GLITCHING FORM

Lesson Plan

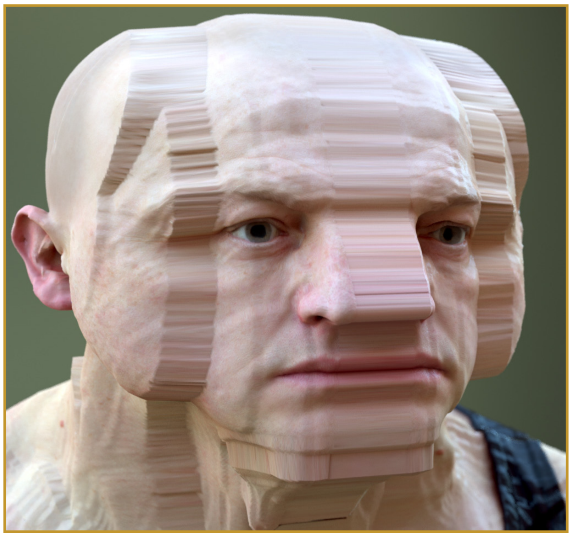

Figure 1. Lee Griggs, from "Deformations" series, 2015.

Figure 2. Caitlind R.C. Brown and Wayne Garrett, "Carbon Copy," 2018.

This MOD draws upon ***MODULE 2: Modeling Form*** *and* ***MODULE 3: Capturing Form****. You could use those modules as a prerequisite for this one, or refer to them as a resource/guide for the processes used here. It is also possible to explore the glitching practices in this unit with found models rather than scanned ones.*

MODULE GOALS

Digitizing entities from the physical world has become a tool for many artists and designers. Fashion designers base their measurements on 3-D scans of customers' bodies. Interior design applications use carefully measured recreations of furniture items to allow experimentation with a room's arrangement. Special effects artists use digital scans of performers to place them in situations that would be impossible for a human body to inhabit.

The translation of physical forms into digital data also affords artists distinct opportunities for experimenting with form in the "glitch art" tradition. Since second half of the 20th century, and increasingly with the prevalence of digital tools in the 21st century, glitch artists have been experimenting with, and intentionally breaking, the technological systems that undergird so many cultural artifacts. By breaking the rules and structures of these systems, glitch artists can make these rules and structures visible, and play outside of their boundaries.

In this unit, students will examine the work of artists who apply the glitch ethos to forms digitally captured from the physical world. Students will experiment with different strategies of disrupting the systems that capture and digitally store information on physical forms. And, ultimately, students will conduct their own creative exploration, developing a digital or physical artifact that meaningfully explores the potential of glitching forms.

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ESSENTIAL QUESTIONS

- What new or distinctive ways of transforming, mutating, or reconfiguring forms are made possible by digitizing them?
- What particular ideas, meanings, or feelings can be explored or elicited by digitally glitching, distorting, or mutating familiar forms?
- What ethical considerations are there to making artwork about distorted or glitched human bodies? Media producers (see Figure 3) and artists (see Figure 4) use distorted scans of humans to elicit feelings of fear and horror. How might this relate to ableist cultural attitudes toward disability and bodily variance? How might artists explore these practices in a thoughtful and sensitive way?

Figure 3. The "boneless" monsters from an episode of Dr. Who were creating by glitching 3-D scans of actors, and were based on 3-D printing malfunctions.

MEANING AND ACQUISITION

- Students will become familiar with the ways different 3-D capturing technologies work, and how those technologies may be manipulated.
- Students will become familiar with traditions of glitching technological systems in art practices, and explore how glitching can be a tool for creating experience and meaning.
- Students will gain experience manipulating digital forms and their underlying data structures to achieve creative goals.

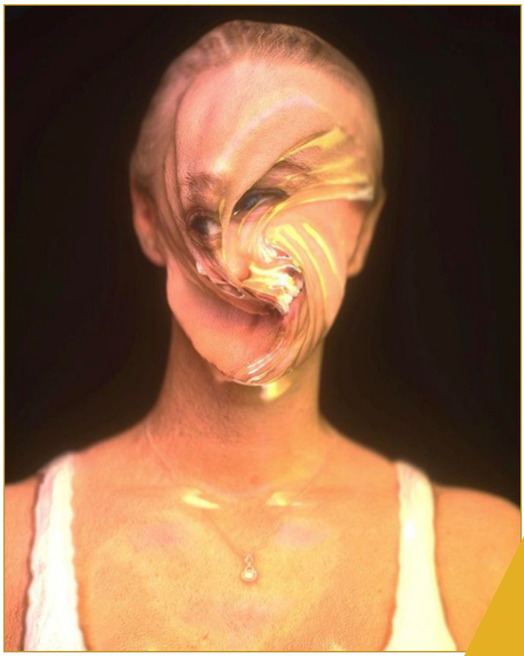


Figure 4. Digital artist Aron Johnson distorts 3-D scans of human bodies to create discomfort he feels is rooted in an "innate fear of mortality."

FORMATIVE ASSESSMENT STANDARDS

- Students experiment with multiple methods for glitching digital forms, including glitching the capture process, glitching the model through manipulation in software, and glitching the underlying textual code of 3-D models **(Cr1.1.Ia, Cr2.1.8a, Cr2.1.Ia, Cr2.1.IIa)**.
- As students develop their personal glitch art project, they reflect on their open-ended experiments with glitch practices and refine them into a more complex and intentional use of those practices to produce experience and/or meaning **(Cr3.1.6a, VA:Cr3.1.8a, VA:Cr3.1.Ia, VA:Cr3.1.IIIa)**.
- In their experimentation and research with glitch practices, students consider how the norms embedded in digital systems and materials, and our responses to glitched ruptures of those norms (e.g. finding a digitally distorted face funny or scary), are connected to larger cultural norms around objects and bodies **(Re.7.1.8a, Re.7.1.Ia, Re.7.1.IIa)**.

SUMMATIVE ASSESSMENT STANDARDS

- Student's artifact thoughtfully uses contemporary glitch practices to meaningfully transform and/or recontextualize a familiar form **(Cr1.2.Ia, Cr1.2.IIa, Cr1.2.IIIa)**.
- Student's written statement or presentation of their work reflects attention to the distinctive possibilities afforded by the digital manipulations of physical forms **(Cr3.1.7a , Cr2.3.IIIa)**.
- Student's work shows consideration of the ethical facets of glitch experimentation, particularly with respect to capturing, manipulating, and distorting human bodies. Student has secured consent from individuals scanned for their work, and has been mindful social implications, such as ableism, in developing their project **(Cr2.2.7a , Cr2.2.8a, Cr2.2.IIa, Cr2.2.IIIa)**.

