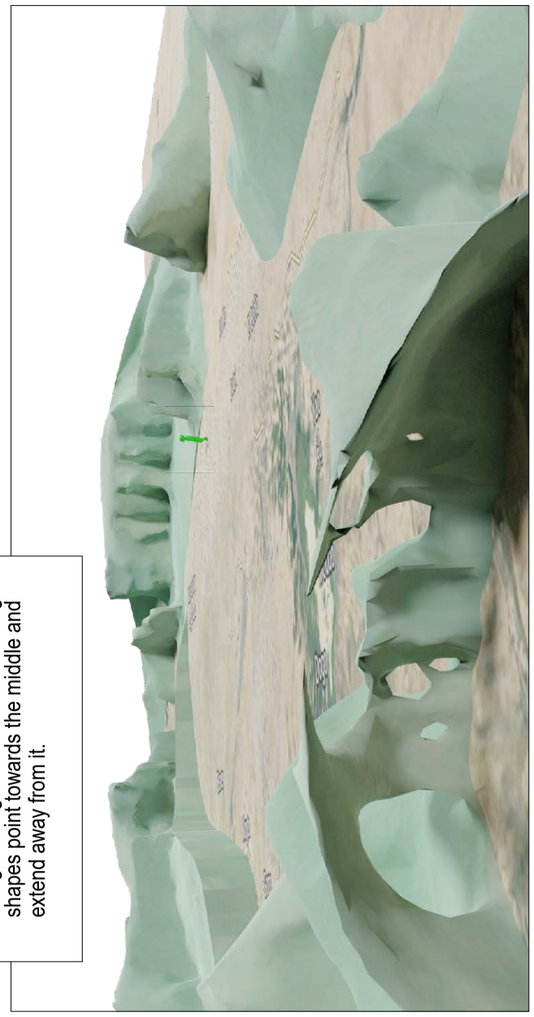




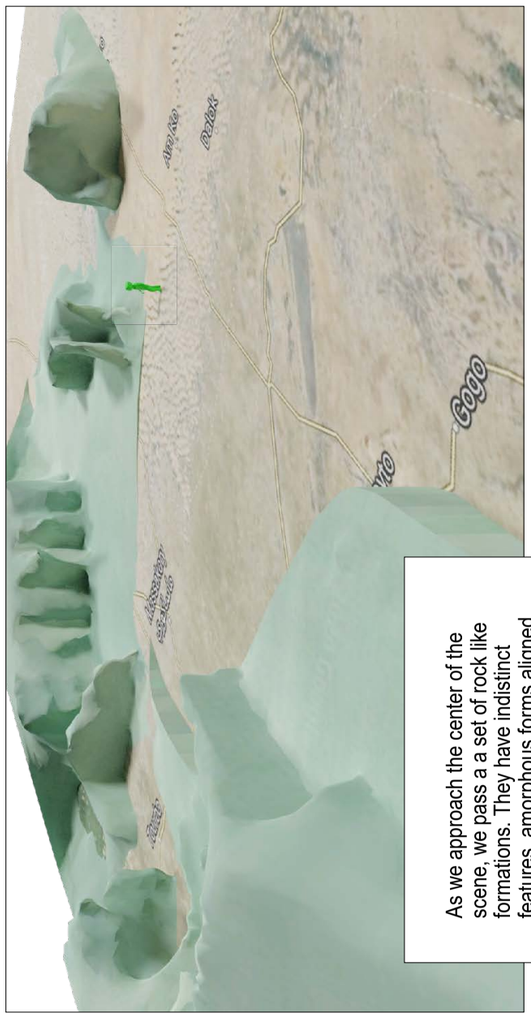




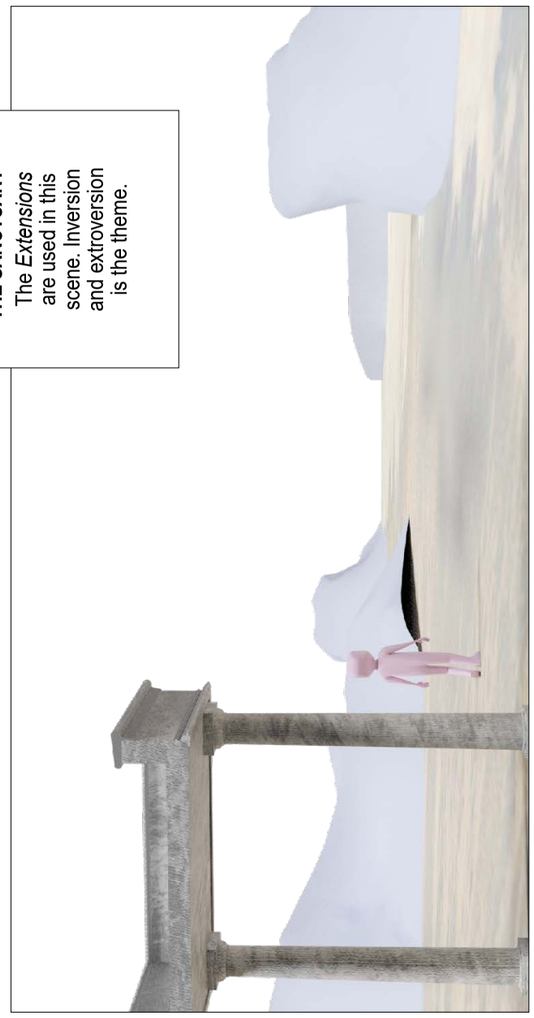
Instead the resulting effect provided even more heaviness to the landscape.



As we approach the center of the scene, we pass a a set of rock like formations. They have indistinct features, amorphous forms aligned along the edge of a circle. Protruding shapes point towards the middle and extend away from it.







**THE SANCTUARY**
The *Extensions* are used in this scene. Inversion and extroversion is the theme.

There appears to be two different half circles facing each other. There is no way to distinguish between the ReCaps and the Revits. In the final scene, they have yet again merged.

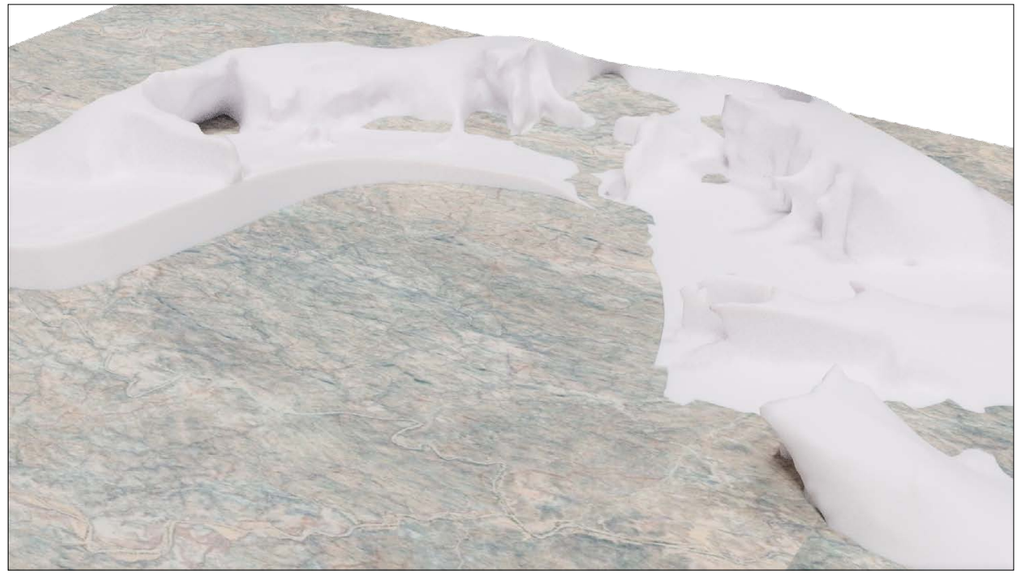
But this time, by a vastly different approach. The various components were arranged into an overall composition and then rendered as a sequence of images. These images were then imported into ReCap Photo and sent into the cloud to produce another photogrammetry model. This procedure was then repeated for several rounds until the original model was no longer legible. Digitizing already digital content.

