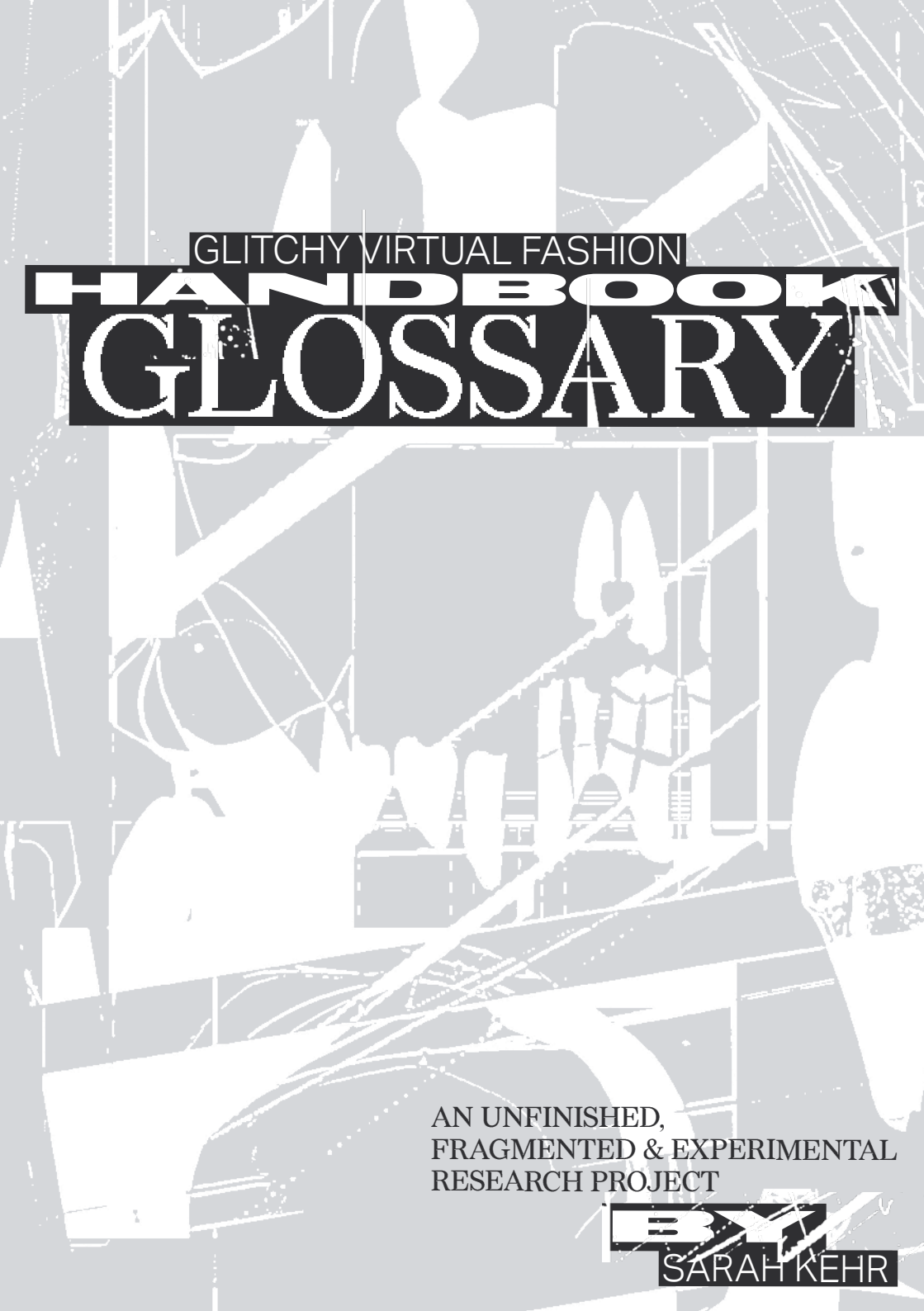


GLITCHY VIRTUAL FASHION

HANDBOOK GLOSSARY

AN UNFINISHED,
FRAGMENTED & EXPERIMENTAL
RESEARCH PROJECT

BY

SARAH KEHR

GLITCHY VIRTUAL FASHION

HANDBOOK GLOSSARY

[S-I] SLIPPING IN

Welcome to the *Glitchy Virtual Fashion Handbook* – an unfinished, fragmented and experimental research project, hopefully serving as a fun guidance for navigating the increasingly expanding and ambiguous field of virtual fashion.

> Structured as a glossary, its chapters are intentionally non-hierarchical and can be entered from any direction. There is no need to read the whole handbook from beginning to end; as each entry can be read independently, you are invited to move through the material in whatever order feels most intriguing at a given moment or simply browse through it for inspiration.

The collection of writings explores theoretical concepts aimed at gaining a deeper understanding of virtual fashion practices, discusses absurdities both minor and major, and offers critical reflections on virtual

fashion and the 3D software commonly worked with in this field. One loose yet common thread connects most of them: the entries build upon encountered Glitches as a threshold to the subject of inquiry. By paying close attention to disruptions and frictions, the handbook experiments with different modes of knowledge production and meaning-making – not through mastery, but through failure.

> *The Glitchy Virtual Fashion Handbook* is a growing collection of vocabularies and offers sources as a companion for further exploration. May it serve as a guide to useful terms, inspiring ideas, as well as enjoyable detours, unexpected encounters, and perhaps even comfort in moments when things don't quite go as planned.

01: Halberstam, J. (2011). *The queer art of failure.*

[V-■] V FOR VIRTUAL FASHION

Why "virtual fashion" you might ask. The choice of the term is deliberate, intended to draw a clear conceptual distinction from the more commonly used term "digital fashion". And most importantly to verbalize the philosophical orientation of this work.

> Virtual fashion, very broadly speaking, refers to garments and accessories created through 3D software, with a wide range of applications and possibilities, that makes it a manifold phenomenon. It first gained popularity around 2018, and when the digital fashion house *The Fabricant* sold the very first digital only blockchain dress, *Iridescence* for $9,500 in 2019, it sparked even more attention. The dress, afterwards assembled onto a photography of the buyer's body, lead to a discourse whether a garment needs to physically exist anymore.

However, this is just one of many ways to experience virtual fashion. As in the case of the *Iridescence* dress, virtual garments can be superimposed onto a photo and, with the help of an AR filter, even applied to videos; this is used, for example, in e-commerce as a "try-on" feature. Taking a look at the work and processes in fashion practices, 3D software is increasingly being utilized to create 3D prototypes in the production process. Virtual fashion, in the form of rendered images and moving images, is gradually establishing itself as a new category even at fashion weeks. Since gaming and virtual worlds are considered the very origin of the emergence of virtual fashion, it's no wonder that brands like *Balenciaga*, *Burberry* and *Louis Vuitton* have partnered with online gaming platforms, to purchase their collections as skins to wear for the avatars or simply to collect as an NFT.

In dominant popular discourse, virtual fashion is often portrayed as immaterial. This handbook, however, drawing on the French philosopher Gilles Deleuze's conceptualization of virtuality, argues otherwise. In Deleuze's understanding, the virtual actively shape practices and imaginaries in the material world. Although virtual garments themselves can neither be worn nor otherwise contribute to the adornment of the human fleshy body, virtual fashion has a very tangible impact on contemporary fashion systems, as I tried to outline above. It redefines notions of (im)materiality by seemingly being experienced as immaterial while relying on a very material infrastructure. It challenges ideas of embodiment in virtual fashion practices, transforms the work of fashion designers through 3D software, and participates in value economies by circulating as collectibles such as NFTs. Therefore, consistently referring to the concept of virtual fashion (and its many practices) means acknowledging its entanglements – how it meshes virtual and physical realities – and recognizing it as both (im)material and, at the same time, very real.

02: Boughlala, A., & Smelik, A. (2024). *Tracing the history of digital fashion.*
03: Burberry Group plc. (2022). *Burberry introduces virtual handbag collection on Roblox.*
04: Deleuze, G. (1991). *Bergsonism.*
05: Nortman, T. (n.d.). *Louis Vuitton's New Game Is Better Than "Fortnite".*
06: Roberts-Islam, B. (2019). *World's first digital only blockchain clothing sells for $9,500.*
07: Stuart, K. (2023). *Hot buttons: Why fashion houses are getting into video games.*
08: Yotka, S. (2021). *Balenciaga and Fortnite team up for a digital-to-physical partnership.*

Curious about a more detailed philosophical conceptualization of virtuality?
Navigate to [■-■] DELEUZIAN VIRTUALITY
Interested in the 3D software?
Check out [■-■] CLO

GLOSSARY

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AGENCY

Agency may seem like a simple concept at first glance, describing the ability to act, but as with many terms in this handbook, things get a bit more complicated once we take a closer look. Philosopher and quantum physicist Karen Barad offers a broader understanding in their theory of *agential realism*, which they describe as an "epistemological-ontological-ethical framework". Admittedly, that is quite an intimidating collection of syllables, so let's translate into simpler terms: Barad argues that questions of being, knowing, and ethics are inseparable and always entangled with one another.

Most importantly, Barad challenges the idea that agency belongs exclusively to humans. Instead, they argue that all worldly matter possesses agential capacities. Agency is not something an individual simply owns or possesses, rather, it emerges through relations. Barad introduces the term "intra-action" to describe this process. Unlike interaction, which assumes separate entities exist first and then meet, intra-action suggests that entities come into being through their relations. In this understanding, matter and meaning, materiality and discourse, are inseparably connected and continuously emerge together.

Because agency is distributed, humans do not control it. Instead, agency is defined as our "response-ability", an ongoing ethical accountability we carry to consider how our actions shape the world and to pay attention to "what matters and what is excluded from mattering". Agency is therefore less about being in charge and more about recognizing that we are always participating in larger networks of relations – whether we

> notice them or not. This understanding has been influential within feminist materialisms, a movement that seeks to challenge human-centered ways of thinking by taking all matter seriously. Rather than viewing matter as passive and merely waiting for humans to act upon it, feminist materialist approaches recognize the agency of human, non-human, and more-than-human beings, all of whom contribute to shaping the world.

> Barad's *agential realism* is therefore simultaneously an epistemology (a theory of knowing), an ontology (a theory of being), and an ethics. How we know the world, how the world comes to be, and how we act within it are never separate questions.

09: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.*
10: Braidotti, R. (2022). *Posthuman feminism.*
11: Neimanis, A. (2018). *Material feminisms..*

Want to learn more about distributed agency in practice?
Navigate to [D–■] DISTRIBUTED AGENCY IN PATTERN DRAFTING
Looking for the place where humans and software meet?
Read [T–■] TO WORK WITH // INTERFACES
Interested in how agency extends beyond the human?
Browse to [V–■] VIRTUAL (FASHION) BODIES

[C–■] CLO

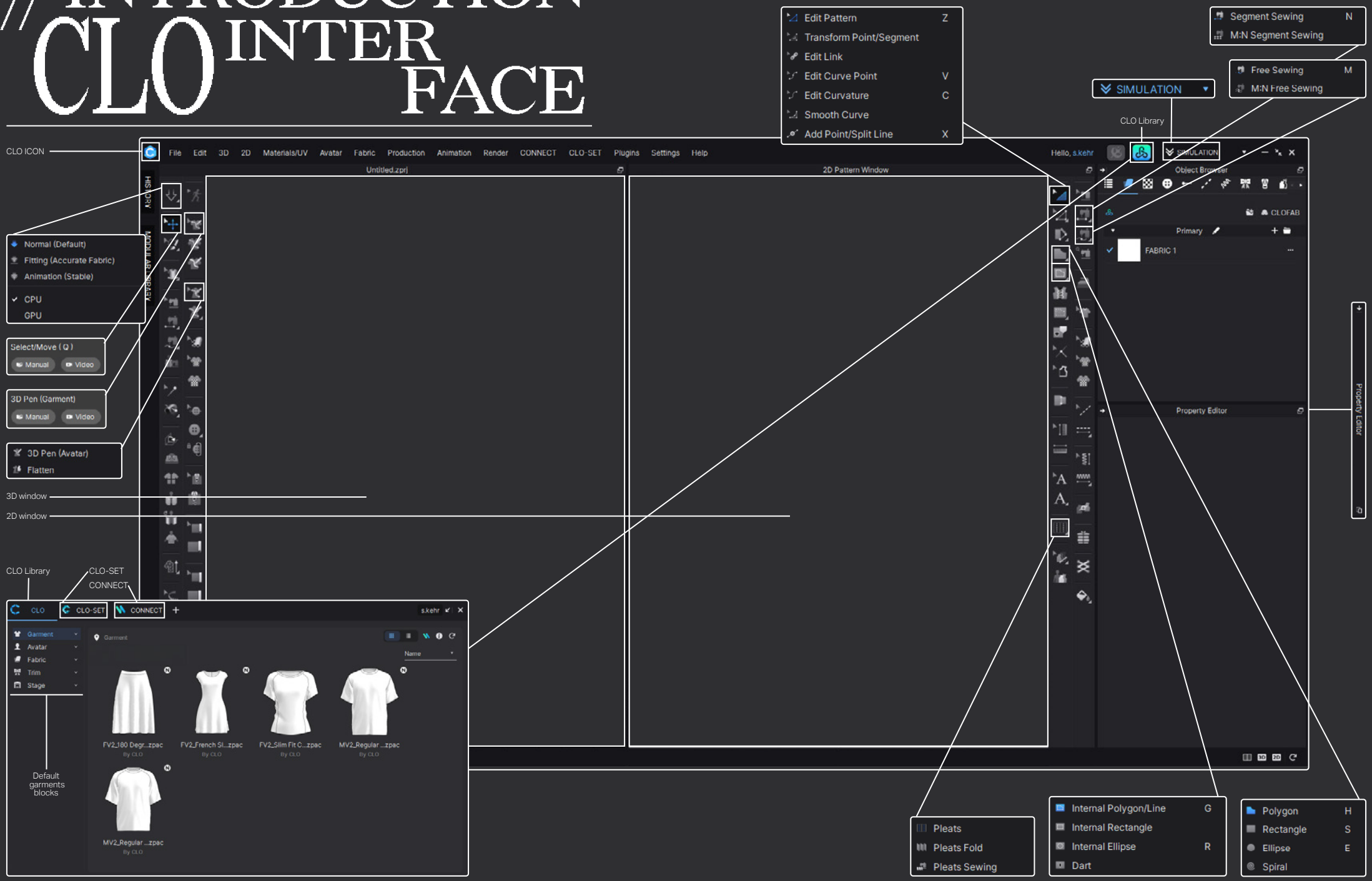
CLO is a subscription based specialized 3D fashion design software developed by *CLO Virtual Fashion, Inc.*, for creating virtual fashion with "real-time" simulation and visualization, that aims for efficiency "with virtual sampling", and to "reduce sample production, shipment and material waste", as the company states on their website. Arguably, it has become one of the industry-leading software for (virtual) fashion design.