GLITCHING FORM

Lesson Plan

MATERIALS

- One or more of the following:
  - A free photogrammetry 3-D scanning app such as Scandy (iOS), Display.land (iOS/Android), or Qlone (iOS/Android)
  - A Kinect or Structure sensor and computer with Skanect software
  - A Structure iPad sensor
  - (If none of these capturing tools are feasible, this lesson could also be done using existing 3-D scans from resources such as the Smithsonian or Thingiverse)
- Laptops, with mice
- Objects, people, or entities to be scanned
- Internet connection and browser
- Text editing software such as Notepad, Notepad++, or TextEdit

KEY TERMS

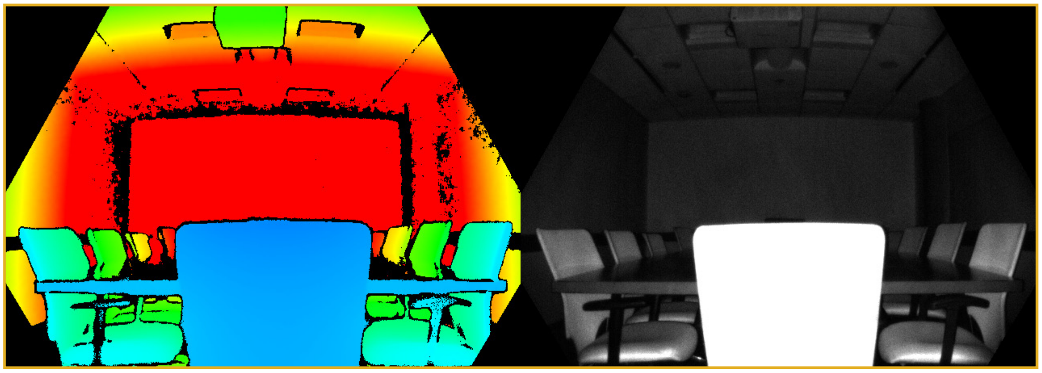


Figure 5. The infrared light shone by a Kinect sensor (right) and the depth image Kinect "sees" (left) with captured 3-D information.

- **3-D scanning** - A process of capturing the shape of physical 3-D objects as digital data. This may involve a focused line of laser light that runs across the surface of the shape, or an infrared light shone of the surface of the shape. In both cases, the interaction of these lights with the surface of the object is captured by a sensor to determine depth information (See Figure 5).
- **Databending** - A specific variety of glitch art where a file of one type is opened and edited in a program designed for another file type. For example, opening up a 3-D model file in a text editing program to change the data inside, or opening up an image file in a sound editing program to apply effects like "echo" to the visual data.

GLITCHING FORM

Lesson Plan

- **Glitch** - An often unexpected error or flaw in a system, which can call attention to that system, or to aspects of that system which often go unnoticed.
- **Glitch art** – When an artist intentionally creates or responds to glitches in systems to create a meaningful or affecting experience. Early glitch artworks included Nam Jun Paik's magnetic distortions of TV images (1965) and Jamie Fenton's hacking the Bally Astrocade video game console to create randomized sounds and images (1979). In the 21st century, glitch art has focused on manipulating digital systems, such as the underlying code in digital image and video formats.
- **Photogrammetry** - An alternative way of capturing 3-D information without special hardware. A program analyzes several photos taken from multiple angles of an object, and determines its 3-D form.

Definitions derived from the following sources:

Betancourt, M. (2017). The invention of glitch video: Digital TV dinner. https://www.michael-betancourt.com/pdf/Betancourt_TheInventionofGlitchVideo.pdf

Klee, M. (2015). The long, twisted history of glitch art. The Kernel. https://kernelmag.dailydot.com/issue-sections/features-issue-sections/12265/glitch-art-history/

PROPOSED ACTIVITY

1. Students will encounter and discuss the work of several artists and designers who glitch or otherwise digitally distort forms captured from the physical world (see attached Case Studies). Specifically, they will look at artists who:
   - Glitch forms during the capturing processes
   - Glitch forms by (mis)using 3-D modeling tools
   - Glitch forms by manipulating their underlying data
2. Students will experiment themselves with the three above glitching practices, capturing and manipulating digitized models of physical objects.
3. Students will experiment with ways to encourage capture errors in 3-D scanners and/or phone-based photogrammetry apps, if available.
4. Students will experiment with distorting scanned objects in the free online 3-D modeling tool SculptGL.
5. Students will experiment with manipulating the

textual code in 3-D modeling files using free text editing tools such as Notepad, TextEdit, or Notepad++.

6. Students will then develop their own project, extending beyond their initial glitch experiments in a way that thoughtfully incorporates a source entity from the physical world and meaningfully transforms that entity using glitch practices.
7. The format of the final piece is another creative choice/responsibility for the student. It may take the form of a physical 3-D printed object, a digital 3-D model, a 2-D image of a model, an animated GIF, or another form relevant to the student's creative goals with the piece.

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from https://leegriggs.com/deformations

Figure 2. Retrieved from https://incandescentcloud.com/2018/08/30/carbon-copy/

Figure 3. Retrieved from https://www.fxguide.com/fxfeatured/how-3d-printing-glitches-inspired-these-doctor-who-effects/

Figure 4. Retrieved from https://www.instagram.com/crashoverrrride/

Figure 5. Retrieved from https://docs.microsoft.com/en-us/azure/kinect-dk/media/concepts/depth-camera-depth-ir.png

GLITCHING FORM

Case Study I: Point-of-Capture Glitch

A number of artists generate glitched digital models and images by deliberately misusing and experimenting with the devices used to capture form. Rather than introduce glitches to data after the fact, these artists experiment with processes to create files which are glitched from the start.

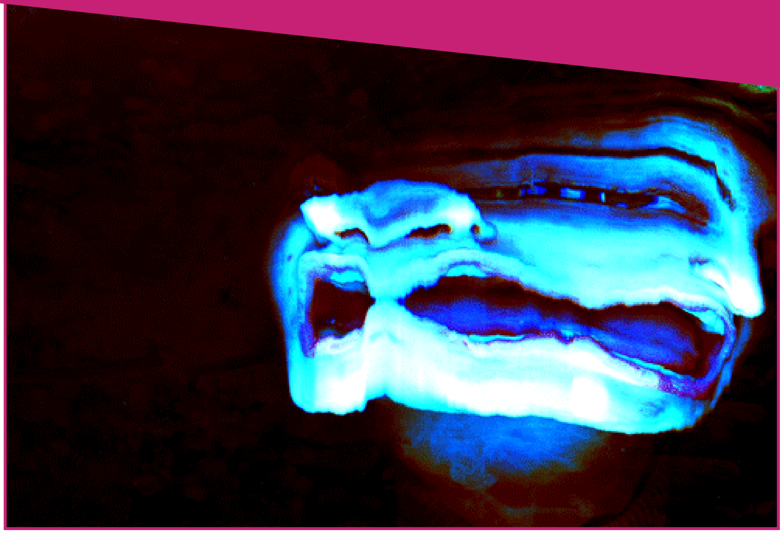


Figure 1. "Ziplock," 2015. Click here to see the original animated image.

KARA ZONA

Atlanta-based artist Kara Zona's work has focused on the way scanning technologies, unlike instantaneous photo technologies, can capture movement, since they slowly scan a single line at a time (Zona, 2014). According to Zona, the distorted image that results when the scanned subject moves during a scan tells a story of an event taking place, the same way a video might.

Figure 2. An experiment in disrupting the 3-D scanning process. Click here to see the original, animated, image.

Zona's older work with 2-D scanners also explores how scanners can remap space. Drawing on the work of Cubist painters from the mid-20th century, Zona has explored how, for example, rolling a face across the scanner captures multiple angles in a single image, forming a more "complete" image than a traditional "realistic" photograph. In this way, artists can play with the limits of scanning technologies to explore expressive, subjective themes through performative gestures, or try to "objectively" capture facets of the material world that traditional capture technologies fail to see. In both cases, Zona argues that scanning "takes these real life objects and makes them unreal." Per Zona, unlike a photo or video, a glitched scan doesn't pretend to be "real," and as a result might tell us *more* about reality!

Figure 3. A 2015 image from Zona's Fragmented People series, where the subtle temporal distortions of the individual scans are juxtaposed with a more drastic fracturing of the body into different scanned facets.