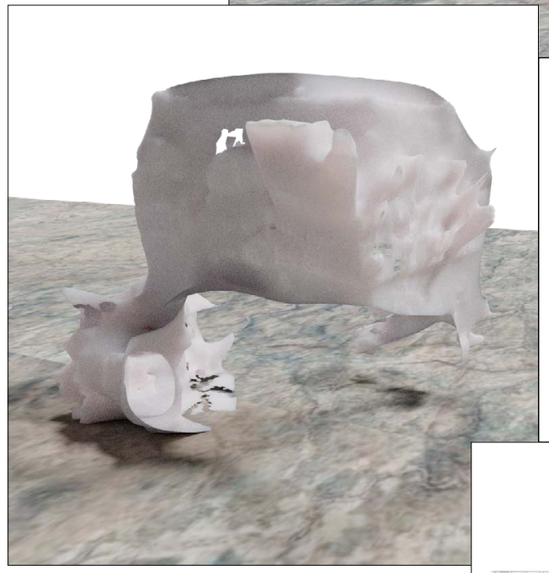
The process of merging the various parts into one model is sidestepped, the algorithm will assume the proximity of components as a larger whole and output one object.



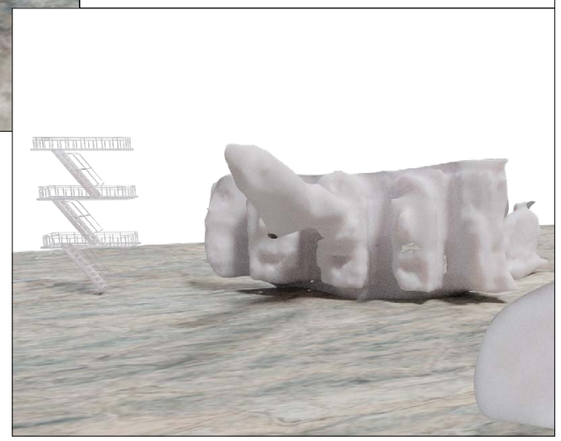
The theme also set up a very reflexive approach to the photogrammetry. The camera did not just revolve around the model, but tried to *recreate* the technique that created the category *Extensions* in the first place.

It is not an easy task to reverse engineer what was seen as an autonomous tendency. A process guided by feeling and trial and error to directly try and grasp the vague parameters of the algorithm. It is a complete reversal of the thesis' method. Everything from camera angles, panning, texture and lighting of models to how they are placed all affect the outcome. To then try to achieve a "A parallel panning shot capturing a cohesive front part with holes in it, such as a wall with open windows. The algorithm can not calculate the depth of such a cavity and thus stretches those parts away from the camera position" (p. 46) was not an easy task in a digital environment.





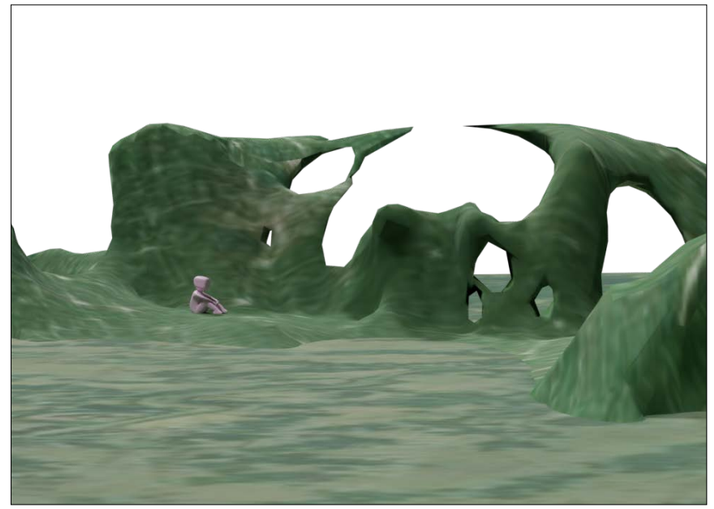
To work outside of precision, to not aim for a specific result and instead use whatever happens to be the output, is a preferable method that will not induce headaches. To turn this haphazard method and try to reach a predefined output by calibrating more or less unknown parameters cannot be recommended. But for the sake of testing the method and level of knowledge reached throughout the project of this particular algorithm, this meta approach was carried out and successful to an extent.