> Distinctive in its focus on virtual design and sampling, *CLO* features a variety of tools for the creation and simulation of virtual garments, ranging from 2D pattern drafting and sewing to simulation, fitting, and adjustments within the 3D window space, even extending to creating animations. The software borrows much of the language of traditional tailoring and garment construction, creating a sense of continuity and familiarity. Yet despite the shared vocabulary, the experience differs significantly from working with physical materials, as the entire process unfolds upon the interface itself.

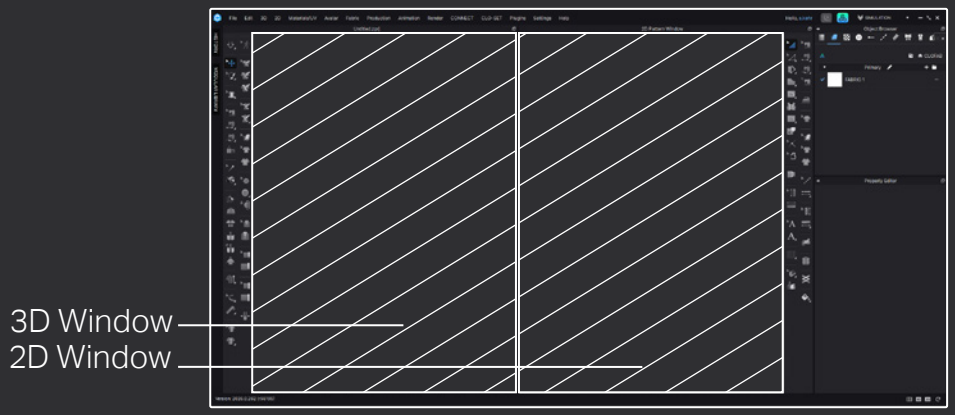
To get a sense of how the software translates garment-making into software space, this brief introduction to *CLO's* interface highlights a small selection of tools to potentially work with, different approaches to drafting patterns and creating virtual garments, the kinds of implicit knowledge the software quietly expects, and the moments where you may find yourself handing over a surprising amount of agency to the software.

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INTRODUCTION
CLO INTERFACE

// INTRODUCTION CLO INTERFACE



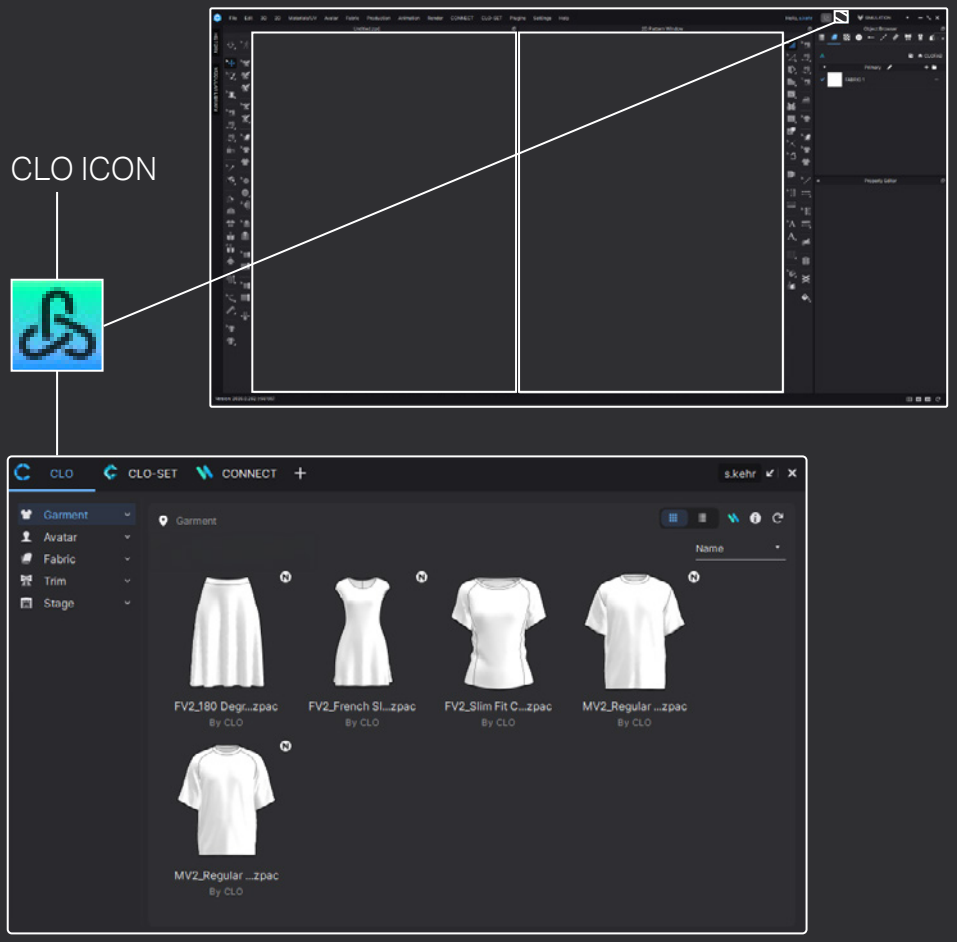
The default arrangement of *CLO's* interface opens in simulation mode with several open workspaces, divided into a 3D window on the left where the virtual garment is visualized and a 2D pattern window on the right where the pattern pieces are drafted and edited.



The corresponding tools are arranged to the right and left of the respective windows, each offering different functions that can be performed either in the 3D window or in the 2D pattern window.



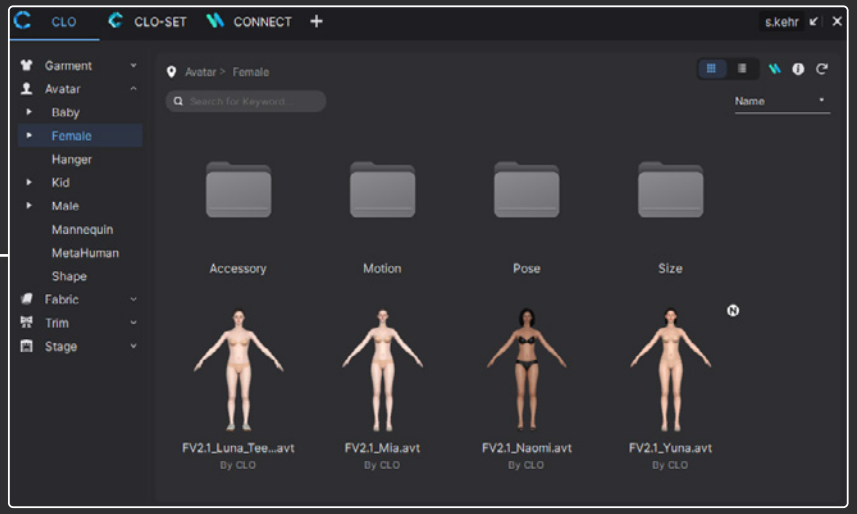
The blue CLO icon in the upper-right corner leads to a library, where CLO offers multiple default garment blocks, default avatars, fabric presets, trims and background stages, while also linking to its other services like *CLO-SET*[1] and *CONNECT*[2], and its integrated *AI Studio*.

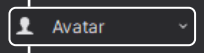


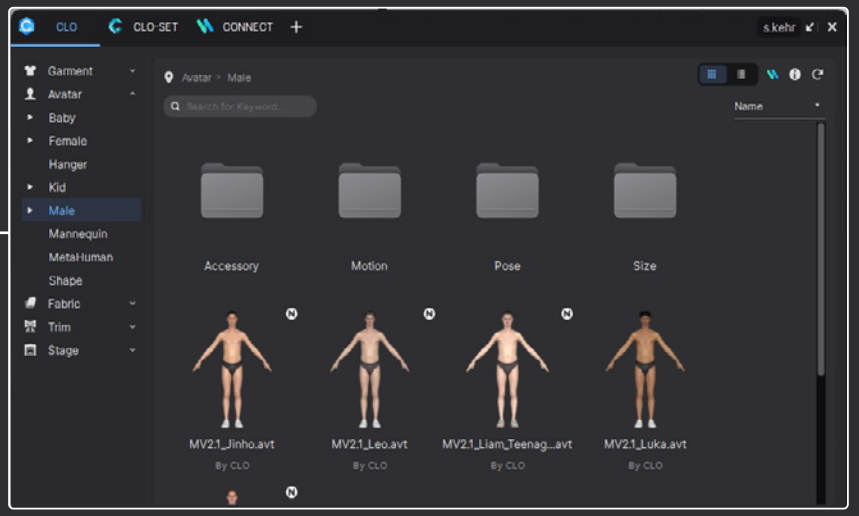
[1] *CLO*-SET is a cloud-based platform to manage, store, share, and collaborate on digital assets. *CLO's* CONNECT platform features a store where designers can upload and sell their designs, as well as contains a gallery, contest calls, a community space and additional information on their additional software features.

[2] The integrated *AI Studio* is an additional service that needs to be enabled. It includes a texture, graphics, and image generator, as well as an AI render plugin that can be used to generate faces or backgrounds in a rendered image.

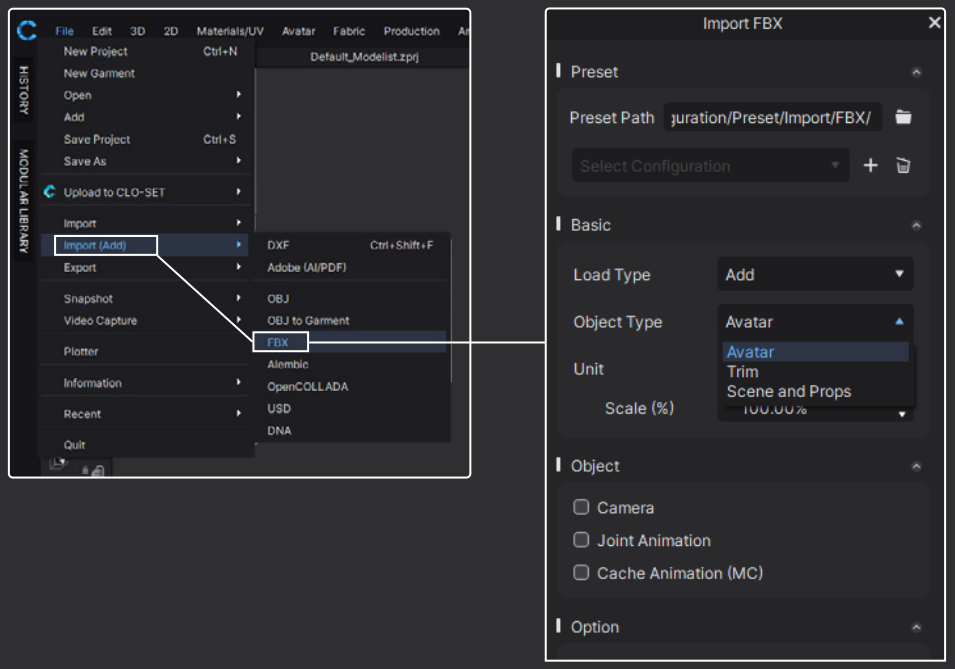
To begin a project, the first step is usually to load a virtual body – although *CLO* goes with the more commonly used term *avatar* – onto which the drafted garment can be visualized. One option is to open the *CLO* library, select a default avatar and load it into the workspace.



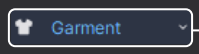


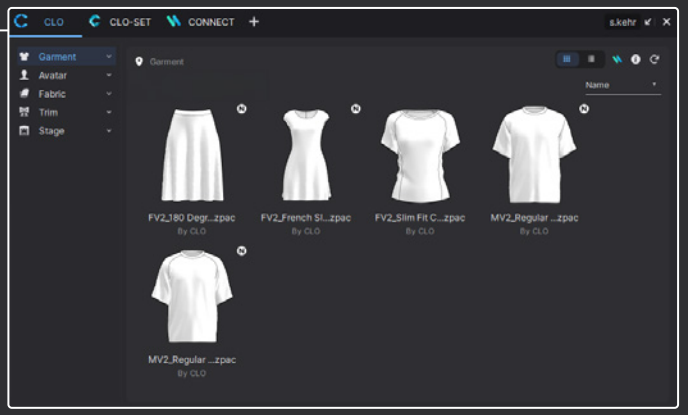


Otherwise, if the virtual body was created in a different software, it has to be imported into *CLO*.

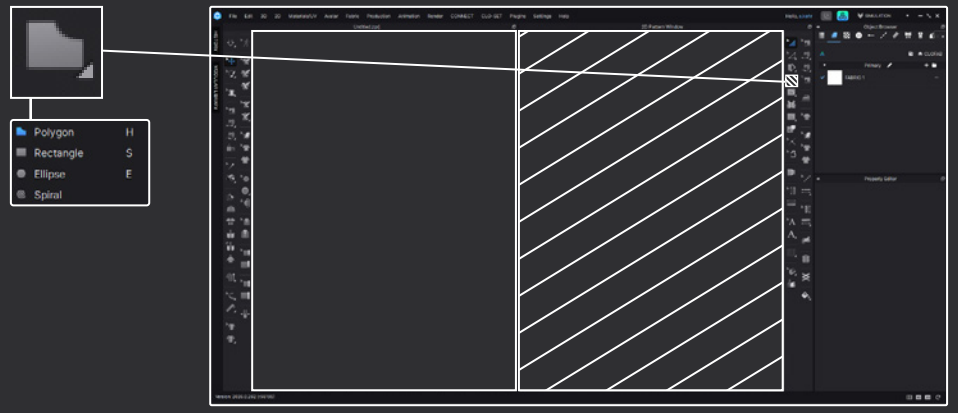


From there, the software offers multiple ways and tools to create a virtual garment. You can either load a default garment block offered by *CLO* and make alterations or construct your own pattern entirely from scratch.