REFERENCES

Zona, K. (2014). On scanning. http://onscanning.blogspot.com/2014/08/on-scanning.html

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from https://karascuro.files.wordpress.com/2015/07/mouthopen2_h264_web.gif

Figure 2. Retrieved from https://karascuro.files.wordpress.com/2016/04/lisa_web_mockup_2.gif

Figure 3. Retrieved from https://karascuro.files.wordpress.com/2015/07/torism_10_72dpi.jpg

GLITCHING FORM

Case Study 1: Point-of-Capture Glitch

SOPHIE KAHN

Sophie Kahn (n.d.) is an Australian artist whose work often takes the form of fractured sculptures of women's bodies 3-D printed from incomplete 3-D scans. Kahn deliberately misuses 3-D scanning technology, moving scanned bodies, or not moving the scanner, to produce incomplete and damaged 3-D forms, which she then digitally processes into printable models.

Kahn uses her glitching of human bodies to explore a variety of issues including history, health, death, and gender. For example, in her recent series "Machines for Suffering," Kahn (2019) scanned the bodies of dancers recreating poses from medical photos of women institutionalized for hysteria. In these works, the glitched "failures" of the scanning process reflect what Kahn called "the folly of using the technology of photography to attempt to capture and codify madness" (para. 2).

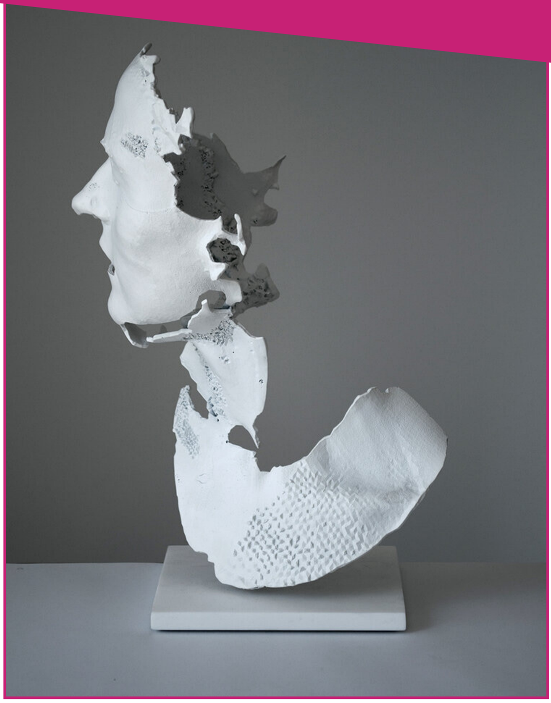


Figure 1. "Bust of a Woman II," a sculpture from Kahn's 2013 "Artifact" series.

REFERENCES

Kahn, S. (2019). Machines for suffering. https://www.sophiekahn.net/machines-for-suffering-sculpture

Kahn, S. (n.d.). About. https://www.sophiekahn.net/about

Figure 2. A sculpture from Kahn's 2018 "Machines for Suffering" series.

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from https://www.sophiekahn.net/artifacts-sculpture

Figure 2. Retrieved from https://www.sophiekahn.net/machines-for-suffering-sculpture

REFLECTION QUESTIONS

- Zona's 2-D and 3-D scans capture the movement of the scanned body in a way that's visible even in a still image of her work. What are other ways digital artists can capture movement or time in their artwork?
- Zona and Kahn disrupt the scanning process by moving the entity being scanned (usually a human head or body) during scanning. How else might you disrupt or glitch scanning tools during the scanning process? Have you discovered any consistent sources of "problems" (reflective surfaces, hidden angles) in your scanning experiments that you could make use of intentionally?
- Both Zona and Kahn use the glitches and failures of scans of bodies to comment on how digital systems often fail to produce a complete picture of things and people. What are other themes or feelings the image of a fractured or incomplete human body might connect with? Are there other types of embodied identity (besides Kahn's exploration of gender) that 3-D glitching might comment on?

GLITCHING FORM

Case Study II: Glitching in Software

A number of artists generate glitched models through the use (and misuse) of 3-D modeling software. Some artists try to recreate common glitch effects by intentionally manipulating the modeling software, while others use the software in experimental or unconventional ways to create unexpected effects.

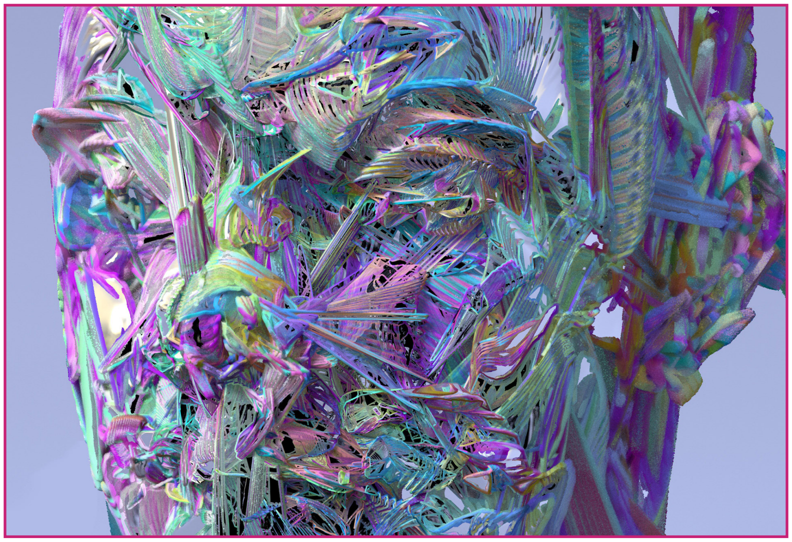


Figure 1. A portrait modeling experiment by Lee Griggs.

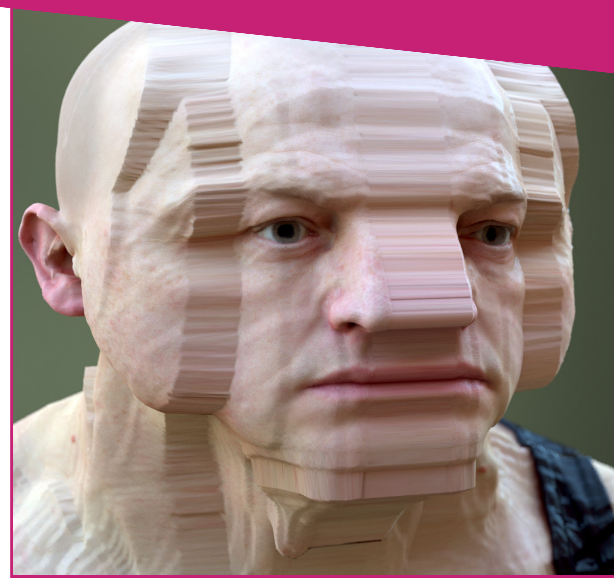


Figure 2. An image from Griggs's "Deformations" series.

Figure 3. Another image from Griggs's "Deformations" series.

LEE GRIGGS

Madrid-based artist Lee Griggs is an in-house artist at Autodesk, the company responsible for 3-D modeling tools such as Maya and TinkerCAD (Griggs, n.d.). In much of his work, he uses 3-D modeling software to alter the underlying geometry of 3-D scans of human heads. For example, in this "Deformations" series he applies mathematical transformations to the meshes, resulting in fleshy forms with sometimes harsh or angular extensions and contractions (Griggs, 2015). In his "Rolling Shutter" series, he applies a concept similar to Kara Zona's scanning work, hacking the virtual "camera" of the modeling software to scan across the models as they are shifted, resulting in forms that contain the twists and contortions of their movements.