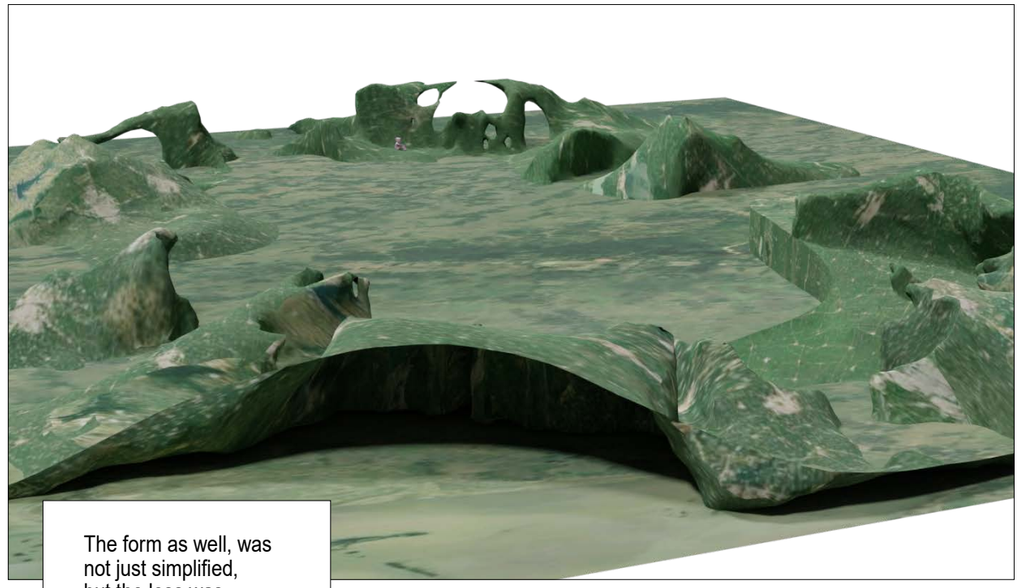




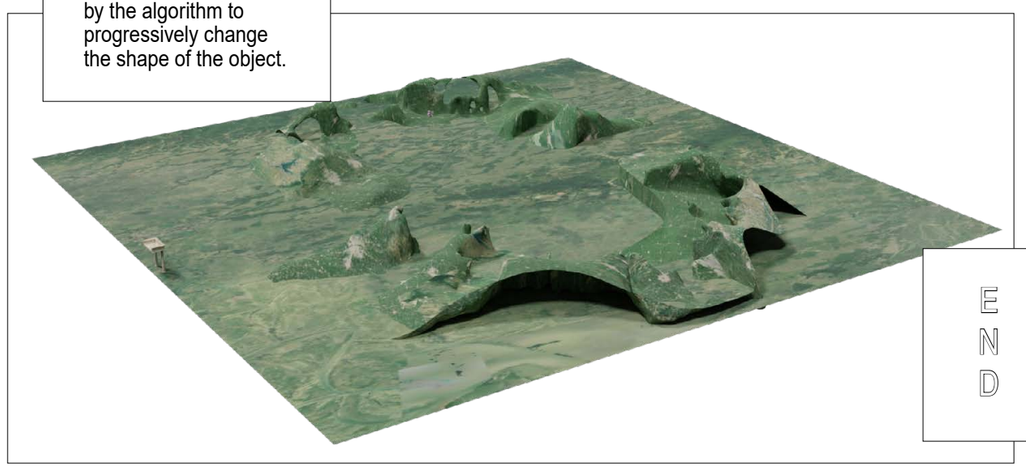


On the opposite side of the circle is a mirror model that have been through four iterations of photogrammetry, losing much of its original characteristics. The progressing (or detoriating) series of models have visual references to physical aging but here the thing being worn off is the complexity of the mesh.





The form as well, was not just simplified, but the loss was interpreted and patched by the algorithm to progressively change the shape of the object.

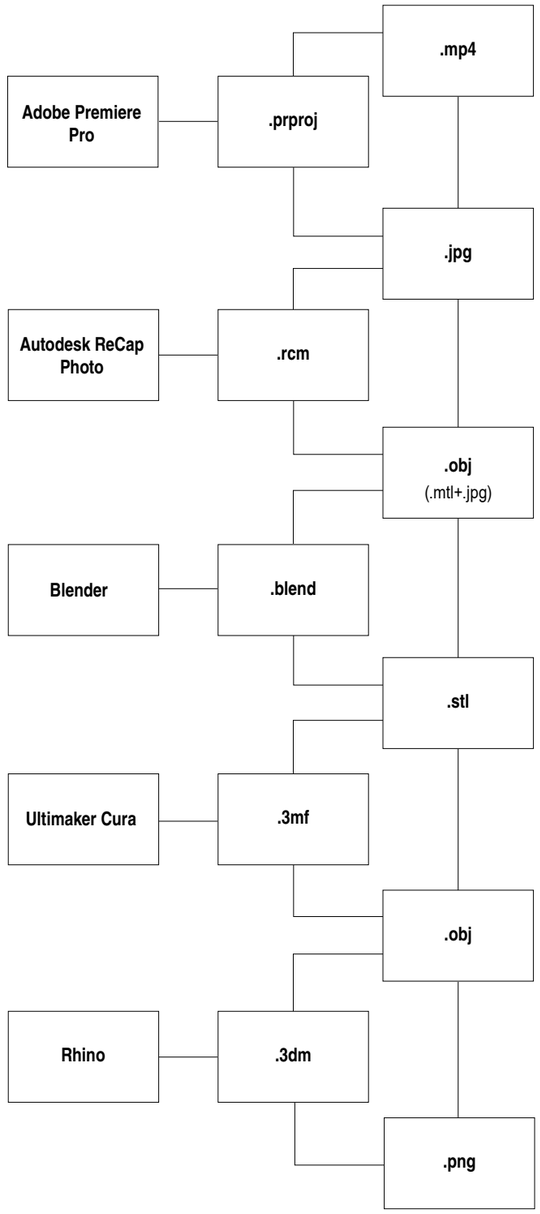


END

# PROCESS

Presented in this section are the different steps that that were taken to develop the method of the project. There is a heavy focus on photogrammetry as it was the driving force for investigations and questions about the digital medium. The project was then formed from within these explorations.

An earlier version of the workflow presented at the Midterm looked like the diagram below. A series of input to output transformations through different software resulted in a final output. The focus lay more on the stages of the process than the actual output.








**A SHORT HOW-TO:**
**3D MODELING A MUSIC VIDEO SCENE**

**STEP 1** Require a video file of desired MV or movie scene in the least questionable way possible.

**STEP 2** Open in Adobe Premiere Pro (or other program of choice).

**STEP 3** Do any necessary edits. In this case the black bars on the top and bottom where only there for cinematic effect so they were removed.

**STEP 4** Export chosen sequence. Keep in mind panning and movement in the frame.

*Export settings:*

JPEG

*Output format and quality:*

Will reflect original video quality.

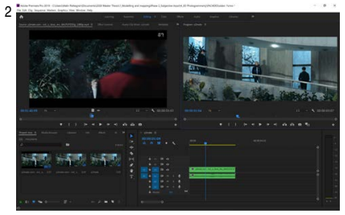
*Export As Sequence:*

Frame Rate, untick box and manually select appropriate number of frames per second to export. Maximum amount of images for a student Autodesk account to put into ReCap is 100 images, hence the length of the video relates to value chosen here. If 10s video, 10 fps etc.

**STEP 5** Export to folder.

**STEP 6** Upload to ReCap Photo as new Object.
**STEP 7** ReCap will cloud-render the model. This might take some time.

2



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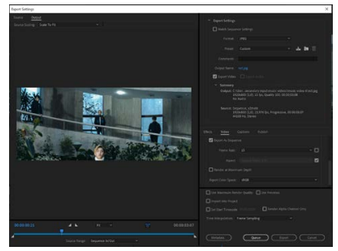

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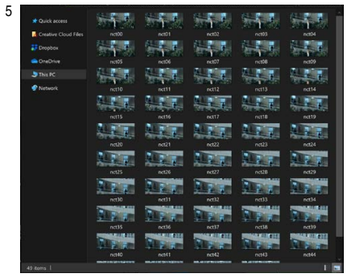


**STRATEGIES**

Photogrammetry was used to digitize spatial data. Disruptive methods of this practice were developed through iterative investigations and questions raised during those. By pushing the limits of the software's imagined ability, compelling digital artefacts were created. As the scope of input was broadened, found objects such as moving media, user-created youtube content and such were executed and modelled by the software.



## GUIDELINES FOR OPTIMAL INPUT ACCORDING TO AUTODESK

**ENVIRONMENT**

>avoid shadows

>used diffused lighting indoors

>do not use the camera flash

>avoid bright sun when shooting outdoors

**EQUIPMENT**

>a good lense makes a difference

>a fixed, 50 mm lens is recommended

>use tripod and clicker for sharp photos

**PHOTO CAPTURING STRATEGIES & SCENE SET UP**

>the targeted object should always be in the middle of the picture and fills most of the photo frame.