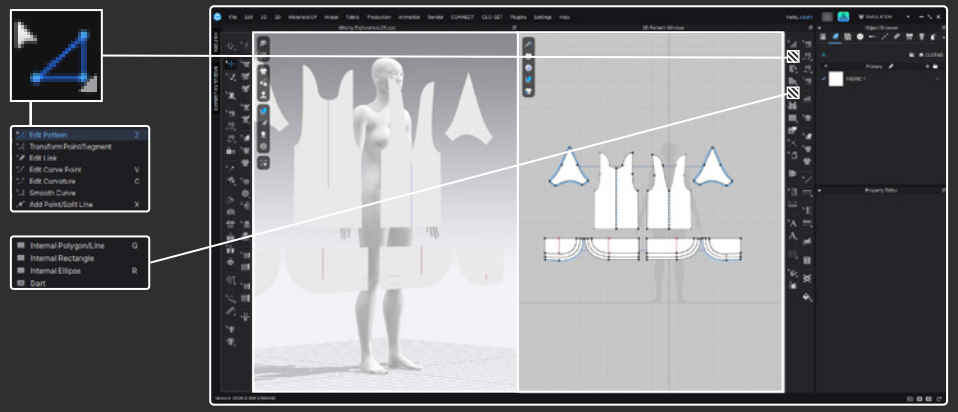




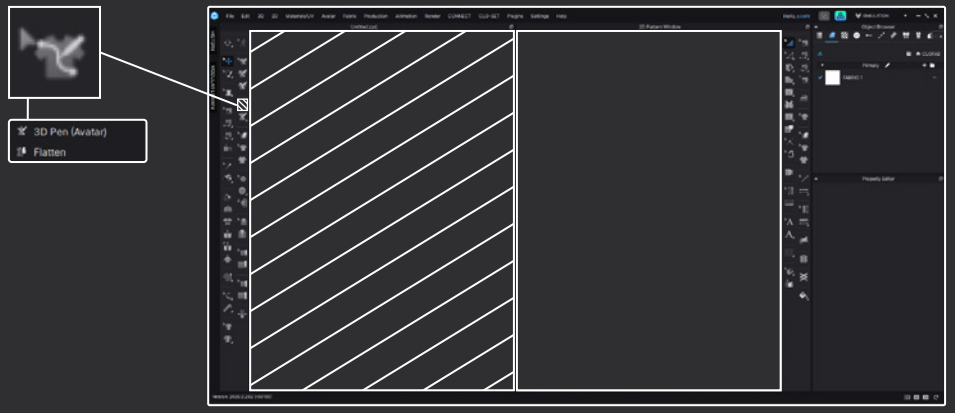
One possible way to create a virtual garment is by working in the 2D window and drawing shapes with tools such as the Polygon or Rectangle tool. The software then visualizes these drafted pattern pieces in the 3D workspace as flat patterns, ready to be further refined with various Edit Pattern tools.



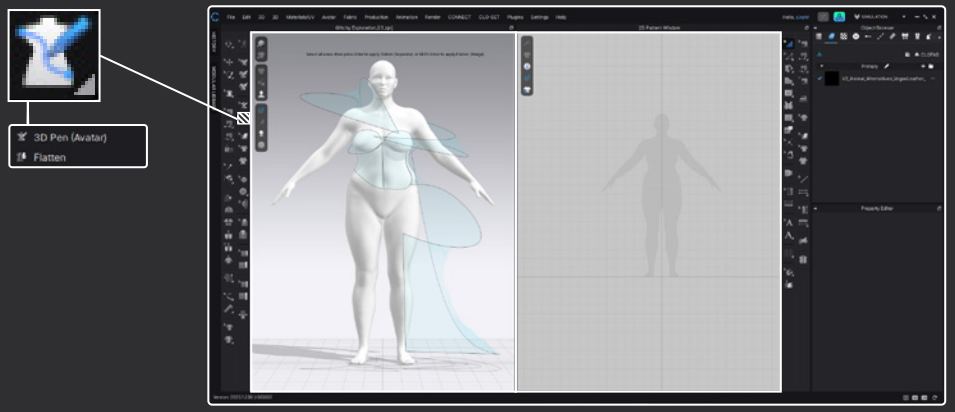
Additional features such as Internal Lines and Darts allow for further adjustments by adding additional seams within the patterns, modifying the overall shape of the virtual garment until the desired result is achieved. This method, however, requires a basic understanding of how sewing patterns are constructed and how these flat shapes translate onto a body.



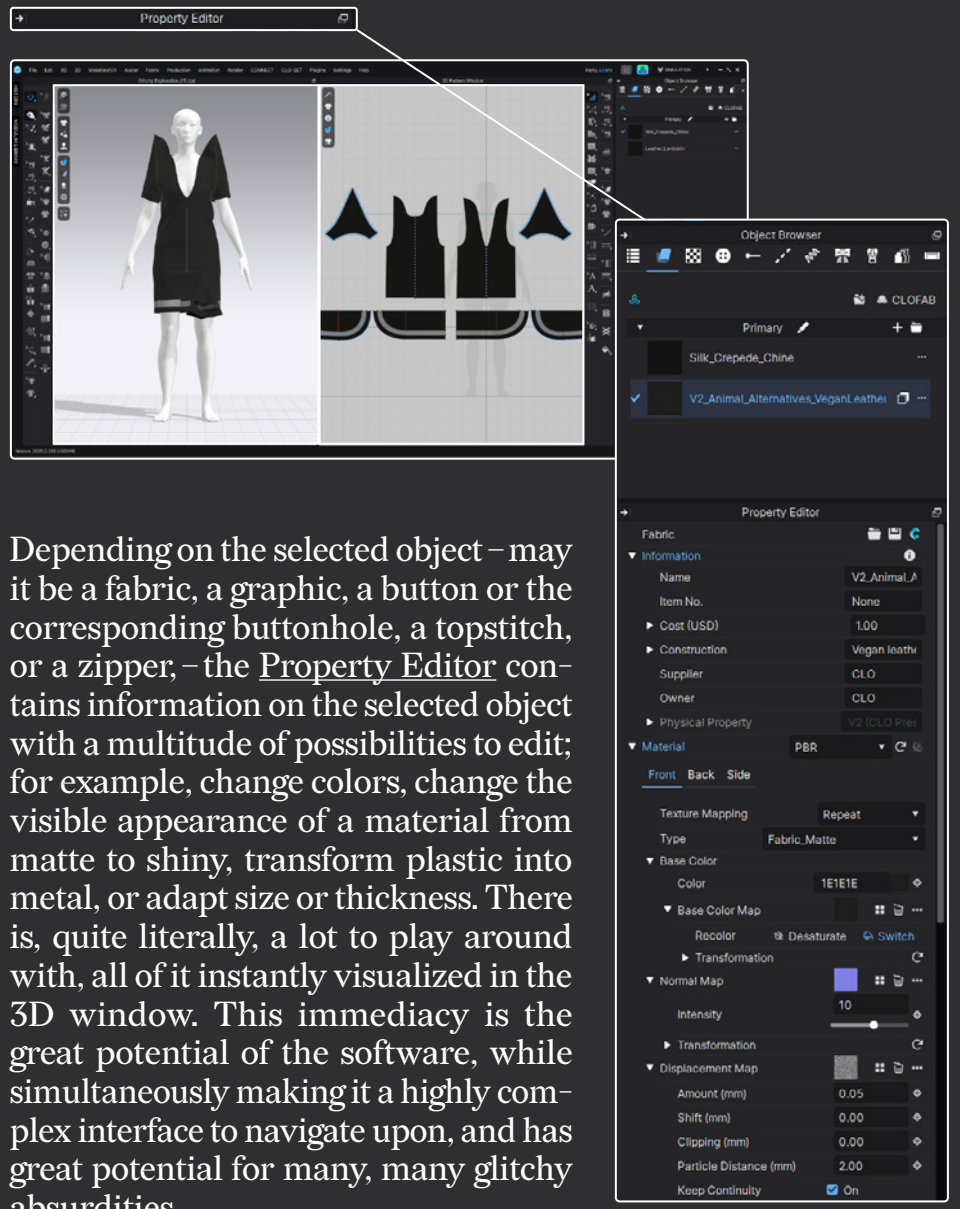
The 3D Pen (Avatar) tool offers more room for experimentation, as it operates entirely within the 3D workspace. Shapes can be drawn directly on and around the virtual body, which the software then interprets and converts into pattern pieces through its Flattening operation. In a way, the process is comparable to draping on a mannequin, a pattern-making technique frequently used in fashion design.



Because the software translates three-dimensional shapes into two-dimensional pattern pieces, the results can sometimes be surprisingly unpredictable. Here, human intention meets software interpretation, with both sides having a certain degree of agency in the process – an approach that has the potential to even lead to greater patterns than originally intended.



Once a virtual garment has been created and fabrics applied, the software offers even more possibilities for adjustments and experimentation. On the right side of the interface sits the Object Browser, with the Property Editor located underneath.



Depending on the selected object – may it be a fabric, a graphic, a button or the corresponding buttonhole, a topstitch, or a zipper, – the Property Editor contains information on the selected object with a multitude of possibilities to edit; for example, change colors, change the visible appearance of a material from matte to shiny, transform plastic into metal, or adapt size or thickness. There is, quite literally, a lot to play around with, all of it instantly visualized in the 3D window. This immediacy is the great potential of the software, while simultaneously making it a highly complex interface to navigate upon, and has great potential for many, many glitchy absurdities.



12: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.*
13: CLO Virtual Fashion. (n.d.). *CLO Virtual Fashion.*
14: Hookway, B. (2014). *Interface.*

Want to know more about Karen Barad's concept of agency?
Navigate to [A–I] AGENCY

Curious about the kinds of Glitches that may emerge while working with CLO?
See [E–I] EXPLODING GARMENTS

Looking for a closer examination of interfaces and interface theory?
Read [T–I] TO WORK WITH // INTERFACES

Wondering why this handbook refers to Virtual (Fashion) Bodies rather than the more commonly used term *Avatar*?
Jump to [V–II] VIRTUAL (FASHION) BODIES

[D–I] DEFAULT CONDITIONS

As you move through the *Glitchy Virtual Fashion Handbook*, browsing through the various glossary entries, you will repeatedly come across the notion "default conditions". The term refers to default settings, arrangements, or configurations embedded within software, systems, or networks that quietly establish certain norms unless they are consciously questioned or changed. Before you may even realize it, a decision has already been made for you.

The term, usually intended as an implicit critique, is meant to serve as a gentle reminder that no technological system is truly neutral, as Judy Wajcman argues. Often disguised as innovation, new technology is developed within existing frameworks, which always have cultural and social contexts, and consequently (re)produce certain narratives, aesthetics, and norms. Accordingly, 3D (fashion) software, situated somewhere between fashion and (media) technologies and marketed as an industry tool, is to be considered within this context to recognize how it shapes visual appearances and aesthetics that are not so different from those of the dominant fashion industry.

Sometimes all it takes is an irritation stumbled upon, revealed by an encountered Glitch, to question a default condition, realizing that the default was never neutral to begin with. A conscious rejection of default conditions, in whatever form they may appear, therefore also becomes a rejection of technological determinism, opening up possibilities for imagining or creating otherwise.

15: Haraway, D. J. (1988). *Situated knowledges: The science question in feminism and the privilege of partial perspective.*
16: Wagemans, E. (2025). *From Cyberfeminism to code control: Cyborg fashion under the technological gaze.*
17: Wajcman, J. (2004). *Technofeminism.*

Looking for a critical discussion of default bodies in 3D fashion software?
Read [V–III] VIRTUAL (FASHION) BODIES IN COLLISION

[D–■] DELEUZIAN VIRTUALITY

This handbook contains a few entries that introduce terminologies and important theoretical concepts, and *Deleuzian Virtuality* is one of them. As mentioned in the introduction, it is a deliberate choice to speak of virtual fashion, strongly influenced by the philosophical ideas of the French philosopher Gilles Deleuze and his understanding of virtuality as presented in his book *Bergsonism*.

> Nowadays, the word virtual is often understood to be a part of the digital world and refers to something that is created by digital technology, that is not physically present yet appears to simulate the real world. This understanding is not necessarily incorrect and explains, to a certain extent, the synonymous use of the terms “virtual fashion” and “digital fashion”.

> However, Deleuze’s understanding of the virtual differs fundamentally from this and provides the decisive explanation for why the *Glitchy Virtual Fashion Handbook* refers to the concept of the virtual. He describes the virtual as not opposed to the real but opposed to the actual – therefore a real but non-actual dimension of existence that continuously tends toward actualization, that is a process through which potentials take form in the world. While the actual refers to things that are already concretely present and tangible, the virtual refers to things that are real but not (yet) fully exist in a concrete, tangible, or material form.

This may not be immediately understandable; perhaps it will be easier to grasp with a more vivid example, such as the design of a garment. Before it exists in a tangible form – or as a finished virtual 3D model – it already has a certain reality: references collected, sketches drawn, design decisions considered. The garment does not yet exist in an actual form but exists as a set

of potential that eventually take shapes. For Deleuze, this realm of potentials is the virtual.

> Rob Shields offers another simple yet insightful explanation in his book *The Virtual* when he discusses the past. Is the past real? Most people would probably answer yes. Yet the past no longer exists in an actual form. What remains are memories, traces, and stories. In this sense, the past can be understood as existing virtually: real, but not actual.