Griggs (2016) is interested in the concept of pareidolia – the tendency for humans to see faces in various shapes. This informs his work, as he experiments with how far scanned faces can be pushed before they no longer read as faces, and how non-facial forms may be manipulated to read as human faces.

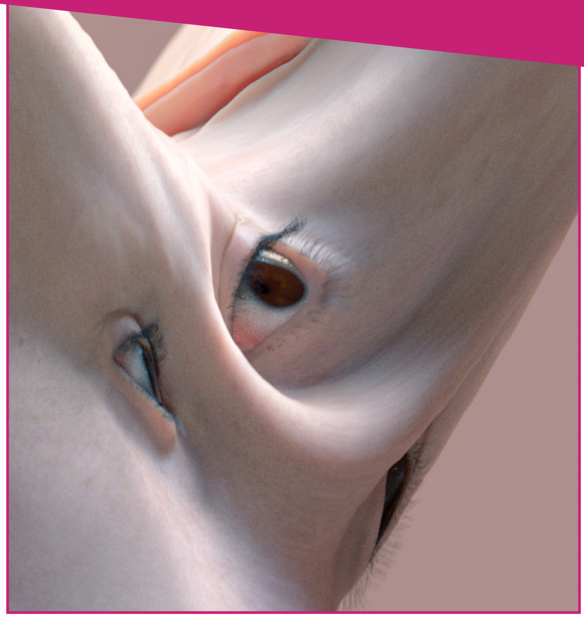


Figure 4. An image from Griggs's "Rolling Shutter" series.

Figure 5. Another image from Griggs's "Rolling Shutter" series.

REFERENCES

Griggs, L. (2015, December 15). Making of 'Blockhead'. https://arnold-rendering.com/2015/12/15/678/

Griggs, L. (2016, December 19). Lee Griggs: Deconstructing humans in 3D (K. Tokarev, Interviewer). *80 Level*. https://80.lv/articles/lee-griggs-deconstructing-humans-in-3d/

Griggs, L. (n.d.). About. https://leegriggs.com/about-1

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from https://leegriggs.com/portrait-modeling-experiments

Figure 2. Retrieved from https://leegriggs.com/deformations

Figure 3. Retrieved from https://leegriggs.com/deformations

Figure 4. Retrieved from https://leegriggs.com/rolling-shutter-experiments

Figure 5. Retrieved from https://leegriggs.com/rolling-shutter-experiments

GLITCHING FORM

Case Study II: Glitching in Software

ANTOINE DELACHARLERY

Figure 1. Still from *Ghost Cell*. Click here to view the trailer.

Figure 2. Still from *Ghost Cell*.

French artist Antoine Delacharlery's film *Ghost Cell* uses 3-D scans of daily life in Paris as the source of its imagery (Failes, 2016). Each scene in the film was captured using photogrammetry, stitching together 20 to 60 individual images to create a 3-D model of an urban space. Delacharlery intentionally looked for the "bugs" or errors that emerged in the stitched-together models, and emphasized them as he developed the models into the final images for the film (Failes, 2016, para. 5). By emphasizing the messiness of the digital scans, Delacharlery wants to draw a visual connection between human urban movements and the movements of messy natural phenomena, such as the growth patterns of fungus (Failes, 2016). This gaps and glitches in the images also comment on the way digital vision systems in urban spaces, such as the "eyes" of self-driving cars, capture an incomplete and often chaotic image of the world around them (Failes, 2016).

REFERENCES

Failes, A. (2016 ,April 20). 'Ghost Cell' uses cutting-edge CG tech to reveal a new side of Paris. https://www.cartoonbrew.com/cgi/ghost-cell-uses-cutting-edge-cg-tech-reveal-new-side-paris-138954.html

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from http://cargocollective.com/antoinedelach/GHOST-CELL

Figure 2. Retrieved from http://cargocollective.com/antoinedelach/GHOST-CELL

GLITCHING FORM

Case Study II: Glitching in Software

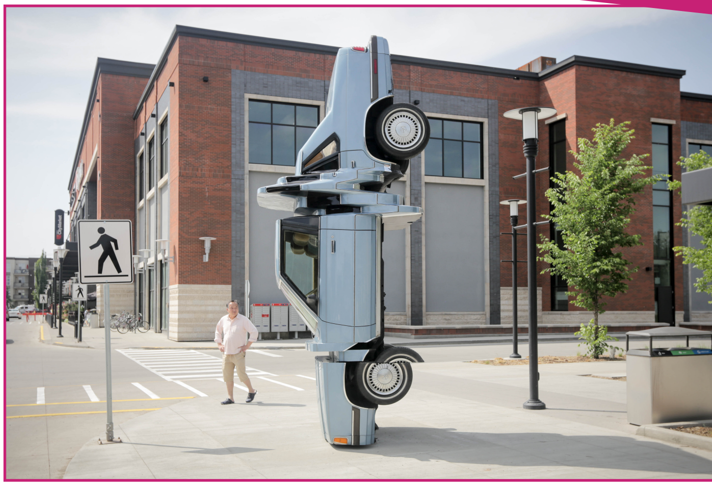


Figure 1. The final installation of "Carbon Copy."

Figure 2. The distorted 3-D scan of the 1998 Plymouth Caravelle used to guide the construction of "Carbon Copy."

CAITLIND R.C. BROWN & WAYNE GARRETT

Canadian artists Caitlind R. C. Brown and Wayne Garrett's (2018) Carbon Copy is a piece of public sculpture depicting a full-size 1988 Plymouth Caravelle distorted in a way inspired by the "rolling shutter" effect of shifting an image on a 2-D scanner (the same glitch practice that inspired work by Kara Zona and Lee Griggs, above). While the final sculpture is built from an actual car that was sawed apart and had sculptural elements inserted, in order to construct the sculpture, the artists first took a 3-D scan of the car and distorted its model digitally to use as a guide (Brown & Garrett, 2018).

Figure 3. Construction of "Carbon Copy," involving the physical sawing apart of a car and the creation of foam inserts based on the distorted 3-D scan.

The artists note that "glitches and aberrations are sometimes re-absorbed, moving beyond their genesis to become something new, separate, and previously unimaginable – a broken mirror image of their origins" (Brown & Garrett, 2018, para. 13). In creating this sculpture, one of their goals was to take the way glitches can transform digital media and invite new ways of thinking about them, and bring it into the physical world. By taking a mundane car from the 80s and subjecting its form to the kinds of transformation typically reserved for digital images, they aim to charge the commonplace object with a new kind of energy (2018).

REFERENCES

Brown, C. R. C., & Garrett, W. (2018). Carbon copy. https://incandescentcloud.com/2018/08/30/carbon-copy/

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from https://incandescentcloud.com/2018/08/30/carbon-copy/

Figure 2. Retrieved from https://incandescentcloud.com/2018/08/30/carbon-copy/

Figure 3. Retrieved from https://incandescentcloud.com/2018/08/30/carbon-copy/

REFLECTION QUESTIONS

- All three of the above artists took inspiration from glitches and errors in scanning technologies, then used modeling tools to intentionally re-create visual effects based on these glitches. What does a glitch effect lose when it's intentionally re-created, rather than when it emerges as a result of a technical shortcoming? Is simulating a glitch effect using a modeling tool just a superficial exercise, or can it call attention to the shapes and limits of technical systems in the ways glitch art typically aims to?
- Lee Griggs glitched scans of human faces, while Antoine Delacharlery glitched scans of places, and Garret and Brown glitched inanimate objects. How did the artists' choices of the entity they glitched affect the conceptual content and experiential impact of the artworks they made? What objects are you considering glitching, and how might that impact your approach to your project?
- The final artworks of these three artists all took very different forms. Griggs created 2-D images, Delacharlery created an animated film, and Garrett and Brown created a physical sculpture. How does the choice of medium affect the conceptual content and experiential impact of the artworks they made? What form(s) are you considering for your project?