>“rich” backgrounds are better than monochrome ones

>big don’t is moving objects in the scene.

>there should be significant overlap between photos

>50-70 photos for small objects, 70-100 for medium sized object like sculptures, and 180-200 photos for buildings is recommended

> instead of capturing photos from the middle of the room and rotating around, move along the walls and take pictures in the other direction

>always move when shooting to avoid "panorama-like" photos

**PHOTO QUALITY**

>entire pciture should be sharp, not just the object

>keep the camera settings the same for all photos

>ISO 100 creates the least amount of noise in the photos

>before starting the capture process, take some test pictures and zoom-in until the very last pixel to check how sharp your photo is and if the right camera settings were chosen

**KNOWN TECHNOLOGICAL LIMITATIONS OF PHOTOGRAMMETRY**

>photogrammetry does not work on shiny, transparent or highly glossy objects

(rewritten or quoted directly from a RECAP BLOG post titled “What makes photos good for photogrammetry? Vidanovski, 2014)







## SUGGESTED METHODS OF DISRUPTION

**PHYSICAL OBJECT**

>moving objects (both main and background)

>reflective surfaces

>dispersed objects

>faraway objects

>voids

>various lighting conditions

>use secondary digitzed imagery

**CAPTURE**

>variations in camera quality and settings

>be still

>capture along a curve

>long exposure haziness and other techniques

**SOFTWARE**

>just duplicate a few images if you cannot reach the minimum limit

>not much can be done in this step

**COMPUTER MANIPULATION**

>batch edit, or edit individually, the images before feeding the software

>edit the texture map that is exported with the .obj file




**EXPERIMENT 1:**
**PRIMARY INPUT**

"Failed" attempts at capturing objects in a visually noisy urban environment. The parts that the algorithm tried to patch and other distortions proved more interesting than the successful parts of the models.

**EXPERIMENT 2:**

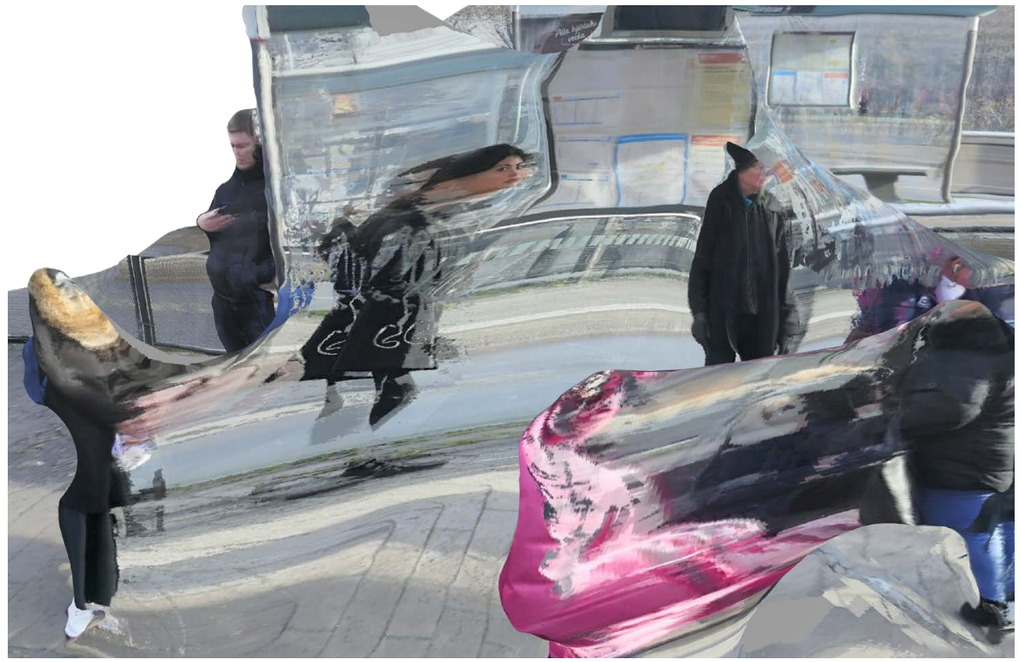
**PRIMARY INPUT**

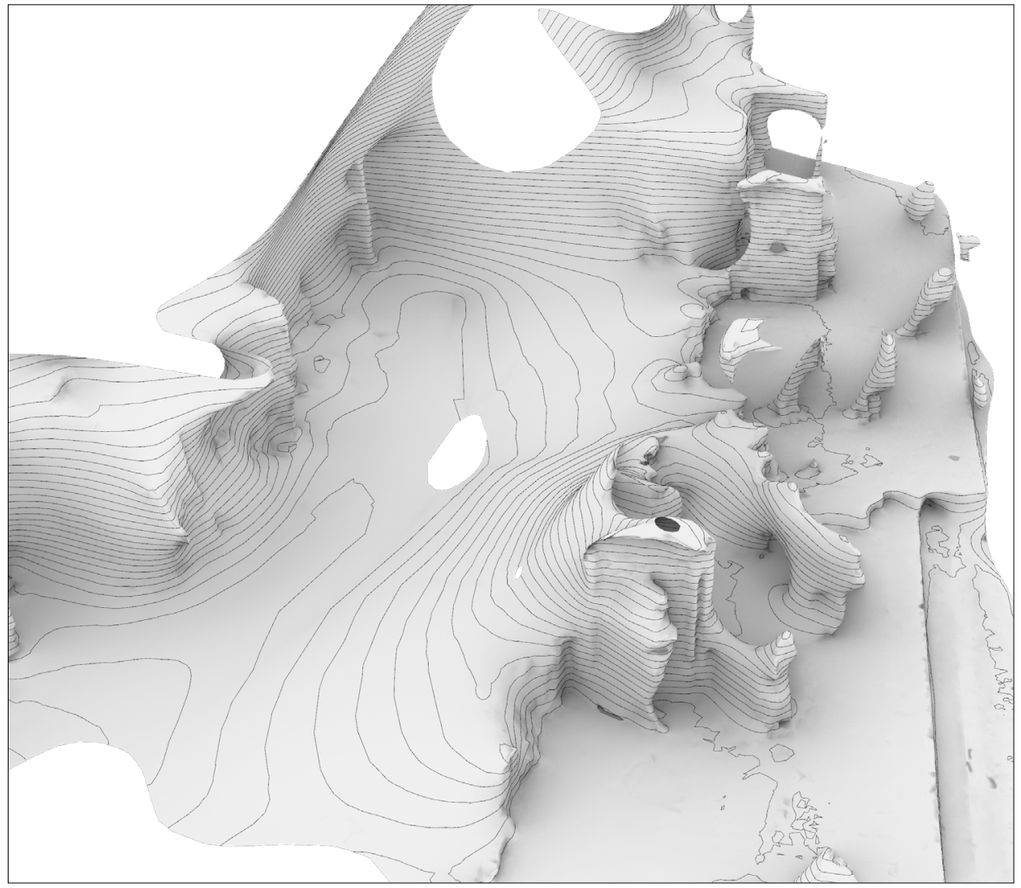
This iteration actively tried to mess with the conditions for accurate photogrammetry. Shot on a tram going past the Nordstan bus stop. Camera set to continuous mode. 28 images. Moving people, full daylight, reflective and see-through surfaces. Both continuous shots and video recordings where conducted. Images produced a sharper result than video but it was the result of the definition quality of the individual frames rather than the manner of capture.