> Now returning to virtual fashion, the concept of the virtual as applied here therefore refers not only to the digital technologies such as 3D software – traversing from the virtual to the actual by giving concrete presence to intangible ideas – but also to the recognition of the complex relationship between what is materially present and what exists as potentials and immaterial imaginations. Virtual fashion practices, which can takes many different forms, may be experienced as immaterial, yet they have an impact on the real world: how (virtual) fashion is perceived, consumed and experienced; what desire it shapes; how it generates value; how it influences the development of designs; and ultimately, how it even participates in economic processes for example through virtual collectibles. Referring consistently to virtual fashion therefore acknowledges its inherent ambiguities and the entanglements that are experienced as both present and absent, tangible and intangible, actual and virtual.
> In short: virtual fashion may not always be actual, but it is very much real.

18: Deleuze, G. (1991). *Bergsonism*.
19: Shield, R. (2003). *The virtual*.

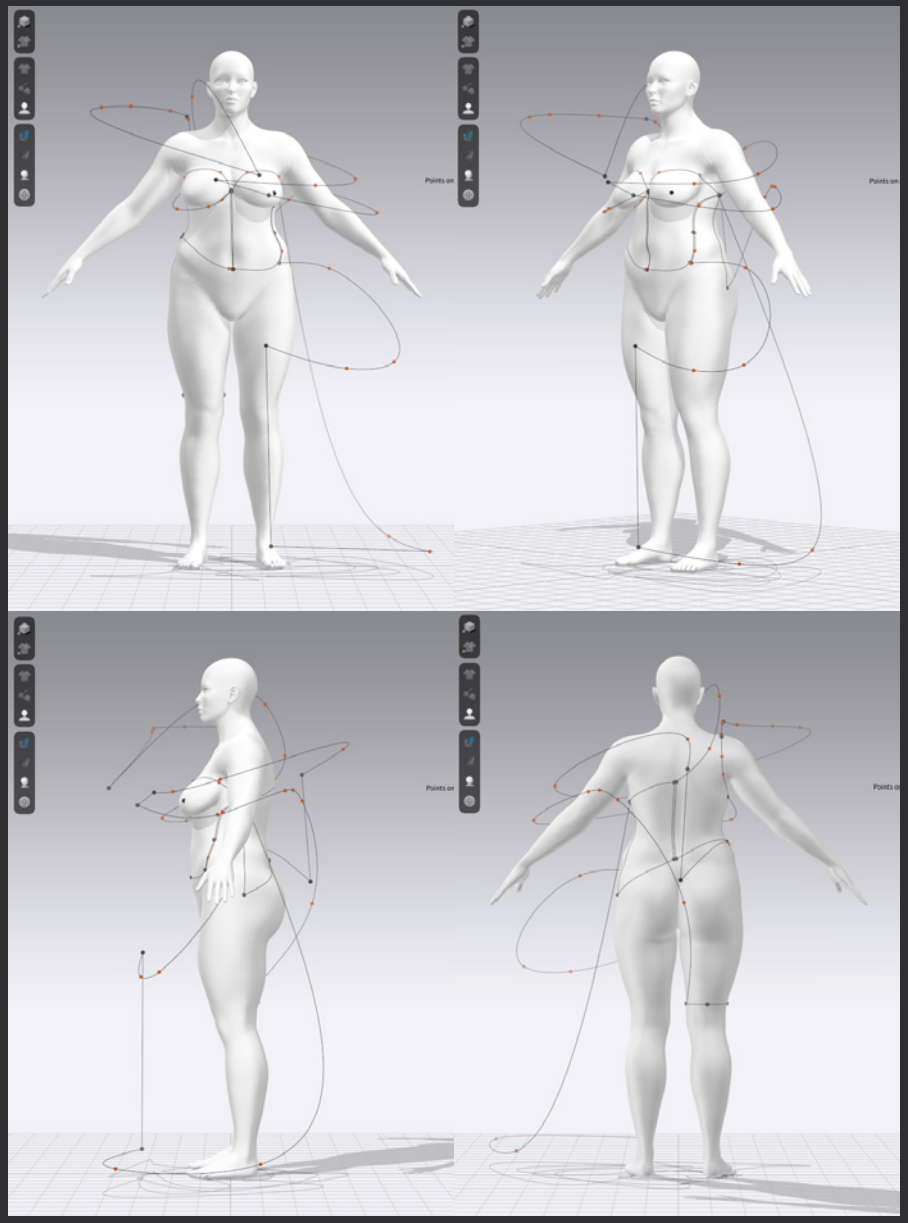
Interested in 3D fashion software?
Go to [C–■] CLO
Want more examples of virtual fashion?
Read [V–■] V FOR VIRTUAL FASHION

DISTRIBUTED AGENCY IN PATTERN DRAFTING

This entry follows two explorations with the 3D Pen (Avatar) tool in the 3D fashion software *CLO*: a tool for drawing silhouettes and shapes onto and around a virtual body in the 3D window space of the software. A process that could be compared to draping on a mannequin, a technique used to create patterns that is commonly employed in fashion design. The 3D Pen offers different possibilities for pattern creation, ranging from highly experimental approaches to more deliberate forms of pattern drafting.

Working with the tool, however, requires becoming familiar with a variety of shortcuts and navigation controls. For example, pressing **P** on the keyboard switches between drawing directly on the virtual body and drawing in the 3D space, while holding **CTRL** creates curved lines. Combined with the challenge of navigating through the interface and in the 3D software space, this can occasionally lead to points ending up in completely unexpected places and unintended commands being made.

The first exploration embraced precisely this uncertainty. Points were placed experimentally in the 3D space around the virtual body, without any conscious idea of what the final virtual garment might shape into.

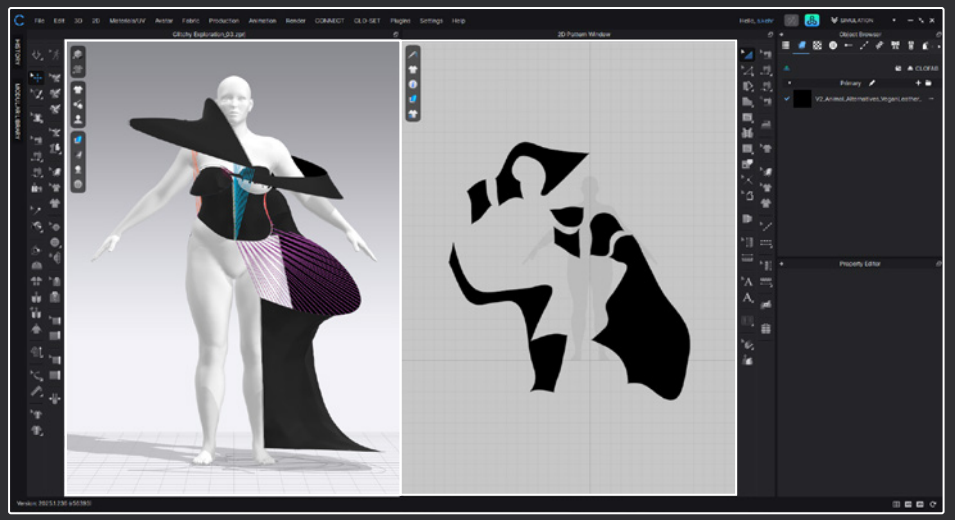


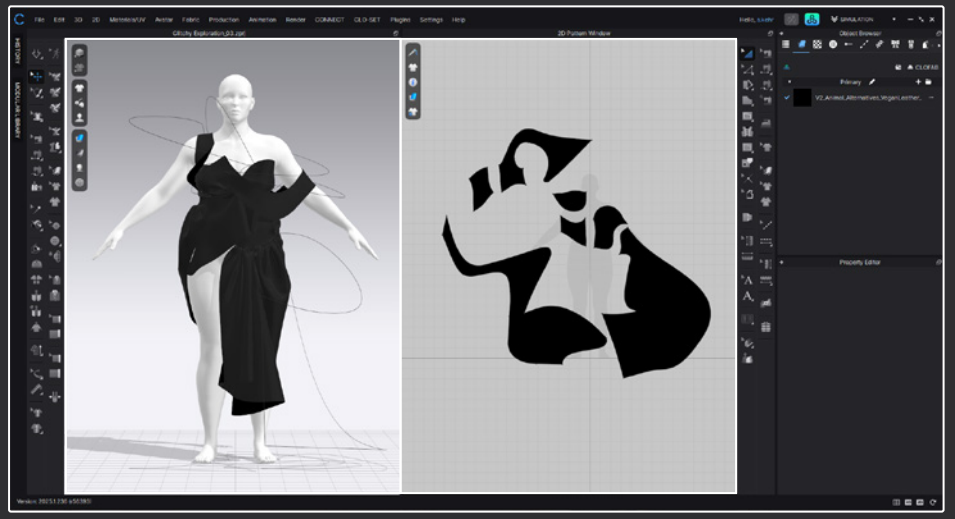
Once the shapes had been created, the Flatten operation was initiated – a *CLO* recognition process in which the software evaluates whether the drawn 3D shapes can be translated into 2D pattern pieces. Fortunately, this time the software agreed to cooperate on the first try, which is not necessarily always the case.



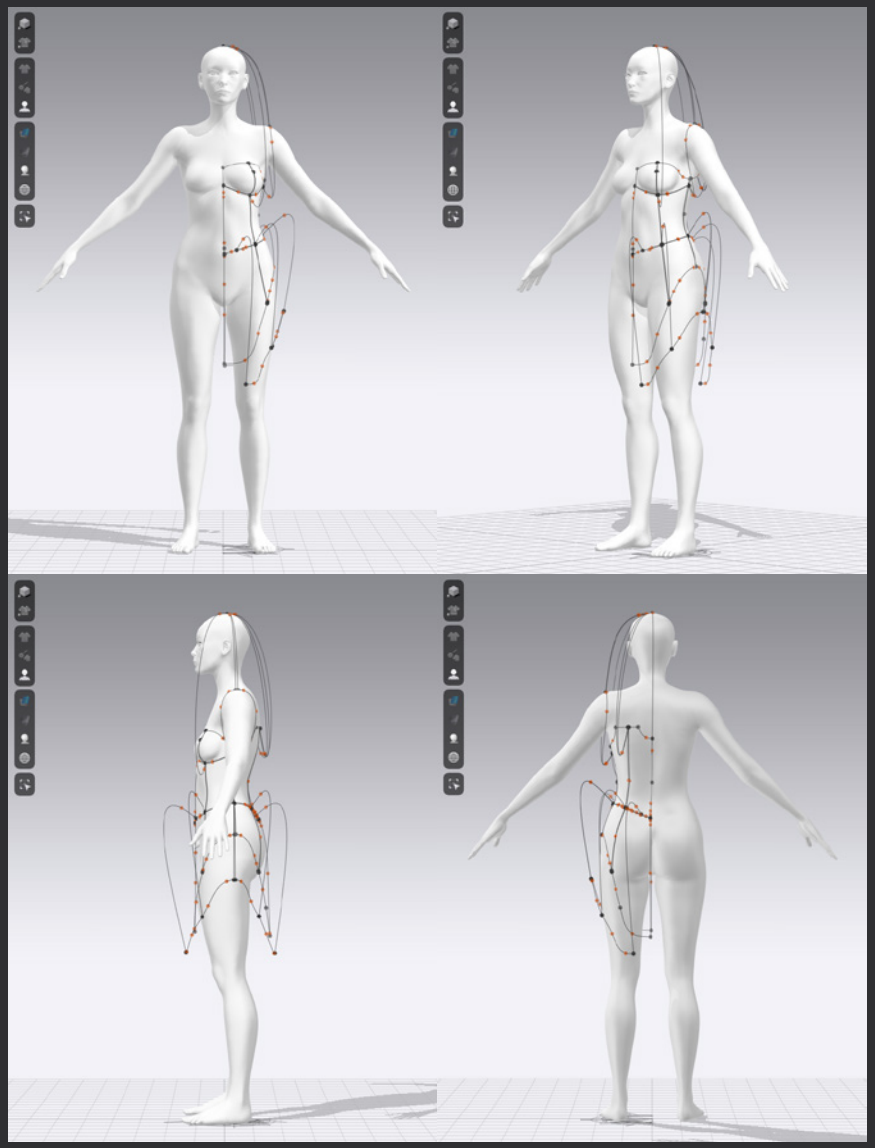
By pressing ENTER, *CLO* generated the corresponding pattern pieces, which instantly appeared in both the 2D and 3D workspaces.