GLITCHING FORM

Case Study III: Glitching Data

Many glitch artists work by manipulating the data and code inside digital files, generating unanticipated errors and breaks in them. They highlight the structures of these file systems by breaking them, and sometimes create new and unintended visual outcomes from common file types.

Figure 1. Glitched video stills generated by Menkman's *Monglot* software.

ROSA MENKMAN

Rosa Menkman (n.d.) is a Dutch artist, author, and curator whose work focuses on the potential of glitch practices for producing new knowledge and experiences outside of the standardization of digital systems.

Her creative work often involves manipulating the underlying data that digital materials are made of. For example, she created a piece of software called *Monglot* that edits the compression-decompression ("codec") data in video files to introduce visual glitches. *Monglot* is designed as a tool to help people learn about and research digital file formats through experimenting with them – a reflection of the way glitch practices can make digital systems more visible by breaking them.

REFERENCES

Menkman, R. (2019). Portfolio. https://beyondresolution.nyc3.digitaloceanspaces.com/Portfolio%20November%202019.pdf

Menkman, R. (n.d.) Welcome to beyond resolution! https://beyondresolution.info/ABOUT

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from https://beyondresolution.nyc3.digitaloceanspaces.com/Portfolio%20November%202019.pdf

GLITCHING FORM

Case Study III: Glitching Data

MARK KLINK

California-based artist, teacher, and programmer Mark Klink emphasizes the role play and experimentation have in his glitch-based 3-D modeling practice (Klink, 2016; 2018). One influence Klink cites is his former teacher, ceramicist Robert Arneson, whose sculptural practice similarly focuses on playful distortions of human heads that subvert traditions of sculpture (Klink, 2018). He describes the development of his creative practice as "experimental and iterative," rarely entering a project with a specific plan or concept, and rather discovering themes as they occur in the artwork (Klink, 2016, para. 22).

This experimental mentality informs Klink's glitch practice, which includes "databending" - opening 3-D model files in other software, such as text editors or spreadsheet programs, and manipulating the data inside. This way of working lends itself to exploration and experimentation, as the artist can't immediately see the outcome of the changes they make. However, Klink also notes that simply "play[ing] around" with new tools can result in work that only has a superficial novelty, but which doesn't invite extended or repeated engagement from the viewer (2016, para. 11). Consequently, Klink views discerning rich thematic or conceptual content from his experiments as a necessary part of the creative process (Klink, 2016; 2018).

Figure 1. A 3-D scanned head, with forms distorted by databending.

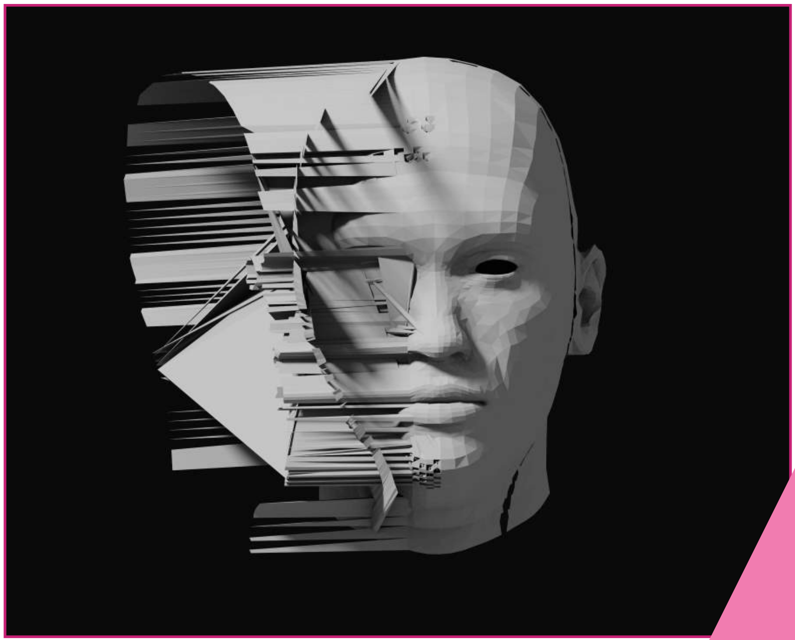


Figure 2. A 3-D scanned head with forms distorted by databending.

REFERENCES

Klink, M. (2016, September 23). Interview with digital artist Mark Klink (M. Penney, Interviewer). https://www.sessions.edu/notes-on-design/interview-with-digital-artist-mark-klink/

Klink, M. (2018, February 22). Interview with Mark Klink (I. Malatesta, Interviewer). Medium. https://medium.com/codame-art-tech/interview-with-mark-klink-de407a014a2c

IMAGE ATTRIBUTIONS

Figure 1. Retrieved from http://www.srcxor.org/blog/3d-glitching/

Figure 2. Retrieved from http://www.srcxor.org/blog/3d-glitching/

Figure 3. Retrieved from http://www.mark-klinkart.com/

Figure 4. Retrieved from https://www.flickr.com/photos/markalanklink/22017468860/in/photostream/

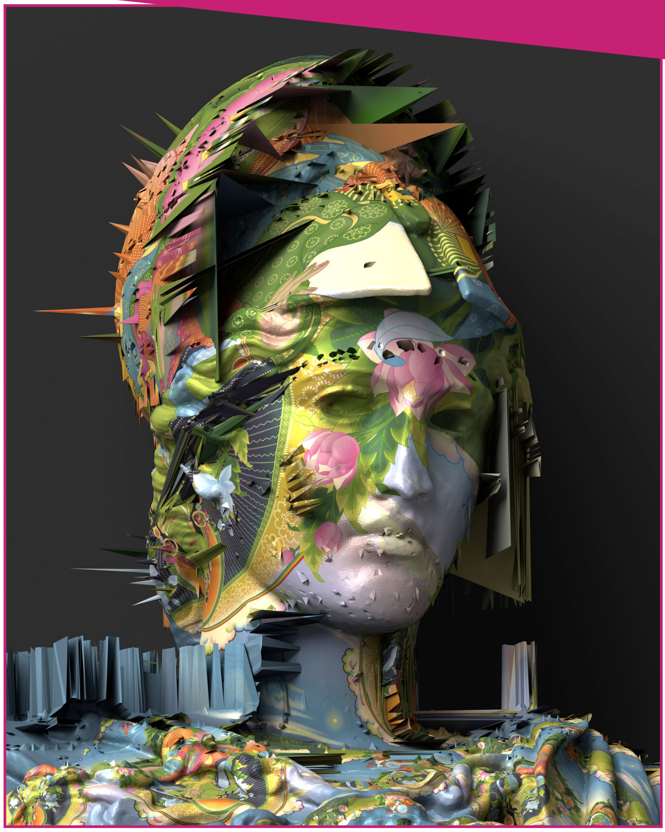


Figure 3. A 3-D scanned sculpture with forms distorted by databending.

Figure 4. "Assembly002," a databent composition which includes databent 3-D scans of statues.