The combination of movement and transparency produced renderings where objects blend in to the background and vice versa. Elements like the sky and people are treated equally as any other mass.







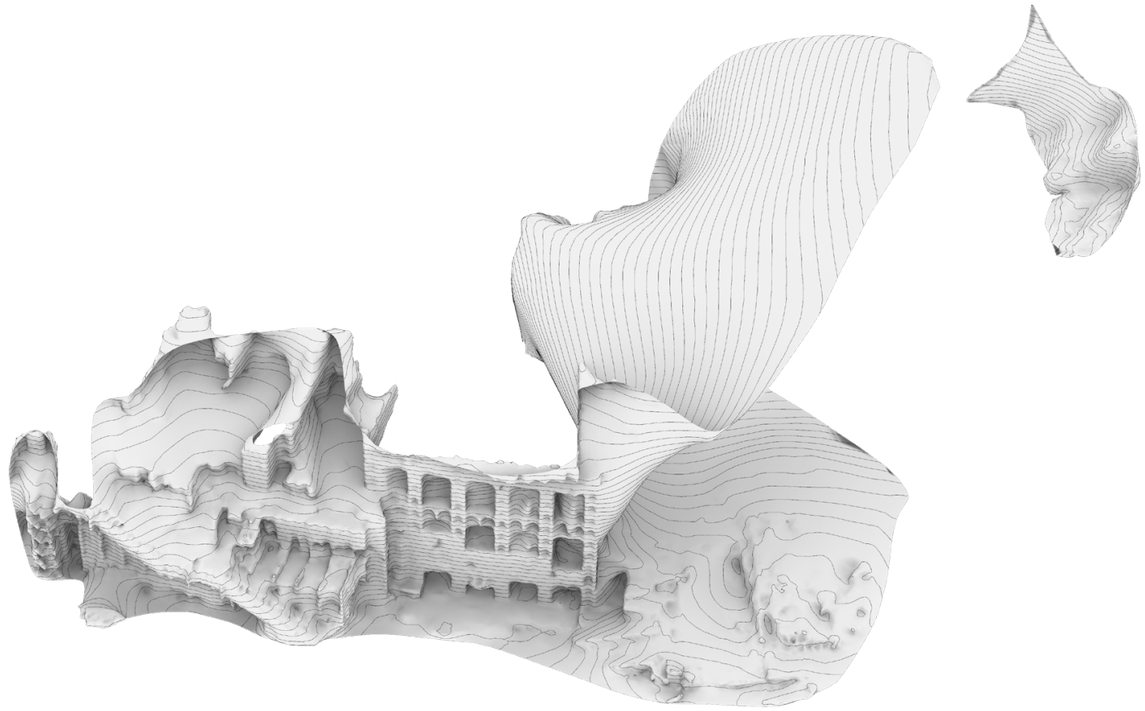
**EXPERIMENT 3:**
**SECONDARY INPUT**

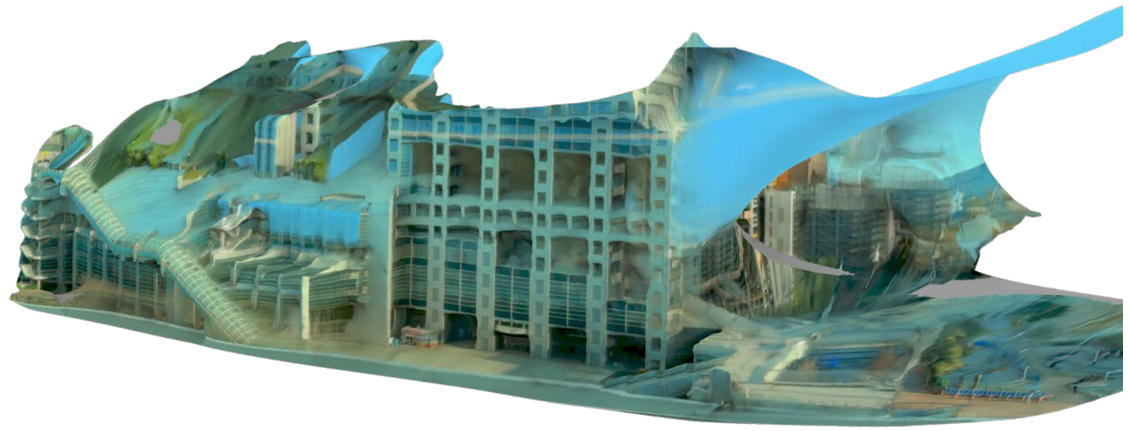
Input similar to the tram and bus sequences were found online such as train videos and drone shots. A sense for the kind of panning and camera to subject position was developed. Still images where exported from the video clips and sent to the photogrammetry software.

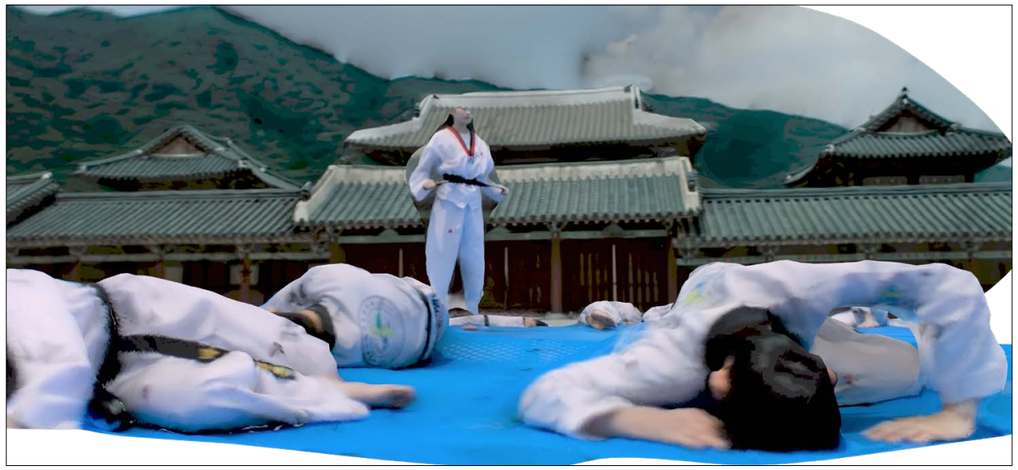
Modeled here is the Fuji TV Headquarters by Kenzo Tange. A random encounter in one train video.