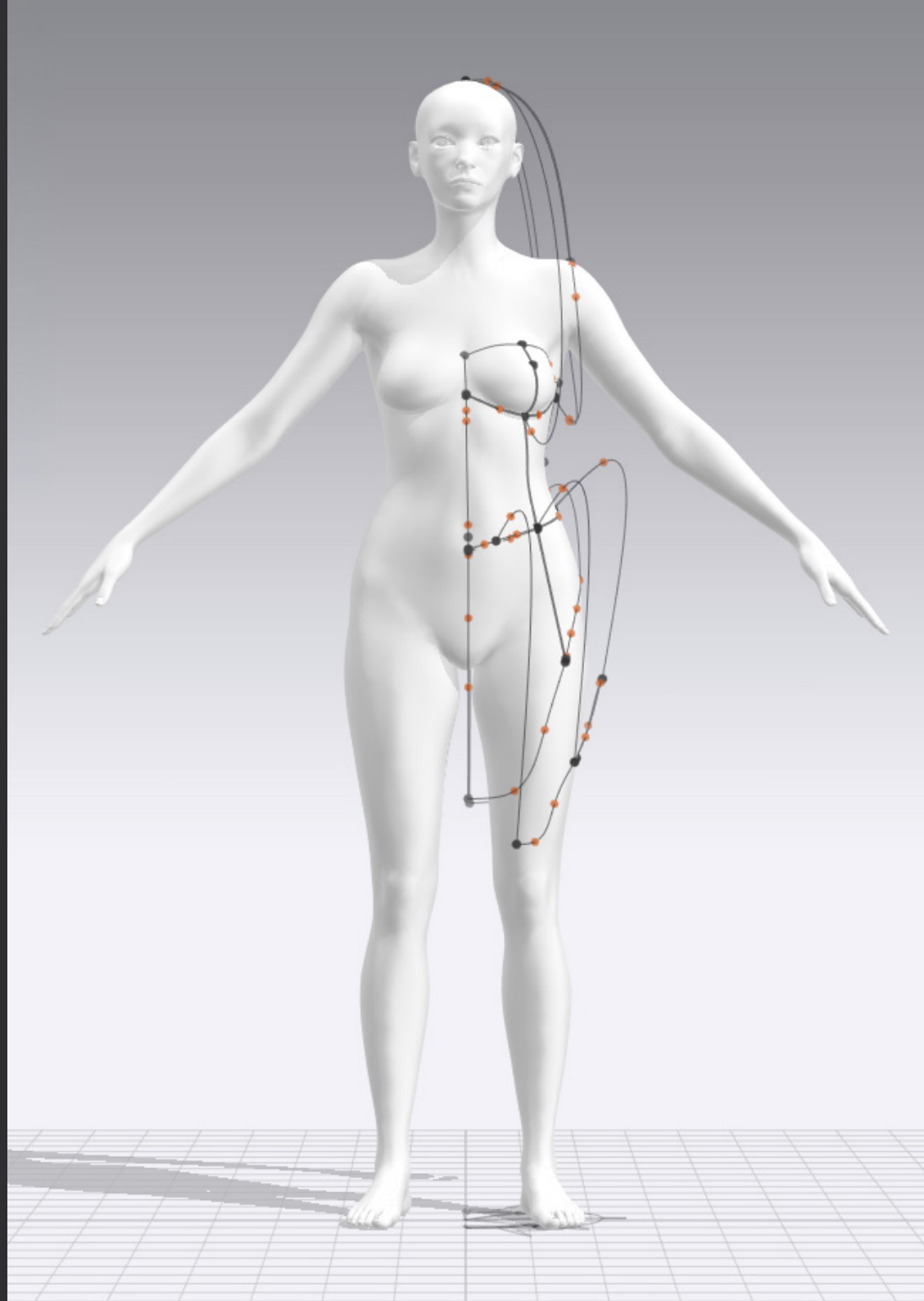
The following process required manually sewing the pattern pieces together, here, working with the Free Sewing tool in *CLO*, tracing the lines of pattern pieces to tell the software where a seam needs to be. A few adjustments followed, including some slight alterations to the patterns and seam corrections to several pattern pieces that appeared somewhat out of place within the overall composition.



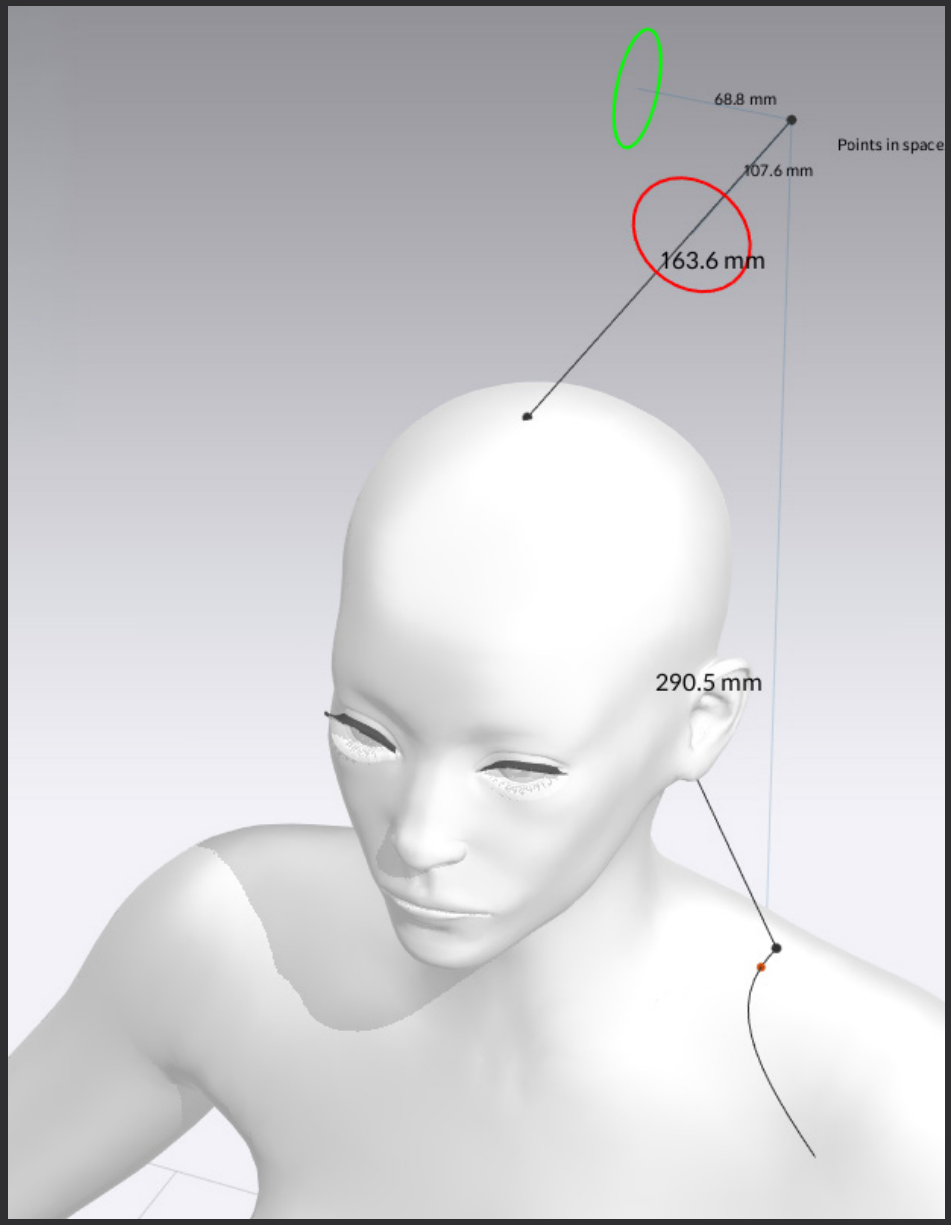


The second exploration, on the other hand, followed a more deliberate approach and was initiated with a clearer idea of a garment to be created, which consequently required more prior knowledge of pattern construction and a closer engagement with the virtual fashion body. Most points were placed on the body's surface with intention: however, not every point.

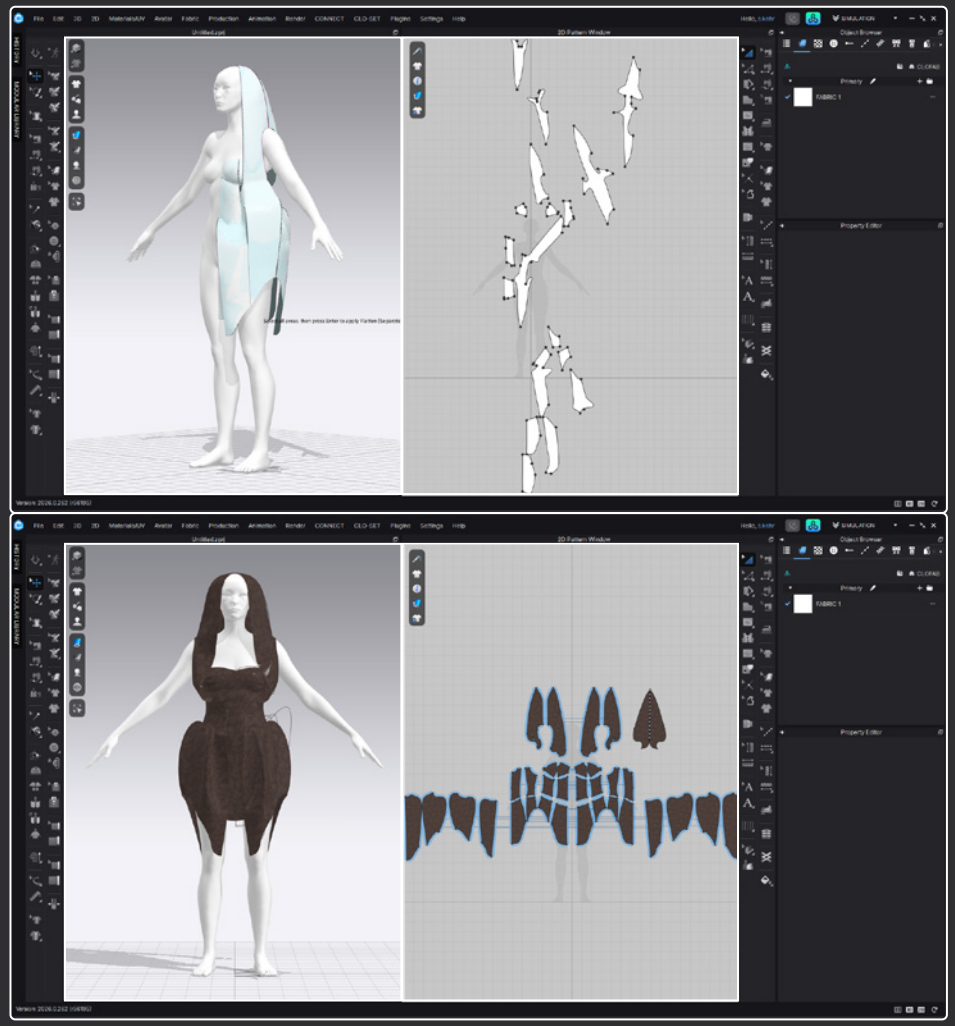




During a lapse of concentration, one point accidentally landed on top of the head, which prompted a brief pause for consideration – and perhaps mild confusion – but in the end, it remained in place and was incorporated into the garment as a headpiece.



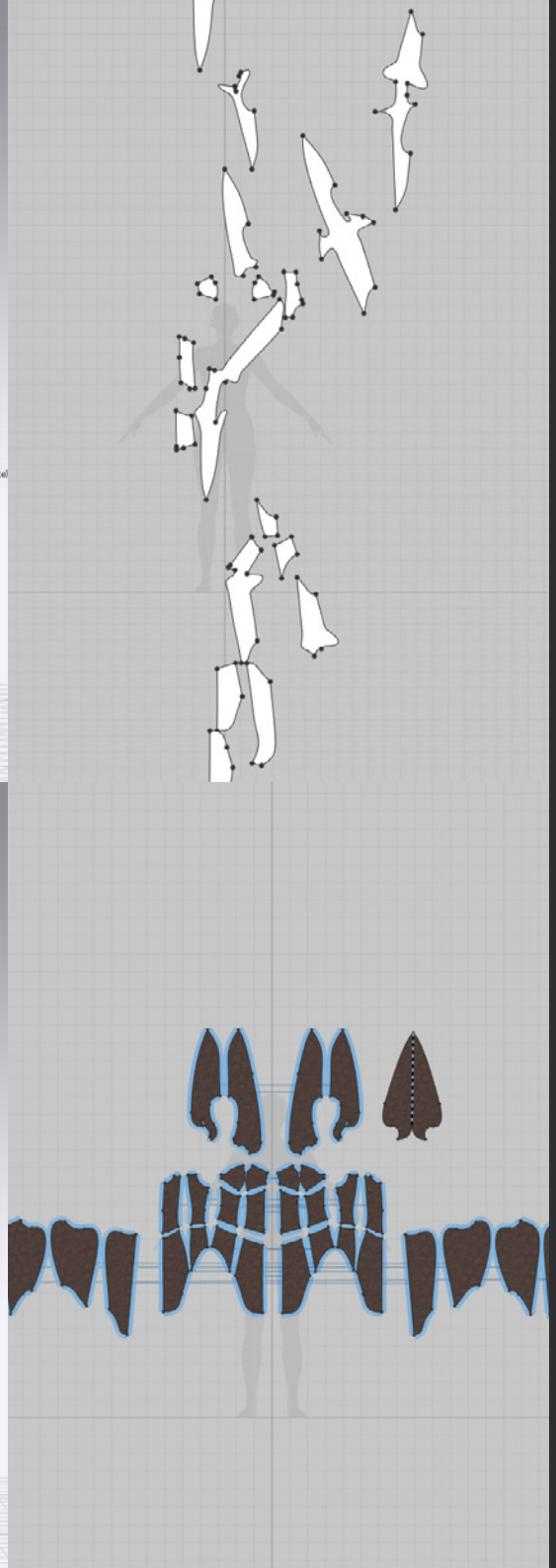
Interestingly, the flattening process in the second approach produced considerably more friction. Unlike the previous exploration, the software translated the drawn shapes into unfamiliar forms and chaotically placed pattern pieces that differed greatly from what I had intended the forms to be interpreted.



How exactly the software arrived at these interpretations remained largely unclear and required considerable manual correction within the 2D workspace before the garment could continue developing.