REFLECTION QUESTIONS

- Databending practices typically involve experimentation and discovery, rather than working with an intentional visual plan or goal. The results can be unpredictable, and you can't immediately see the results of your actions. What are the benefits of this way of working? What are the limitations? How might an artist databend in a way that allows for some control or intention?
- Both of these artists create works that exist as digital forms – programs, video files, and image files. What challenges might there be to creating physical versions of databent and glitched models through 3-D printing? How could you overcome these challenges?
- Several of Mark Klink's artworks use scanned sculptures as their source material. What ethical considerations does an artist have to take into consideration when using existing cultural artifacts? Are there harmful ways an artist may glitch or transform an artifact? Are there certain artifacts that should be "off-limits"?

GLITCHING FORM

Handout I: Point-of-Capture Glitch

GLITCHING
FORM AT POINT OF CAPTURE

(Teachers, if you or your students do not have access to 3-D scanning through photogrammetry, or a 3-D scanner/sensor, you may skip this section and focus on the other glitching exercises below.)

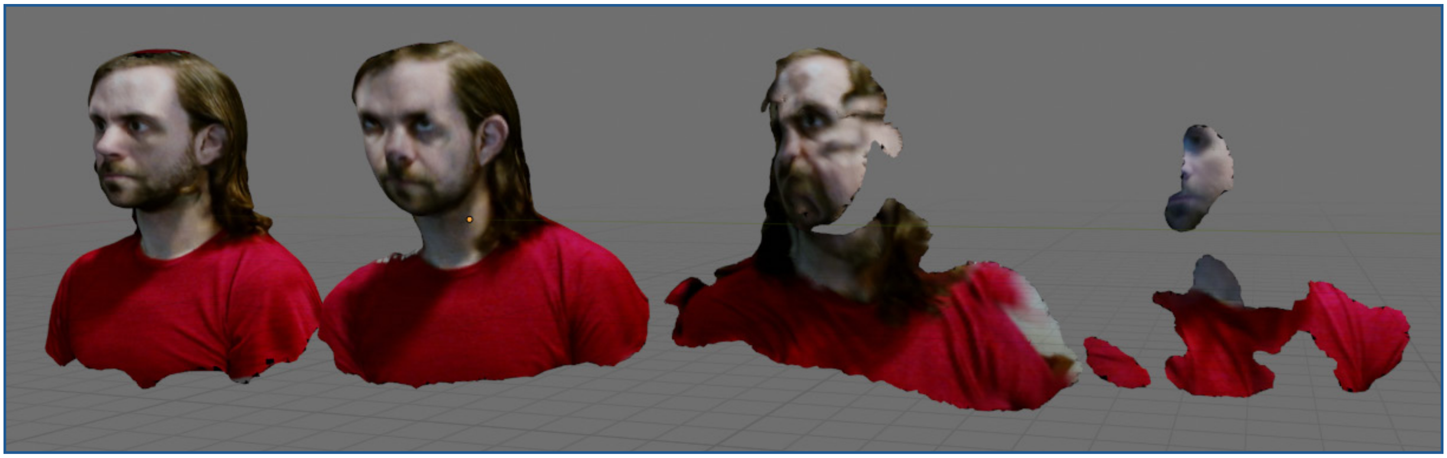


Figure 1. A series of 3-D scans made using an XBox Kinect sensor. From left to right: a conventional 360 rotation; a rotation while the subject rolled his neck back and forth; random shaking of the head without rotation; and a scan made with a bright LED light stuck to the subject's forehead.

There are a variety of 3-D capture tools available, some requiring special hardware, such as a Kinect camera or Structure sensor, and photogrammetry tools designed for use with phones (such as Display.land), or for use with a computer and digital camera (such as 3DF Zephyr Free). As these tools (and their free availability) are always changing, and different settings will have access to different tools, this tutorial will not focus on a step-by-step use of particular tools, but rather illustrate some general practices to experiment with using whatever tools you have available.

1. MOVE AROUND!

Several of the artists we looked at take advantage of the fact that scanners (2-D and 3-D) take their time scanning, and expect the object they're scanning to stand still. The two center models in the above image were the result of different kinds of irregular movement by the scanned subject.

2. USE TRICKY MATERIALS

3-D scanning tools have a difficult time seeing clear or shiny objects, and can be confused by bright lights or insufficient light. Play around with materials to confuse your scanner. In the rightmost image on the previous page, the subject had a bright LED light attached to his forehead, which disrupted the Kinect scanner from seeing his face.

Below, a French coffee press, made entirely out of reflective and clear materials, almost completely disappeared, looking something like a drop of water hitting a puddle.

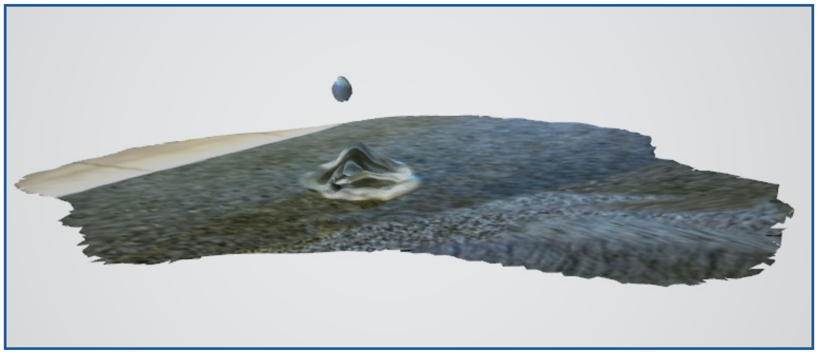
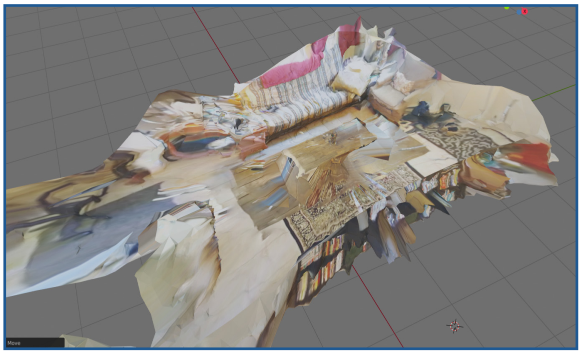


Figure 2. Left: What a camera sees. Right: What the Kinect scanner sees.

3. MIS-USE THE PROGRAMS

Another way to generate unusual or glitchy results is to use programs for unintended purposes. For example, the free phone app Display.land is primarily designed to capture large environments. This means, if you use it like a traditional scanning app, on a specific object, you can get unusual effects as the program tries in vain to scan the larger area around the object.



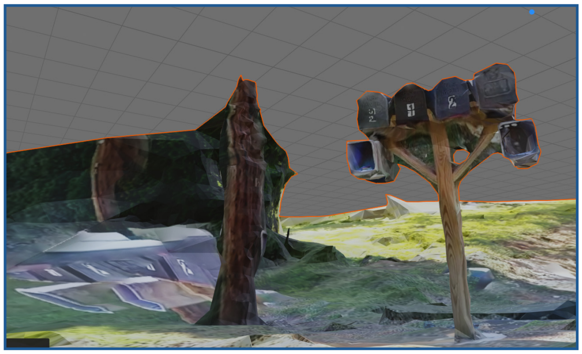


Figure 3. Scanning a small cup of paintbrushes on a table in Display.land, or focusing on a mailbox on the roadside, generates a contorted landscape with irregular patterns and textures.