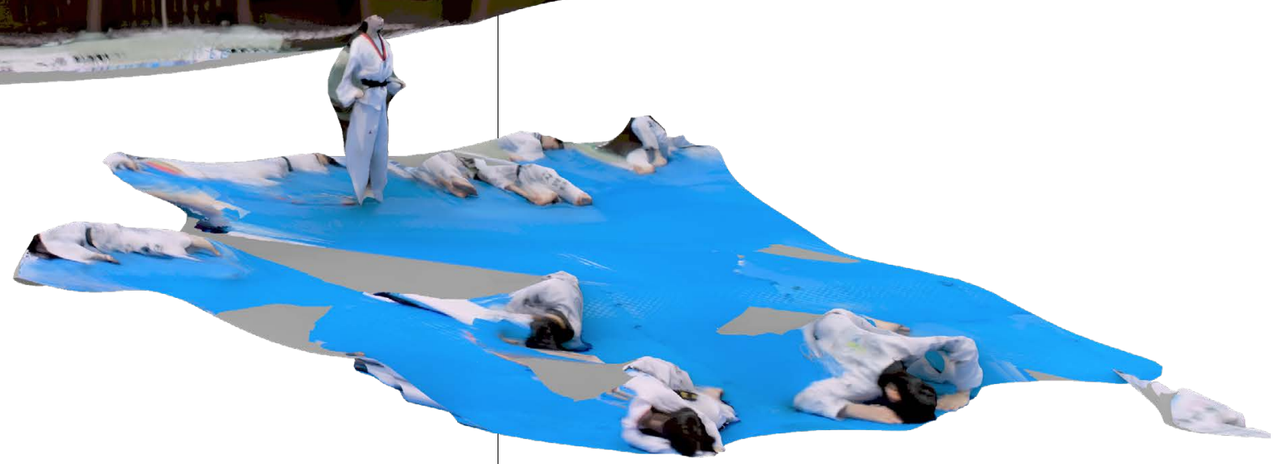










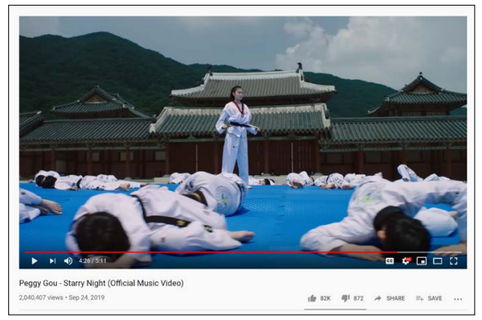




**EXPERIMENT 4:**
**FOUND FOOTAGE**

3 second scene from Peggy Gou's music video for Starry Night. Exported as 40 frames, 15 fps.

The scope of input was expanded to include music videos. The music video genre have specific tendencies and certain cinematic techniques such as high tempo cut-shots, sets that require a heavy center focus, static camera positioning, a short depth of field, forward or backward tracking shots and multiple people dancing a majority of the time. These all made it difficult to find suitable images that could be used. But it was during this stage that the Architectural Sweep were developed due to of all these conditions.

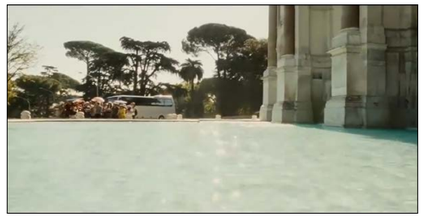


**EXPERIMENT 5:**
**CINEMATIC SPACE**

25 seconds, 100 frames, 4 fps. The scope of input was further expanded to include scenes from movies. The connections between cinema and framing, signification and action, abstract and concrete were developed.

Scene from the opening sequence of La Grande Bellezza (2013). The scene takes place on top of one of the hills in Rome.










# REFLECTIONS

Conclusions reached by the thesis demonstrate that there are many alternative ways of approaching an algorithmic practice. The investigation indicates that agency in human to non-human interactions can be attained by disrupting the perceived relationship between the aforementioned actors. Situating the architectural practice in a digital space connects it to many other cultures and expressions that share the same material conditions and ways of navigating the digital. Native ways of executing actions such as downloading, editing, and copying are shared within a number of disciplines, thus enabling the practice of architecture to connect with a larger digital culture of remix and in turn, expanding the role of the architect in the process.

What follows are short reflections on the questions stated in the beginning, hints at continuous research, and more open-ended discussions about certain themes that try to place the outcome of the thesis back in a broader discourse. Half-way through, the reflection tries to reposition itself to expand upon associations the Design Output might invoke if being understood as a separate unit, with the hope of getting into more detail regarding the initial aim:

*To continue the discussion and production of knowledge about the digital medium through multiple forms of representation such as architectural imaginaries and narratives*.

**CONCLUSION, FIDELITY, AND USELESSNESS**

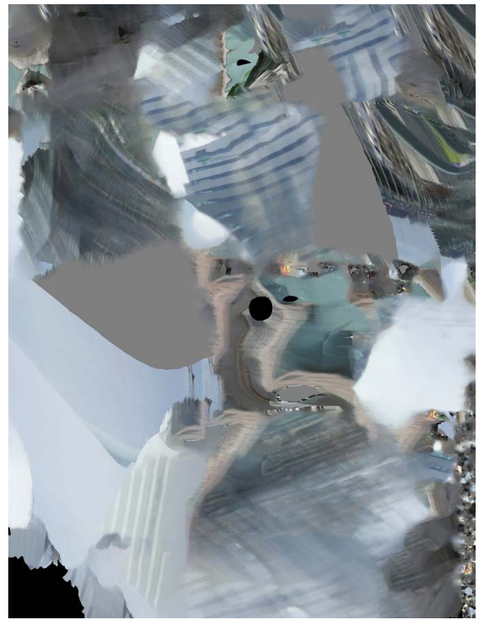
This exploration has resulted in a deeper understanding of the digital medium and the possible ways in which it can enable alternative practices. The theoretical base that described digital media enabled a language to evaluate specificities that would otherwise have escaped definition. This foundation also provided an invitation into algorithmic practices without the need for technical qualifications and managed to establish a space for maneuvering within and talking about these frameworks. Conclusions that can be taken from the work presented in the booklet are that there are indeed many varying ways of engaging in algorithmic practices and create a space with agency shared between human and non-human actors. These approaches will give rise to output that bears material references to the algorithmic transformations that have taken place thus achieving a “digital expression.”

The methodology questioned the role of precision as the primary criteria of software value. This shift of awareness also positioned the tool as not only a means to achieve a predetermined goal but opened its use to include emerging design investigations. An algorithmic tool is evaluated based on how accurately the output matches the intended transformation of the input, thus limiting the possible ways in which it can be used. Software is strict in the sense that as long as certain parameters are met it will execute the action, if they are not met, it will not execute. Anything within that margin will still produce some kind of output if execution is carried out. The results might be deformed in certain ways, missing huge parts of itself, break up into several pieces or just output a tiny portion of a whole, but all of these are still valid results and can be used and developed. This way of using algorithms, in contrast to a post-human sentiment, invites human agency. As the first introductory quote stated, the computer is incredible capable but can also be unbelievably stupid at times.

A reflection upon why this specific road was chosen as a way of studying the subject at hand should perhaps be made. Other than just emerging out of random experimentation, unconscious decisions were made along the way to navigate the thesis along this specific approach. Exploring ways of advancing tools or finding innovative methods might have been the most straightforward choice of exploring the digital medium. Pushing the envelope on progress will not only reveal the outmost boundaries of the digital and uncover relevant obstacles, it might also lead to technical advancements or innovations in the design discipline. This aligns more to the idea of the digital as rapid paced and driven by technological advancements. The focus of the thesis was instead placed on uselessness. It might be useless to reflect and speculate on why this happened but could prove interesting so here goes.