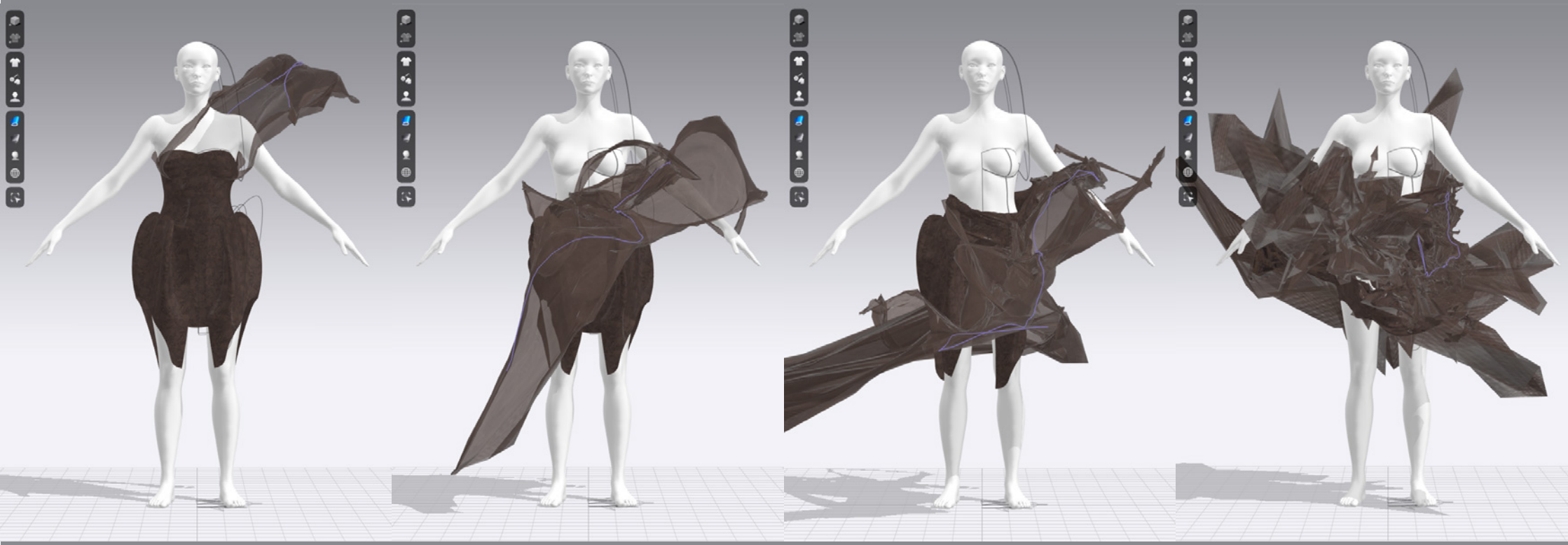
Both approaches, even though they may be quite different and require different levels of expertise in pattern making, demonstrate how agency can be distributed across virtual fashion practices, constantly shifting between the designer's intention, interface affordances, and software interpretations. The misplaced point that became a headpiece, the software's unexpected interpretation of shapes, and the need to respond to these outcomes all illustrate Karen Barad's concept of (distributed) agency particularly well. Agency emerges here through the interaction taking place upon the interface, much as Branden Hookway suggests. As a result, the process becomes difficult to fully predict or control. Rather than demonstrating human mastery over software, the exploration revealed a collaborative moment in which both human and non-human participants contributed to the outcome.

Ultimately, this entry is an encouragement to actively distribute agency between both participants, the human designer and *CLO* as the software – or any other software. Sometimes, the most interesting ideas emerge in the work with Glitches instead of considering them as failure. Because, paradoxically, it is often precisely the moments of destabilization, the inability to fully predict or control processes, which are able to produce some of the most engaging and joyful moments.

20: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.*
21: Halberstam, J. (2011). *The queer art of failure.*
22: Hookway, B. (2014). *Interface.*

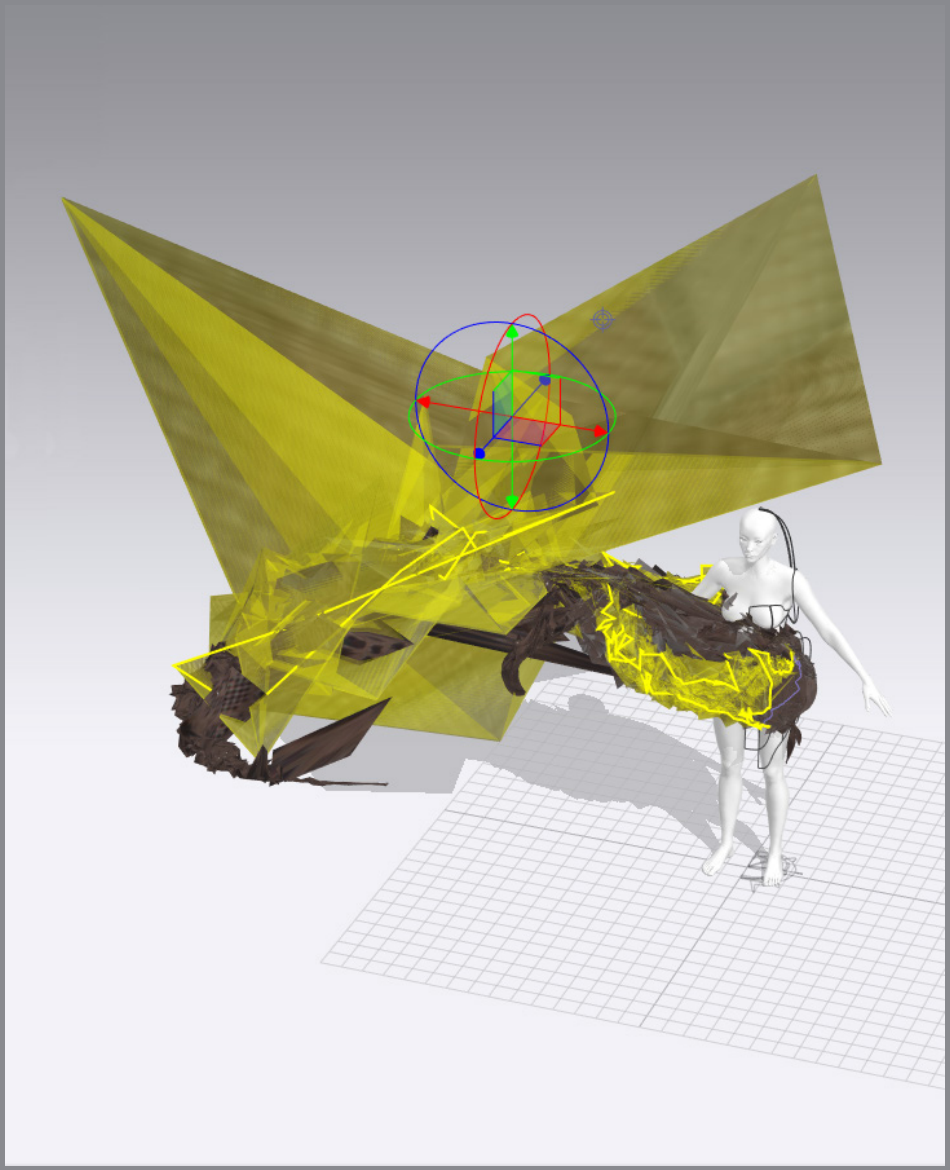
Interested in reading more about Karen Barad's concept of agency?
Browse to [A–I] AGENCY
Want to see a Glitch that followed this process?
Navigate to [E–I] EXPLODING GARMENTS
Looking for a broader explanation of Glitches as a research methodology?
See [G–I] GLITCHES TO THINK WITH
Looking behind the smooth surface of software interfaces?
Read [T–I] TO WORK WITH // INTERFACES

[E-I] EXPLODING GARMENTS

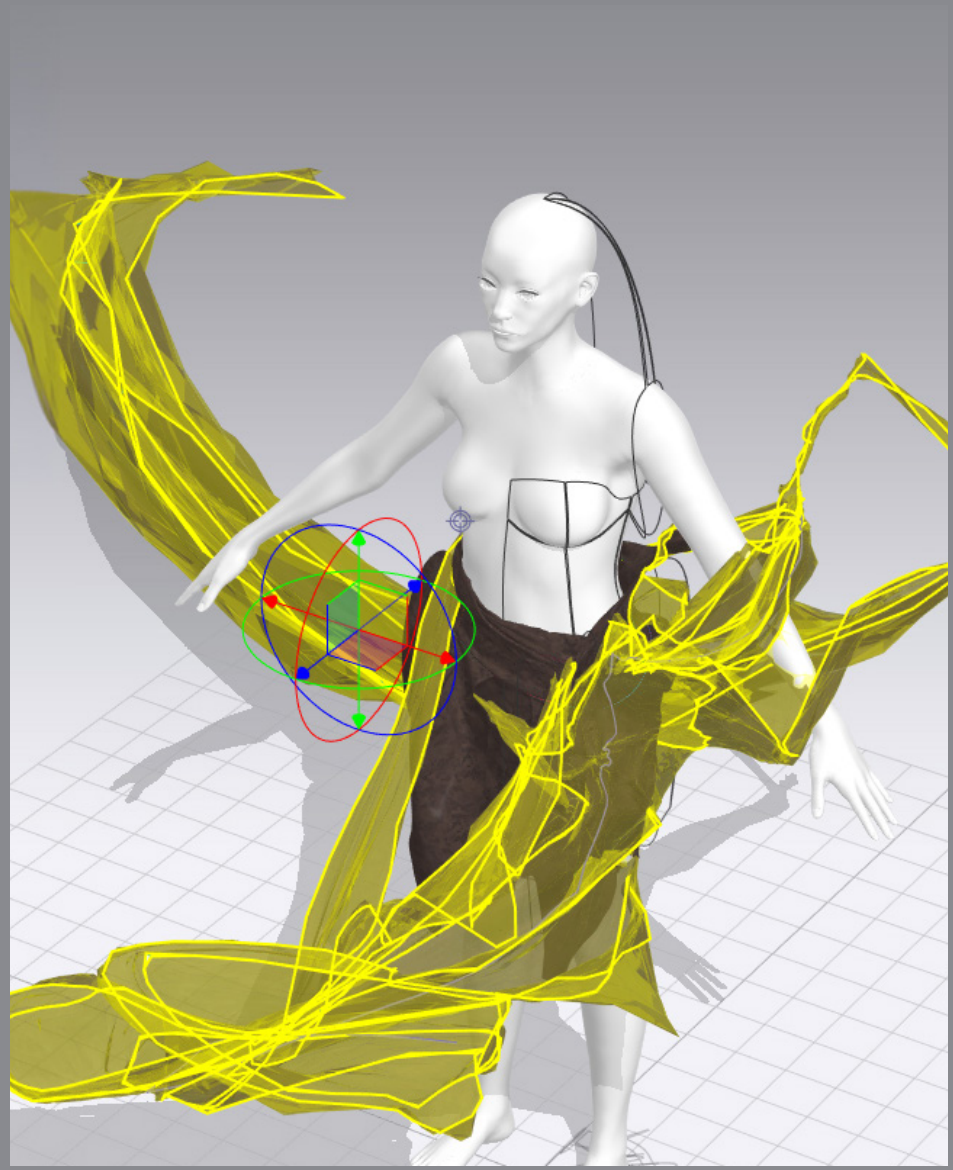


What you are witnessing here is a moment of pure chaos. All of a sudden, the virtual garment created within the 3D software began to explode and implode simultaneously, twisting itself into increasingly incomprehensible shapes until the software gave up entirely, crashed, and closed itself without further explanation.

The cause? A mystery. This particular Glitch does not occur very often, but since there is always a chance that someone, somewhere, will encounter a similar dramatic software meltdown, this entry stands in for the many different disruptions one might stumble upon.



Certainly, a system crash can be frustrating, but what it reveals, and how it might influence the design process, can be far more interesting than the crash itself. Watching fabrics distort around a virtual body until everything literally implodes usefully illustrates that, despite the dominant narratives in virtual fashion promising boundless creativity, the work is not without limitations.



The endless, seemingly immaterial possibilities of virtual creation remain constrained by the very material hardware the software is running on, and where the processing capacities reach its limits. What holds even greater potential, however, is the influence that an unexpected Glitch can have on the design process itself.





What finds practical application here is Donna Haraway's concept of *thinking with* and *working with(in)*. Rather than being left frustrated by the exploding dress, a Glitch offers an exciting opportunity to pause for a moment, observe, and engage with what is unfolding. Upon closer inspection, the distorted and unexpectedly interesting shapes that emerged during the explosion proved surprisingly inspiring and eventually led to the decision to add a veil to the dress at a later stage.

The software crash disrupted the design process, prompted reflection, exposed technical limitations, and generated new knowledge, all of which was made possible by thinking with a Glitch rather than simply trying to resolve it. Of course, not every exploding garment holds a design idea. But sometimes, somewhere between chaos and system failure, something more inspiring quietly emerges.