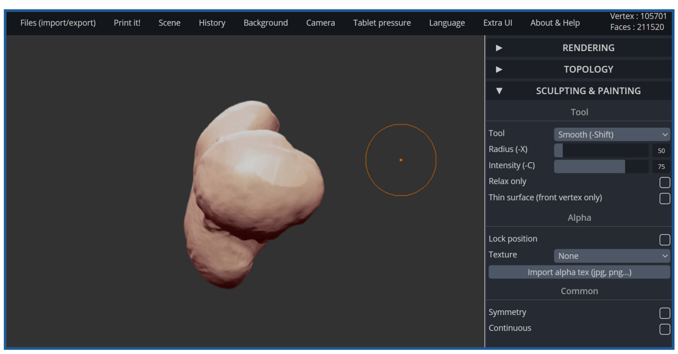
GLITCHING FORM

Handout II: Glitching in Software

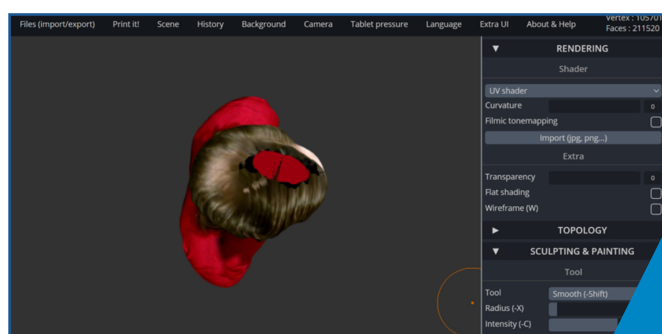
GLITCHING FORM WITH SOFTWARE TOOLS

Another way to glitch found and scanned 3-D models is through the (mis)use of 3-D modeling tools. In this tutorial, we're going to use SculptGL, a free online modeling tool designed to make 3-D modeling work like sculpting clay. While in this tutorial we'll be using a scanned human head, this process could also be explored with other types of scans, such as this sculpture (right) from the Smithsonian collection of scanned artifacts.

1. When you first arrive in SculptGL, there will be a large sphere in the workspace. Click on **Scene->Clear Scene** to remove this.
2. Then, click on **File->Add (obj, stl, ply, sgl)**. Choose your OBJ file and upload it. It will be colorless, initially, and probably be oriented strangely.

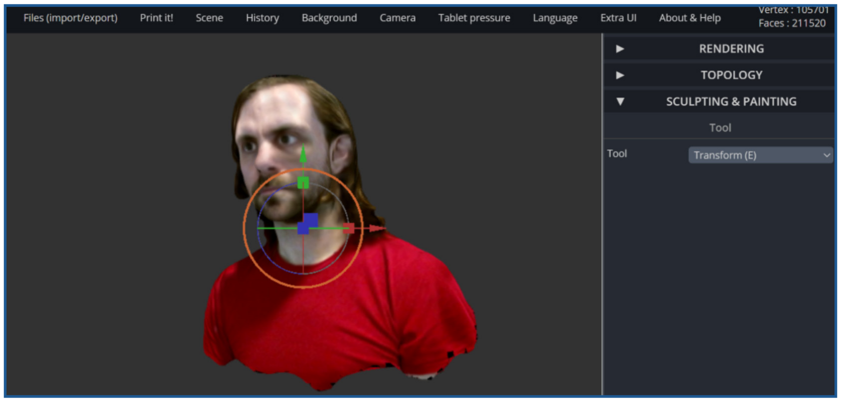


3. To add color, click on the **RENDERING** settings on the upper-right. Then change the mode from **Matcap** to **UV Shader** (UV is a term related to texture-mapping 3-D models – it doesn't stand for anything, strangely enough!). You can then click on **Import (jpg, png)** and import the image texture that was generated with your OBJ. Now your image should have color.

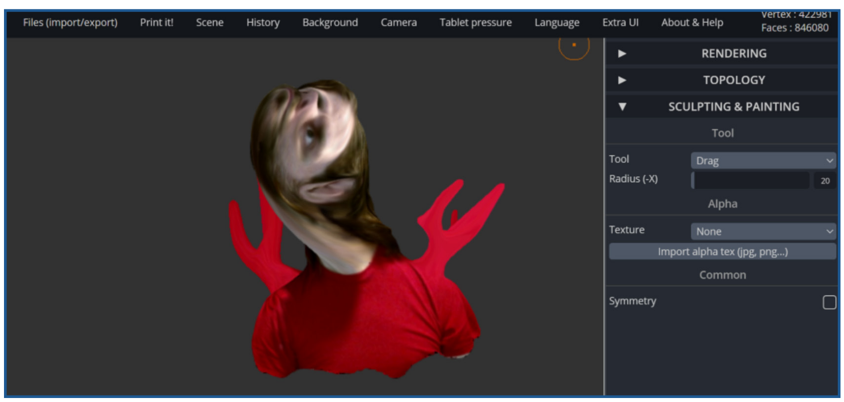


4. Under **Sculpting & Painting** on the right side, there are a variety of tools you can use to manipulate and distort your model.

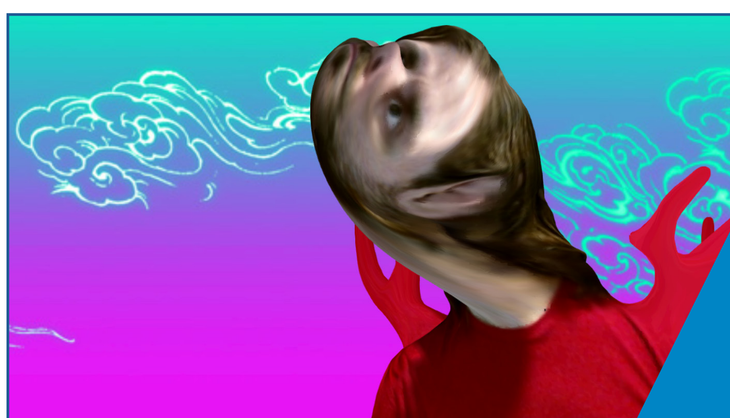
First, though,
choose the **Transform** tool to
rotate and position your model.



5. Now, take some time to experiment with the other tools! Drag and twirl are quite powerful, but you can also add subtle deformations with tools like brush and pinch. Paint will let you paint on your model with color.



6. There are multiple directions you could take this work. If you want your final piece to be an image, you can load a background image into SculptGL **(Background->Import)**, pose your model, and screenshot the composition, or you could export your model **(File-> Save .obj)** and your texture **(File->Save diffuse)** to use in another program. These are just two possibilities of many!