The promise of the digital medium, as expressed in the introductory quote, lies in its capabilities to exceed human limitations in many aspects. A personal belief is that this can give rise to the “Michael Bay effect” mentioned in the reference *Post-Cinematic Affect* (2010). Bay, famous as a movie director, produces highly stylistic, fast-paced action movies with a heavy use of special effects and explosions. What this tries to illustrate is the pursuit of maximum effect. Computers provide, in a conceptual manner, unlimited memory and processing power that can be utilized to achieve high levels of complexity. Through the multilayered digital composite these artefacts or actions can be combined to even greater magnitudes of output in forms of just pure effect or in more dynamic modes of variability. A (maybe unfounded) jump here to contemporary practices of parametric design can be made. Parametric design has cemented an unmistakable aesthetic of structure and form that manifests itself through rigorous logics and violent geometry. The computer readily gives rise to an approach of modularity and automation, so it is only natural to push it to its limits. Even if such an approach is not taken, it is still the material foundation of everything created on the computer. To summarize, it can be argued that it lies in digital media’s predisposition to encourage “special-effect intentions” and this is also reflected and communicated through the interface of software. The first iterations of experiments in the project back in January was actually the creation of maps in the visual programming environment of Grasshopper by using scripts to harness large amounts of data. I was quickly overwhelmed.

**ARCHITECTURE AS REMIX**

Situating the architectural practice in a digital space connects it to many other cultures and expressions that share the same material conditions and ways of navigating the digital. Native ways of executing actions such as downloading, editing, and copying are shared within a number of disciplines, thus enabling the practice of architecture to connect with a larger digital culture of remix and in turn, expanding the role of the architect in the process. The point of addressing the relationship between human and non-human actors did not occur until later parts of the project. The intention of “doing everything in a digital way” naturally lead to sourcing input material from the Internet and transforming this into output. This output was again used as input to be transformed by another software into output and so on. Nothing that was manually created was added to this process. Although it was unintentional at first, it became a way to explore the transitional role of the human actor in this process while also reflecting on contemporary practices of downloading online content. It set up an alternative way of navigation the role of the designer as a “remixer” of sorts. A position with closer associations to other genres of digital creative practices such as audio and visual arts.

This practice also affects material aspects of the process on the design level. Using downloadable content invites and remediates context. The computer can make anything available, on the condition that everything is then represented in equal states. At the same time that it opens up new arenas of potential, it is also flattening, such as putting a replica of the Pantheon next to an ad for a casino. Inserting digital

context into a project in this manner brings attention to how it is framed. The computer emerges and becomes visible as a medium. The notion of context expands if considered through the logic of computers and fluid formats. It repositions the designer to become more than a digital curator by adding creative agency. Film, sound, text, or other kinds of artefacts can be added to a project in a quite literal and direct fashion to perform as input in this remix culture.

**ARCHITECTURE AS IMAGE**

In a reference already used for different purposes, Koetter and Zeifman (2015) also discuss what it is that an architectural practice produces and come to the conclusion that it produces documents that will either lead to the production of building or not lead to the production of building. Either way, these documents contribute to the discipline as a part of the idea of architecture. But this also establishes the architectural practice as the producer of representations. The documents (drawings) have value not in themselves but in the information they hold that will lead to the act of building. As compared to an artist or writer that work in the same medium in which the final product is produced, the architectural practice does not work in the medium of building but instead in representations.

How does this relate to the digital condition or any outcome of the thesis? The decision to stay in the digital environment and thus producing the output as a native digital object had consequences that can be further developed in line with this discussion. Without the ambition or intention to represent a physical equivalent of the design or pursue methods of fabrication that would extend the scope of the project, the final output was placed within the medium that was also used to create it. Like a painter that explores the medium of paint and canvas to create a painting. As Koetter and Zeifman suggests that the medium of architecture lies outside of its discipline, could the design output of the thesis be interpreted as image-making as opposed to space-making? The authors then further elaborate on this dichotomy of working within or outside of the medium, “those who do not, in the production of their work, address (however radically) the elements of building elaborated above (structure, enclosure, space for function and circulation), cannot be considered to be producing architecture” (Koetter & Zeifman, 2015). The discussion about whether the design output can be considered architecture or where in the discipline it would position itself will be left here, but whatever side the thesis falls on, the design outcome can still be seen as contributing to the larger scope of ideas about architecture.

Still, there is room for a bit of speculation about the role of the digital medium as a vehicle for image-making. As most parts of the design practice has been digitized and digital tools have become the norm, this might also reflect on larger tendencies and trends that come out of such a readjustment. The digital lends itself to image-making on many levels from the production of representation and presentation material, to the distribution and remediation of such content. Since all digital media exists and can be distributed in the same channel it increases the potential circulation of material to reach a wider audience. With this, the emphasis on presenting only the finished product as representative documentation might change, since every version of a not-yet-finished object is preserved and can also be distributed or stored as is.

Digital image-making can also shortly be addressed in the cross-section of cinema and architecture that relates to previous themes discussed in the thesis. The way to construct an architectural experience used to be based in analog representations. As the digital claimed cinema’s ways of seeing and modes of interaction, it conditioned experiences to be both



immersive but also modular and dispersed. “Many new media objects do not tell stories; they do not have a beginning or end; in fact, they do not have any development, thematically, formally, or otherwise that would organize their elements into a sequence. Instead, they are collections of individual items, with every item possessing the same significance as any other” (Manovich, 2001). This can be interpreted that the contemporary experiments of remediations such as video games and virtual reality will establish themselves enough to be appropriated by the architectural discipline. But more importantly, how can the architectural narrative evolve from there?

**AN OUTSIDER POSITION**

The design of the scenes can, and have been, analyzed, evaluated, and presented from within the discourse and framework set up throughout the thesis. But the scenes are produced in such a way that they can be read as a stand-alone complex, thus enabling a more open-ended interpretation. Resituating and untangling my own gaze from within the project are not the easiest tasks but I have tried to present a few thoughts from this inside/outside perspective that might be of interest. The previous parts of the reflection have tried to tie back into contemporary discourse and now it might set up other points of access for further development. This will inevitably put an emphasis on representation as it is a supposed survey from an outside perspective. So, are there any other ways to describe the scenes that do not follow the logic from which they were created, according to the basic principles of data and of computational transformations?

**THE STRANGE DREAM**

First, I will briefly explain why the scenes are as they are. I believe that what kind of effect was desired have not actually been stated previously. I found the principle of transcoding to be the most interesting in terms of working with experiencing the digital, and as such, it guided most of the design decisions. The two prompts “working towards a montage”, as stated in one of the thesis’ aims, mixed with “keeping it digital” led to wanting to create something unreal. Unreal, not as in things flying around and constantly shapeshifting, but unreal as the feeling that emerges when something feels off or unexplained. Creating a sense of otherness, not necessarily reflecting on identity, but where the familiar has been slightly off put to bring awareness to the interplay between the computer and the human and the ways that these order the space. This expression was mirrored in the composition of the scenes. The whole composition

aimed to set up an initial “simple” image such as this is a bridge, a mountain, a forest and so on. But as you zoom in, the shift in scale also reveals complications to that first impression. This is further pushed with every scene rendered slightly differently. Texture maps are continually shifted to increase the material ambiguity of each element but also to disrupt the hierarchy between them.