23: Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene.*

Want a more detailed explanation of why Glitches are approached this way?
Read [⊂–■] GLITCHES TO THINK WITH

[⌐■–■]

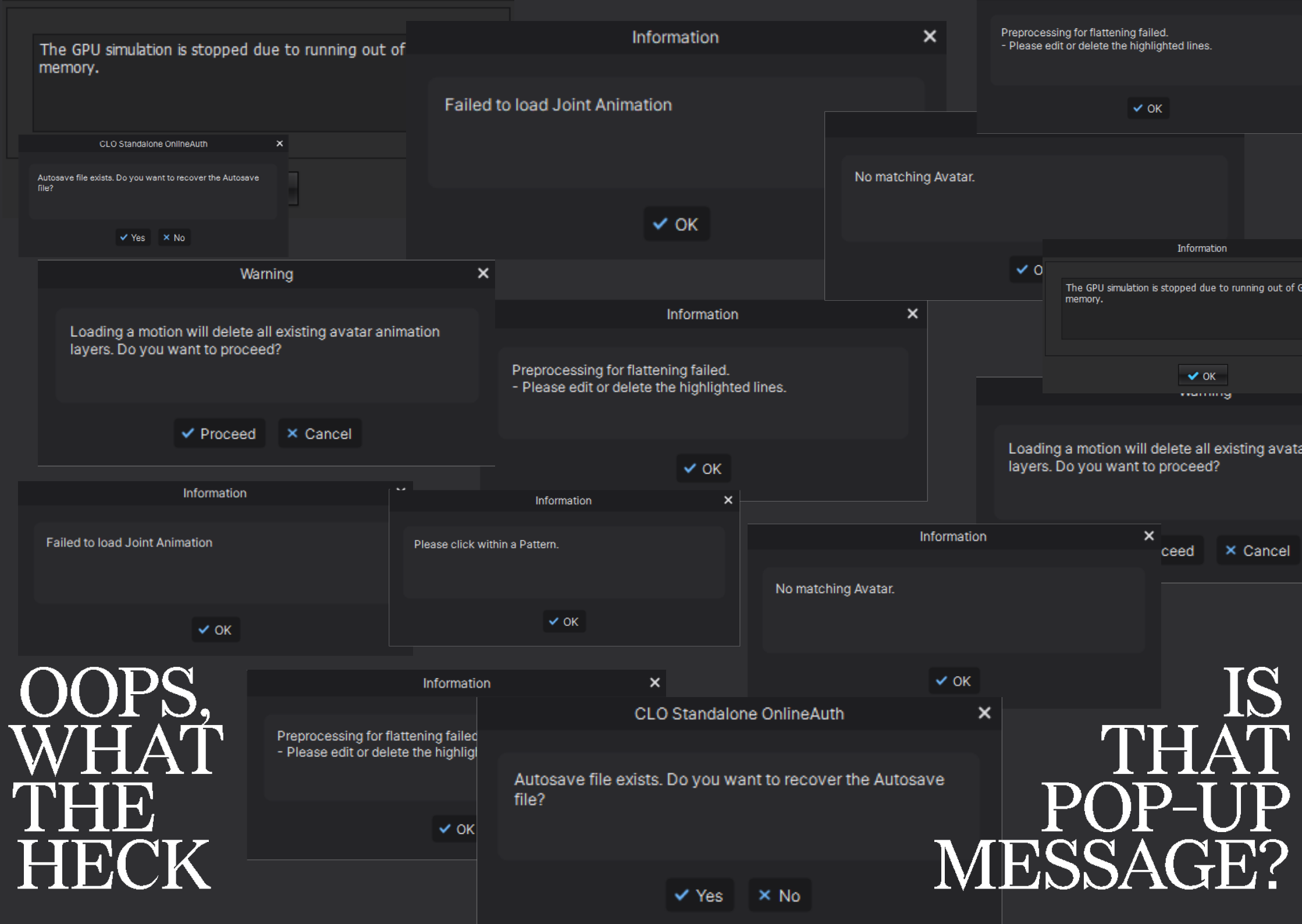
FRAGMENTED COMMUNICATION

Well, pop-up windows appear far more frequently in the work with 3D software than one might initially expect. They arrive suddenly, interrupting workflows and demanding immediate attention, often with messages ranging from mildly helpful to deeply mysterious. Some can be dismissed with a simple click. Others require a longer period of investigation, troubleshooting, and occasionally a desperate journey through online forums populated by people who seem to have encountered the exact same issue several years ago.

These interruptions, as annoying as they might be, can be surprisingly revealing. Whereas interfaces are typically designed to operate in the background as frictionless and invisible mediators, messages interrupt this apparent smoothness, rendering otherwise concealed operations partially visible through communicative fragments. The interface no longer disappears in seamless functionality, allowing the software to briefly step out from behind the curtain and announce its presence, pointing to something that demands attention, regardless of whether that attention was requested or not.

24: Callander, A. (2016). *Unable to establish a connection": Interpreting empathy within the interface.*
25: Kemper, J. & Jankowski, S. (2024). *Silicon Valley's frictionless future: The design philosophy of frictionlessness.*

A good chapter to follow up with?
Navigate to [⌐■–■] TO WORK WITH // INTERFACES


The GPU simulation is stopped due to running out of memory.
Information
Failed to load Joint Animation
OK
Preprocessing for flattening failed.
- Please edit or delete the highlighted lines.
OK
CLO Standalone OnlineAuth
Autosave file exists. Do you want to recover the Autosave file?
Yes
No
No matching Avatar.
Warning
Loading a motion will delete all existing avatar animation layers. Do you want to proceed?
Proceed
Cancel
Information
Preprocessing for flattening failed.
- Please edit or delete the highlighted lines.
OK
Information
The GPU simulation is stopped due to running out of memory.
OK
Loading a motion will delete all existing avata
layers. Do you want to proceed?
ceed
Cancel
Information
Failed to load Joint Animation
OK
Information
Please click within a Pattern.
OK
Information
No matching Avatar.
OK
Information
Preprocessing for flattening failed
- Please edit or delete the highligl
OK
CLO Standalone OnlineAuth
Autosave file exists. Do you want to recover the Autosave file?
Yes
No
OOPS, WHAT THE HECK
IS THAT POP-UP MESSAGE?

[G–I] GLITCHES TO THINK WITH

As already hinted at in the title of the handbook, Glitches play a central role throughout these pages. The emphasis, however, is less on technical malfunctions and more on exploring their possibilities as a research methodology and a way of thinking. Within this handbook, Glitches function as an umbrella term for disruptions encountered in the work with 3D (fashion) software, for irritations, or contradictions stumbled upon in the field of virtual fashion. In essence, a threshold that invites further attention and exploration.

> The word itself possibly derives from the Yiddish term *glitsh*, which refers to a slippery place or slippery condition and already suggests a far more layered meaning. The idea of slipperiness gestures toward unpredictable movements – slipping across various observations, theories, and disciplines, offering a research approach guided by glitchy encounters and holding the potential to open up a multitude of research questions and topics that may not seem connected at first glance.

Of particular significance in supporting this approach are the theoretical concepts of feminist thinkers Karen Barad and Donna Haraway, both of whom offer valuable theories for recognizing the meanings and connections between all the different glossary entries in the *Glitchy Virtual Fashion Handbook*. In *Meeting the Universe Halfway,* Barad describes a *diffractive* methodology as a practice of mutually interpreting insights while remaining attentive to differences and interconnections. More importantly, Barad encourages engaging directly with the world rather than observing it from a safe distance, because knowledge does not simply emerge at the margins, but through actively working with it, and often in moments when things do not go quite as expected.

Similarly, in her book *Staying with the Trouble*, Haraway proposes a practice of *tentacular thinking* that embraces the complexity of interconnected experiences, practices, and modes of thinking. Particularly important for this project is the concept of *thinking* and *working with* others, whether human or non-human matter – a conceptual framework that challenges anthropocentric assumptions that the creation of meaning and the production of knowledge are exclusively human endeavors. Nevertheless, this destabilization by no means implies a release from responsibilities, but it does make things considerably more crowded around the decision-making table.

> It is precisely these two dimensions of Glitch(es) as an unpredictable research methodology, combined with a diffractive attentiveness, to *think with* and to be *worked with(in)* although they are mostly not initially intended to be worked with. Let's keep this in mind as we read through the *Glitchy Virtual Fashion Handbook*: Glitches can be valuable sources of disruptive ideas and offer great potential for generating new knowledge when they occur in unexpected, slippery encounters and create space for lively exploration that can flourish precisely because the findings couldn't be anticipated.

> Various entries in the handbook are sprinkled with screenshots documenting practical explorations, tracing encounters with Glitches, opening multiple subjects ranging from minor absurdities in the work with(in) 3D (fashion) software to more critical structures in contemporary virtual fashion practices, and it is this very multiplicity of differences which forms a valuable coexistence.

26 Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.*
27: Halberstam, J. (2011). *The queer art of failure.*
28: Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene.*
29: Merriam-Webster. (n.d.). *Merriam-Webster.com dictionary.*

Explore Curious about a different, but equally important, threshold? [■–■] TO WORK WITH // INTERFACES

SIMULATION EQUALS ITERATION

Simulation processes – especially garment simulations on a moving body – rarely unfold as neat, linear processes. Instead, they tend to be highly iterative. While *CLO* performs remarkably well in replicating the physical properties of fabrics and their behaviors in motion, virtual garments nevertheless respond differently in comparison to their material counterparts; it might be best described as an approximation of physical properties by the software engines, calculating countless invisible parameters behind the interface.

In this exploration, the created dress was initially left unaltered in order to observe how it would behave under default conditions. Unsurprisingly, the virtual garment promptly slid off the virtual body and began collapsing toward the floor Apparently, gravity was having a particularly good day.







To prevent the dress from abandoning the virtual body altogether, *CLO's* Tacking tool was introduced. This tool allows the virtual garments to be attached either to specific points on the body or to other parts of the garment. Yet solving one probleam quickly revealed another.



During the next attempt, the hand repeatedly collided with the dress, creating new distortions and unexpected deformations. What followed was a series of simulation attempts, each involving slightly different tacking placements, adjustments, and observations. Only after roughly six attempts did the animation finally reach a state that could be cautiously described as satisfactory.



Working with *CLO* may not amount to a full human-software merger just yet, virtual fashion practices nevertheless involve a gradual and often unconscious adaptation to the logic of the 3D software. Examining this process more closely reveals how much producing a desired outcome depends on *thinking with* and *working with* the software. It is less a matter of issuing commands and expecting obedience from the software, rather it requires an understanding how the software simulates physical properties and the movements of the fabric, to be able to adapt one's own way of working to the software affordances.

A final simulation therefore does not emerge through mastery or complete control. Rather, it is the result of lengthy, iterative negotiation processes between human intentions and the simultaneous possibilities and limitations of the software. Agency remains distributed throughout the entire process and shifts continuously back and forth between the designer and the software. Both sides impose different demands, and neither is entirely in charge. The final result emerges somewhere in between – a product of collaboration, compromise, and a surprising amount of negotiation with a virtual dress.

30: Hayles, N. K. (2012). *How we think: Digital media and contemporary technogenesis.*
31: Särmäkari, N. & Vänskä, A. (2022). *"Just hit a button!" – fashion 4.0 designers as cyborgs,experimenting and designing with generative algorithms.*

Navigate to Wondering why the software gets a say, too? [A–■] AGENCY

TO WORK WITH // INTERFACES

This entry takes a closer look at working with 3D (fashion) software, focusing in particular on interfaces and their connection to Karen Barad's concept of agency.

Simply put, this handbook considers an interface to be the very threshold that makes working with 3D software possible in the first place. It enables interaction between the human and the software; it is designed and promised to function as seamlessly as possible, fading into the background while simultaneously concealing most of the underlying processes beneath its surface. In fact, a "good" interface is often designed to disappear entirely, allowing us to focus on the task at hand rather than on the technology itself. We click, drag, zoom, and rotate, while in the background, thousands of calculations run quietly and invisibly, hopefully doing what they are supposed to do.

Branden Hookway offers a particularly interesting perspective on interfaces. Rather than defining an interface simply as a piece of technology, he describes it as a way of being put into relation with technology. More importantly, he argues that agency unfolds within the interface, and this idea forms a wonderful bridge to Karen Barad's notion of agency, that they describe as emerging through relations rather than preceding them.

> When learning, and possibly even attempting to master an interface, Hookway further argues, a process of simultaneous subjectification takes place in which the subject of the interface finds its counterpart in the human being. Taking this seriously, interfaces can be understood as distinct entities with their own characteristics and, occasionally, stubborn behaviors, that at once maintain a distinction to the software while creating and mediating forms of mutual interaction. More precisely, according to Barad's understanding, both entities come into being exactly through their relations. In these very moments, we share our agency with the software we work with.

Despite, or perhaps precisely because of, the distinctive characteristics of interfaces, working with 3D software holds considerable potential for friction and disruption, and often does not go as smoothly as promised. This is where Glitches become particularly interesting. Whether it is a pop-up window suddenly demanding attention, a misplaced point appearing somewhere entirely unintended, or a simulation deciding to behave in unexpected ways, such moments interrupt the workflow and make visible what usually remains hidden. Glitches point out how agency is distributed between human and software, while also uncovering the software's affordances: the possibilities and limitations built into its design, and the ways interfaces quietly structure interaction.

For this reason, the *Glitchy Virtual Fashion Handbook* deliberately refers to *working with* software rather than using it. This small linguistic shift acknowledges that 3D (fashion) software is more than a passive tool carrying out human intentions. It actively participates in shaping the process of creating virtual fashion, with the interface functioning as an important actor in that relationship. Agency, therefore, does not exclusively belong to the human designer but emerges through the interaction taking place upon the interface. Sometimes that interaction runs smoothly. Sometimes it results in a Glitch. Either way, both have something valuable to teach us.

32: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.*
33: Hadler, F., & Haupt, J. (2016). *Towards a critique of interfaces.*
34: Hookway, B. (2014). *Interface.*
35: Retzepi, K. (2019). *You, the users.*

Want more Barad?
Navigate to [A–■] AGENCY
Interested in the interface?
See [C–■] CLO
How does agency unfold in practice?
Go to [D–■■■] DISTRIBUTED AGENCY IN PATTERN-DRAFTING
[S–■■] SIMULATION EQUALS ITERATION
Wondering about those pop-messages?
Navigate to [F–■] FRAGMENTED COMMUNICATION
Looking for another threshold?
Head over to [G–■] GLITCHES TO THINK WITH

[V–II] VIRTUAL (FASHION) BODIES

In the field of virtual fashion and within 3D (fashion) software, there is surprisingly little agreement on what to call the bodies on which virtual garments are designed. Depending on the software, they may be referred to as "avatars", or "figures". *CLO*, for example, uses the term avatar. While this terminology seems intuitive at first glance, this handbook deliberately adopts the term "virtual (fashion) body" instead.

> Why? The term avatar tends to evoke images of animated stand-ins, a virtual replica of a person – which can be traced back to its origins in virtual environments and video games. Whereas the term figure may bring them a step closer to being recognized as bodies, but it still feels somewhat incomplete. Both terms seem insufficient to describe the significance they occupy in virtual fashion practices, given that these bodies do far more than simply stand there representatively, waiting to be dressed. The creation of virtual fashion – designing a pattern in the software's 2D window, draping the garment around the virtual body in 3D space, adjusting and fitting the virtual garment – is inextricably linked to a sustained engagement with the virtual fashion body. Virtual garments depend on virtual bodies; removing the body entirely causes the garment to lose its structure and literally collapse into formlessness.

Stepping away from the software for a moment and looking at virtual fashion imagery, specifically those in which the virtual body has been removed, leaving only the virtual garment visible. And yet the body has never completely disappeared. The shape

of the virtual garment preserves the body's shape, implicitly continues to reveal the virtual body it once enveloped. Fashion theorist Karen de Perthuis describes a similar phenomenon in fashion photography, in which a (human fleshy) body is turned into the substance of a garment. In virtual fashion, that perhaps occurs even more intensely due to the absence of any fleshy substance. In their synthesis, both are perceived as one product, as seemingly immaterial objects that nevertheless direct attention to virtual fashion as the apparently more valuable product, even though its existence depends on the body.