GLITCHING FORM

Handout III: Glitching Data

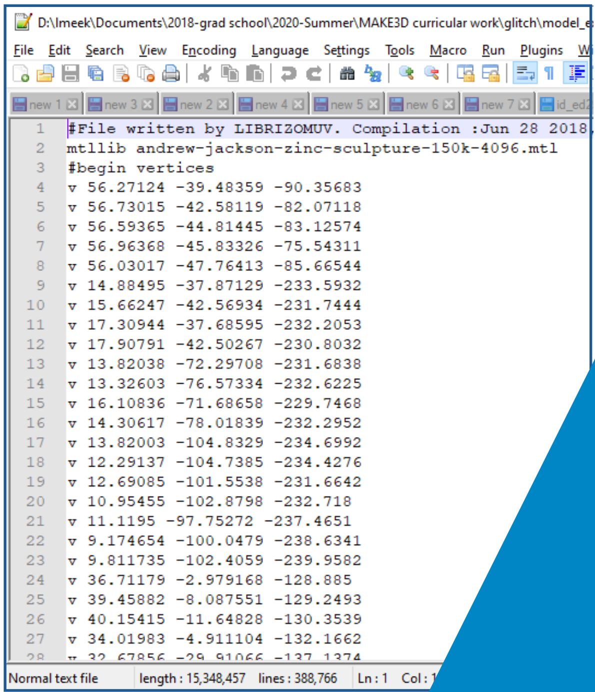
GLITCHING FORM BY EDITING DATA

All digital materials are built from data – it's the different ways data is organized and labelled (as .MP3 or .GIF or .OBJ, etc.) that allow different data files to contain and be presented as different media types, like sounds, videos, images, or 3-D models. Because different digital materials are nonetheless comprised of data, it's possible to "trick" a program designed for one kind of media into opening a different kind of media file, and using that to change the file's data in experimental ways. Glitch artists call this practice **databending.**

In this tutorial, we will be databending a model by opening it in a text editor and manipulating the values inside. This tutorial will depict a sculpture of Andrew Jackson (right) from [the Smithsonian collection of scanned artifacts](), but could also work with any scanned or found model. Andrew Jackson has a contested legacy – honored in statuary as a President, but remembered for policies that led to the deaths of millions of Indigenous Americans. Glitching this statue participates in a long history of artists questioning who gets memorialized in a culture. How might your choice of object to glitch have meaning beyond these exercises?

OPEN THE FILE

1. Open a **text editing program** such as TextEdit, Notepad, or [Notepad++]().
2. Go to **File->Open** and open your OBJ file in the program. You might need to "trick" the program by telling the file open window to look at "All files (*.*)" rather than just "Text documents (*.txt)". You'll see a long list of numbers, with a 'v' at the front of each line. If you scroll down further, you may see other prefixes. But we're going to stick to the 'v' lines. V stands for 'vertex' here, meaning these numbers, in sets of three, represent the 3-D position (x, y, z) of each point on the model's surface.



GLITCHING FORM

Handout III: Glitching Data

COPY & PASTE DATA

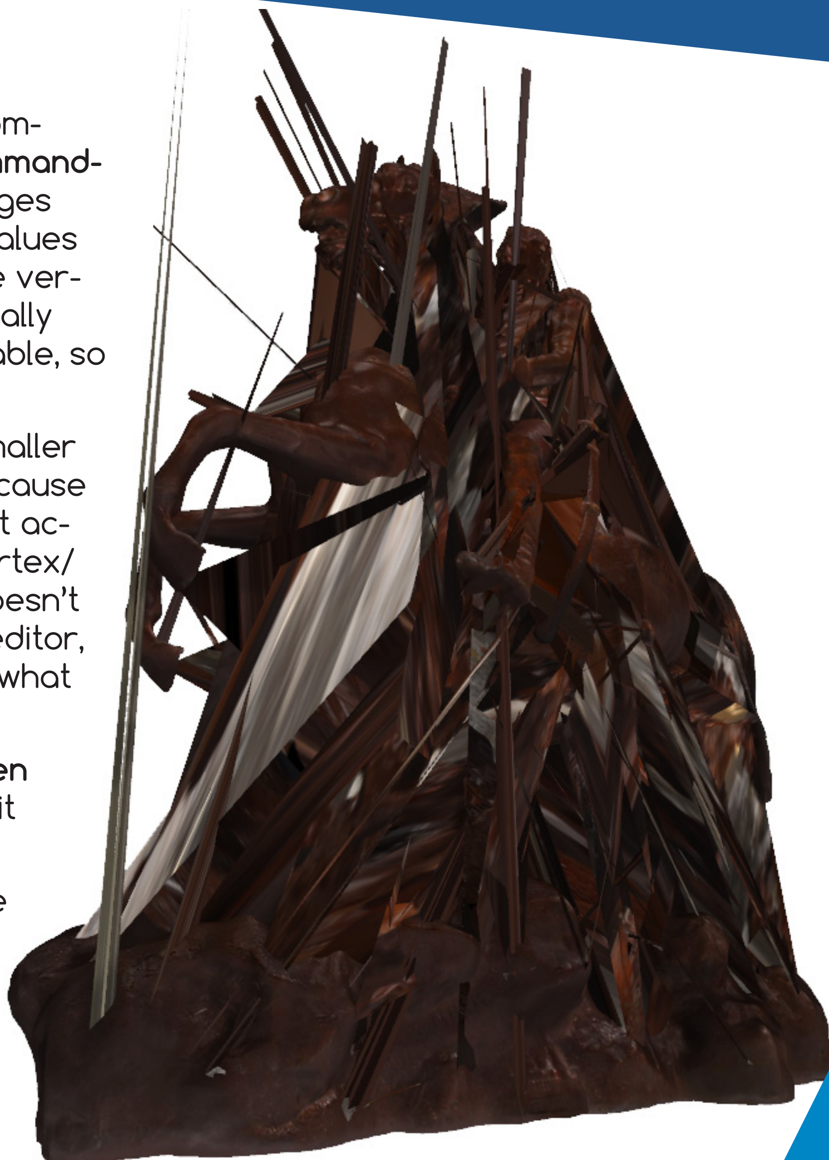
3. One easy way to manipulate data is simply copying data from one part of the file to another. Highlight a few lines of data – **making sure to select complete lines from start to finish**. Then press **ctrl-X** (Win) or **command-X** (Mac) to 'cut' the numbers. If there is a blank space left over, make sure to delete it.

4. Then, go to another part of the file where there are 'v' lines, and press **ctrl-V** (Win) or **command-V** (Mac) to paste your code in. Make sure each line only has one 'v' and three numbers. If you have an 'extra long' line after pasting, press 'Enter' to make sure each set of numbers has its own line.
   With databending it can be pretty easy to 'break' a file and make it unreadable, so we need to make sure we preserve the formatting. That's why we have to be so careful to cut and paste, not copy or delete, so the final file is the same length as before. It's also why we need to be careful that each set of values is on its own line.

5. **Save** your file.

6. **Open the OBJ in a 3-D model viewer**, and look at how it has changed. Make a few more cut & paste changes, and see what happens. What patterns do you notice? What happens when you move values just a few lines, versus moving them to a completely different part of the file? Do certain parts of the file seem to correspond with certain parts of the model? (Remember, you can always undo a change if it goes too far!)

FIND & REPLACE VALUES



7. You can also use the "Find & Replace" command (usually **ctrl-H** in Windows and **command-F** on Mac) to introduce large-scale changes to your data. Because this can change values all throughout the file, and not just in the vertex ('v') part of the file, this could potentially "break" the model and make it not viewable, so we need to be careful.
8. In general, replacing a number with a smaller number won't break anything. This is because the 'f' section of the file, the 'faces' won't accidentally get changed to attach to a vertex/corner with a really high number that doesn't exist. Go to **Find & Replace** in your text editor, and try replacing "95" with "32" and see what happens.
9. **Save your file** in the text editor, then **open the OBJ in a 3-D model viewer.** How has it changed?
10. Another possible mutation is the replace "-" (minus sign) with "" (nothing), which will turn all of the negative numbers positive!
11. If you're using Notepad++ or another text editor with more options, you can do **find &replace within a selection**. This means you can highlight a certain area of text, and then just find and replace within it. This will let you focus on glitching specific areas of the model, or let you do drastic changes to the 'vertex' (v) section of the file without breaking the 'faces' ('f') section.

This tutorial was inspired by another tutorial by artist Mark Klink. Students interested in pushing databending further may look at this next tutorial, where Klink shows how to open an .OBJ file in a spreadsheet program to alter the data in even more ways.