I likened it at one time to the placeholder text you can find in Adobe InDesign (Lorem ipsum…). At a glance it is just a normal block of text but at closer inspection, do the words actually make any sense? To achieve this kind of effect was at least the intention. I believe that to do this, setting up only one design situation would not have been enough, which is why I created five. Instead of one-off instances, there is a variety in how different situations are handled, and by doing so, enhances the overall feeling of world-building.

It is not particularly foreign then, that the scenes can be described as surrealism (as the external critic did at the final seminar). “Many surrealist artists used automatic drawing or writing to unlock ideas and images from their unconscious minds, and others sought to depict dream worlds or hidden psychological tensions” (Tate, n.d.) What I see as the materialization of data and Internet artefacts must seem like a slightly strange and dream-like landscape from the outside. To work both with and against representation at the same time caused the digital expressions to align not with something augmented or virtual but instead with the surreal. This tendency was even further enhanced with the method of juxtaposing strange objects made from misusing conventional and often disregarded software and creating unexpected outcomes in the interplay between human and non-human agents.

The large amount of automation also produces a sense of vague aesthetic values. The input artefacts taken from various sources and the ready-made algorithms can be traced in the scenes. They were more or less left unchanged in their appearances other than having been fashioned together. In the way they are presented, with image sequences continuously switching UV maps, likewise weakened any bond to preconceived contexts instead of strengthening them. This strange concoction where multiple authors are visually present contributes to the constant duality of the collage.

## LO-FI AND EMPTINESS

Any more interpretations? Representation seems to take precedence over any alternative route I try to walk down on this quest. How the scenes are presented and communicated, what is there but almost even more importantly, what is not there, condition any kind of reading. There is an eerie emptiness to the temple. The lone traveler being watched, an aimless ritual, a choreographed gaze, an apparent lack of function, substance, and ideology. Could the addition of photoshopped life onto the images have resulted in a perceived historical or cultural context? Is it the failure to live up to the expectation of the digital spectacular? Does the focus on an intricate process instead of the final object let the design fall flat? Should representations also contain life, time, and trash? Is the emptiness closed and flat, or does it have the potential to be filled?

It is like the “infinite workspace” of a 3D modelling program. The same hypothetical space that the scenes float freely in. It is supposed to be a void with no end, but this concept must still be represented and presented somehow. I liken it to the sensation when you wake up facing a completely white, smooth wall, your eyes being unable to judge the distance between the wall and your face. You linger in this weird limbo until you finally spot a small crack in the paint and the perception of depth snaps back into place, revealing that the wall had been just at the tip of your nose all the time. Likewise, the 3D void is flat, cramped almost, a solid color looming right at the end of the furthest limbs of your model. That empty nothingness takes shape right in front of your eyes.

A quality that is not part of the emptiness but reinforces it, should perhaps be pointed out. Artefacts created with the logic of the digital will (without intentional disruptions) be clean and crisp, optimized for data management and the smooth experience. Contrarily, the material results of this thesis’ approach is present and felt in the model output. Noise and imperfections are carried along the source material and persist through the transformations. When bits and pieces of the world, like scratches and hiss sounds on an LP, are displayed, it evokes a sense of uneasiness regarding the clinical vacuum chamber of digital creation. The lo-fi aesthetic was in this case an unintended result, but it managed to openly convey idiosyncrasies of a sample and remix culture.

## NATURE REMEDIATED

To finally round up the reflections on alternative interpretations, I want to elaborate a bit more on one outcome of the transcoding aspect present in the scenes. I had superficially considered this path in the middle of the project but decided against it, and it will instead still serve as a short, but hopefully, interesting discussion point. If the scenes are interpreted as something potentially physical, all the design elements are suggested to be representations of something real. The Revits are quite easily interpreted as already known artefacts but the “syntactically ambiguous” Recaps are a different matter. Several factors, such as their strangeness and the lo-fi quality are combined to alienate them in the digital space, pushing them outside of what is thought of as something man-made. Man-made in the sense that it is intentional design (with or without algorithmic enhancement). They lack that quality that would have allowed for easy cognitive classification, but since any components cannot remain illegible, a vocabulary will still be used to explain them. Instead of reading them as something completely unknown I would argue that the Recap elements fall into an already well-known category, nature.

This identification is not based on the function, organization, regulation, origin, or technical aspects of nature but is purely expressed here through form. In comparison to conventional form, the Recaps inherit an otherness of mystery and atmosphere, attributes more commonly associated with nature (Kolatan, 2012). The words used in some scenes such as garden, mountain, forest, and rocks, reflect on this state even though there really are no such things present. Since this track was dropped during the project, it is not explored in depth at all but can still be found to a greater extent in the final three scenes compared to the first half. The reconceptualization applies to the Recaps in both solidary states as well as larger composite objects. A landscape emerges from these compositions and the overall structure of the scenes in the dialectic with the Revits. One explanation behind the abstract impression of a landscape can be directly traced to the material basis for the construction of these scenes. When working in 3D space, spatial units are created and then assembled from a top-down, sideways, and mouse-controlled panning kind of perspective. The ready-made components are always viewed from the outside and at great length. This is quite different from how a line drawing would be constructed. This gaze is one of the reasons why there are no buildings or dwellings in the formal sense in any of the scenes, but an environment with apparent references to a natural landscape is produced. This is not necessarily a universal condition of all digital modelling, but more a specific consequence from the use of the Rhinoceros software. The computer game Minecraft, to use a contradictory example, has an embodied point of view enabling a “hollowing out” approach and encourages enclosure when modelling an object.

There is a prevailing idea that nature is an ideal and balanced entity that exists separately from humans and society (Ghenoiu, 2012). Anything that is designed is man-made and is therefore not nature. What is then the point of claiming this as nature, and on an aesthetic level at that? The separation of nature and the artificial have long been contested. The claim that nature encompasses everything instead of being a distinct delimitation from what we create and do, is advantageous in many ways. In this context, it allows for the creation of a synthetic landscape. Nature is messy, far from pristine and stable at times. This approach creates an interesting overlap with themes of the thesis which can inspire further design research and expand the digital design language. Rather than reproduction and imitation of forms of nature that takes place on one end, a synthesis or middle ground between nature and the digital can be carved out.

To start addressing these tangents I cannot help but automatically turn back to the digital framework and principles, to the structure of data, the multiplicity of the interface and the many cultures of the screen. This analysis loops back and aligns with the original exploration of the thesis which was not the intention for this ending part but managed to comprise a lot of it none the less. To conclude this relationship between the many visible and hidden layers of architectural representation, the medium in which we work, offer a complicated gateway into its images and its spaces. It blurs the lines between fiction and non-fictional, as well as the image and the space by confusing the representation with the presentation. The digital representation can be both boundless and simultaneously flat, smooth but at the same time surreal, which only shows the evident need to insert meaning into the empty digital container.

Process images from photogrammetry disruptions.

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