> Consequently, this entry proposes a terminological intervention, because the language we use shapes how we think about things and how we interact with them in practice. Posthuman thinkers such as Rosi Braidotti and Astrida Neimanis offer fascinating perspectives, arguing for the recognition of technologically created beings as agential matter, among which I count virtual (fashion) bodies. This is not to claim that virtual bodies are conscious beings, but rather to acknowledge their significance and importance in working with 3D software, and thus to allow virtual fashion to come into existence in the first place – hopefully challenging the view of virtual (fashion) bodies merely as objects to simply work on.

36: Braidotti, R., & Hlavajova, M. (2018). *The posthuman glossary.*
37: de Perthuis, K. (2005). *The synthetic ideal: The fashion model and photographic manipulation.*
38: Merriam-Webster. (n.d.), *Merriam-Webster.com dictionary.*
39: Neimanis, A. (2018). *Material feminisms.*

Want to know more about agential matter?
Read [A–■] AGENCY
Curious how a virtual fashion body is worked with?
Navigate to [C–■] CLO
Ready to continue this discussion??
Go to [V–■■■] VIRTUAL (FASHION) BODIES IN COLLISION

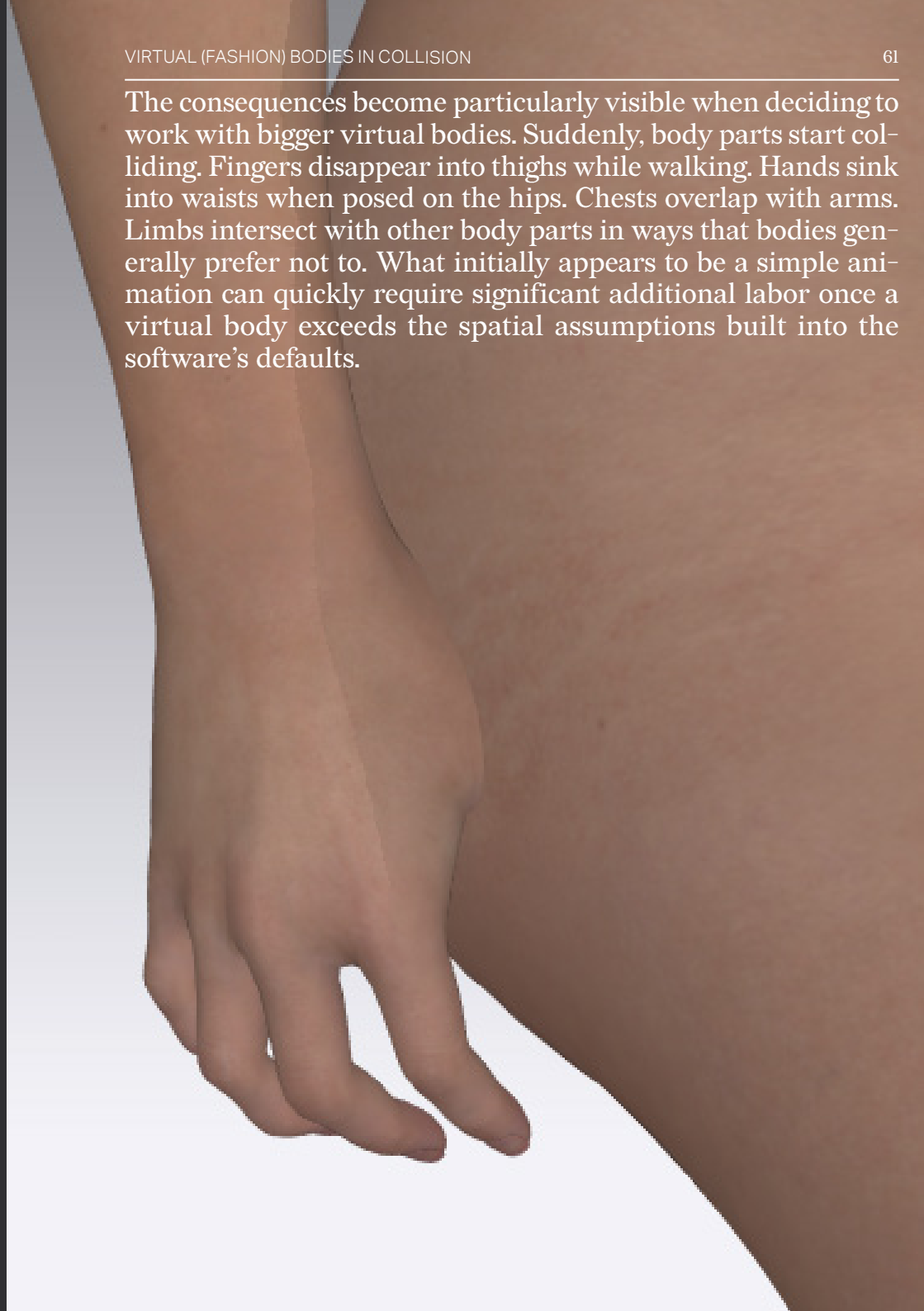
VIRTUAL (FASHION) BODIES IN COLLISION

Let's kick things off with a strong statement: No technological system is ever truly neutral. The colliding Glitches we'll encounter in the following pages offer an important critique of the infrastructure of both the (virtual) fashion system and the software. And unfortunately, this critique is uncomfortable.

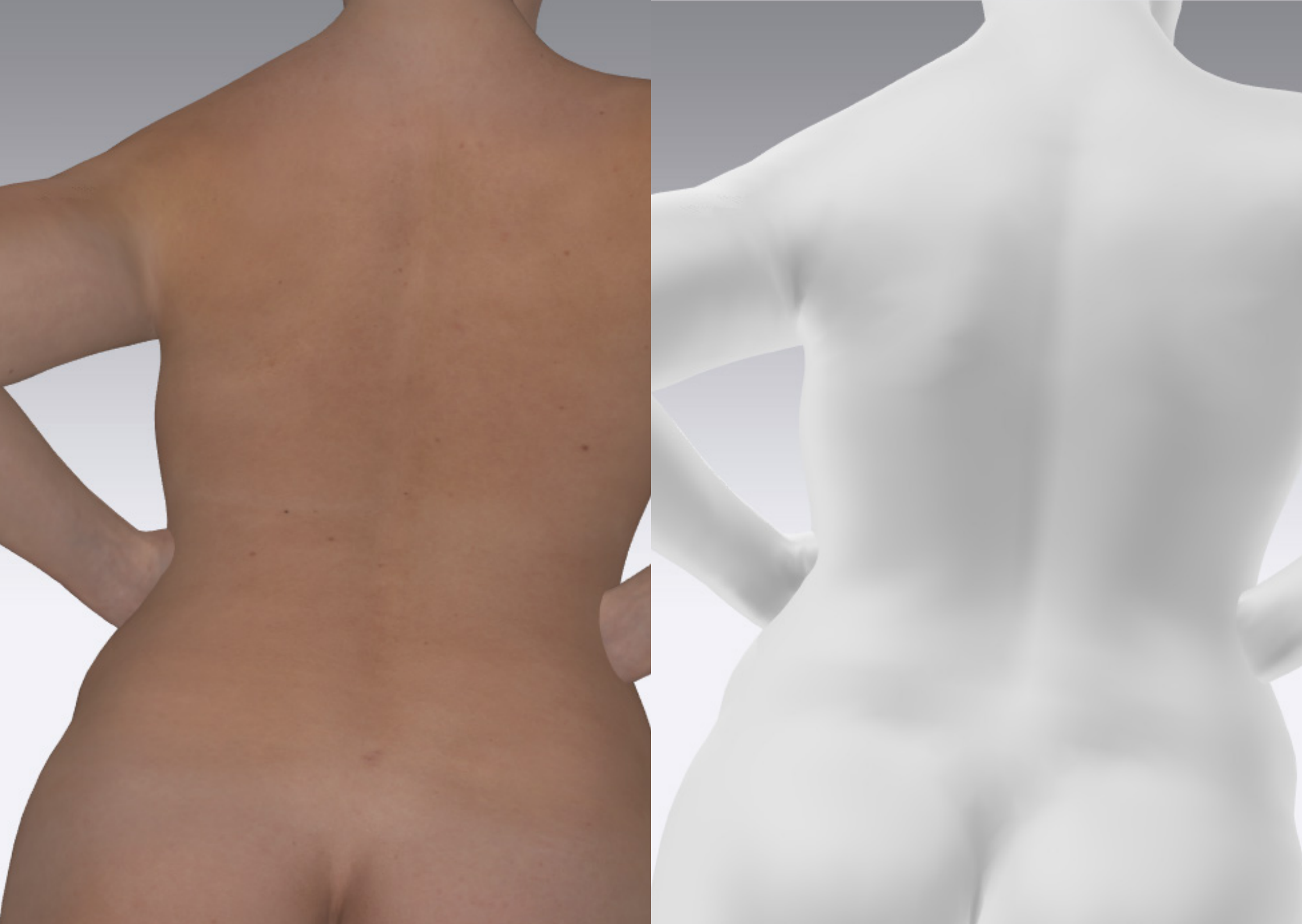
A quick glance at images and animations of virtual fashion circulating across social media platforms reveals a striking homogeneity in the representation of bodies, predominantly privileging fashionable bodies – young, skinny, smooth-skinned, and white. These virtual bodies often seem to serve the gaze of fashion and are designed primarily for visual consumption by the human eye, which hardly differs from what is observed in dominant fashion systems.

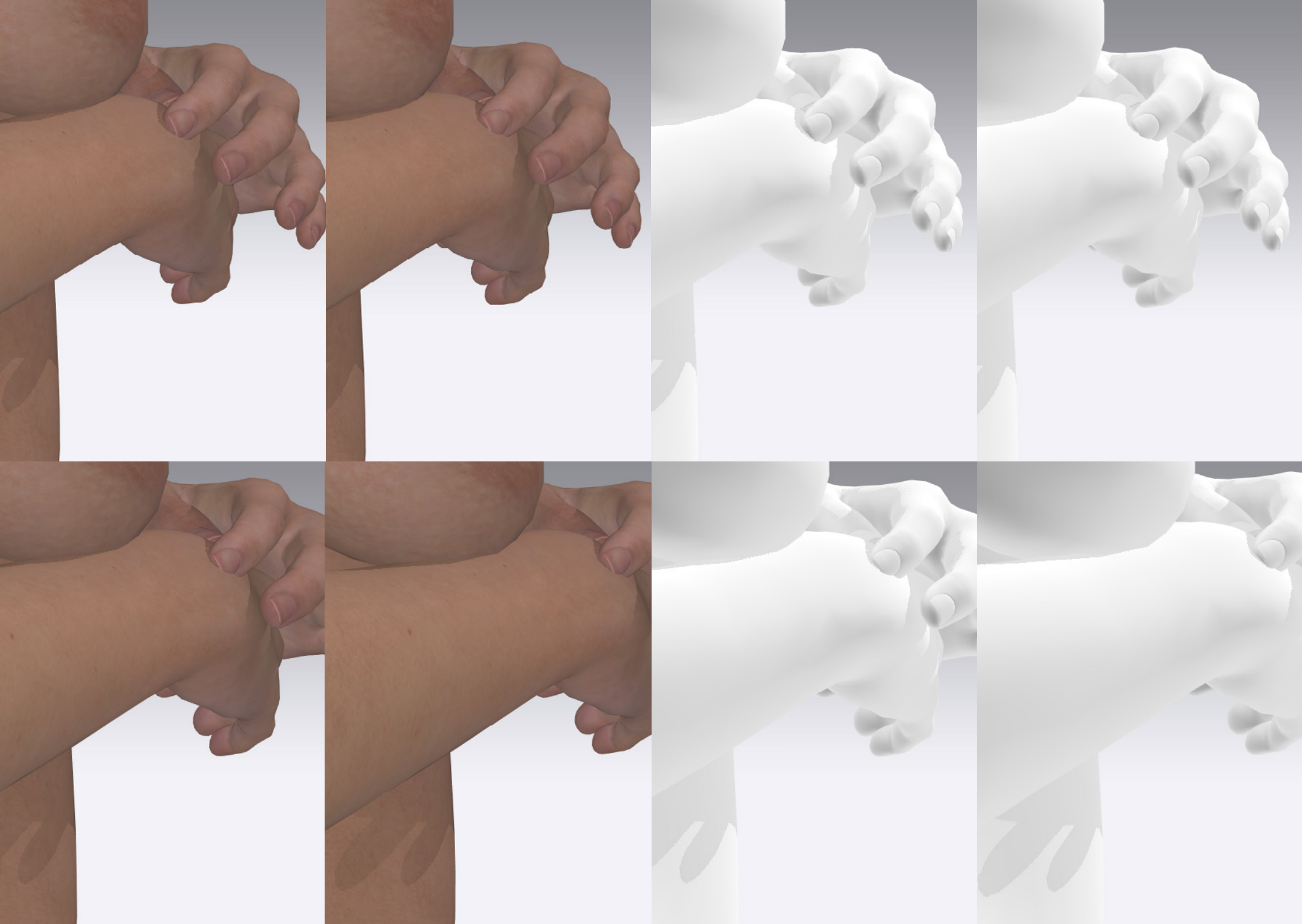
The issue, however, extends beyond representation. Not only are virtual bodies often designed according to narrow ideals, but many of the systems through which they move are also tailored exclusively to skinny bodies. Across a wide range of 3D software, default poses, animations, and simulation processes are typically built around a very specific body type: the thin, idealized fashion body.

The consequences become particularly visible when deciding to work with bigger virtual bodies. Suddenly, body parts start colliding. Fingers disappear into thighs while walking. Hands sink into waists when posed on the hips. Chests overlap with arms. Limbs intersect with other body parts in ways that bodies generally prefer not to. What initially appears to be a simple animation can quickly require significant additional labor once a virtual body exceeds the spatial assumptions built into the software's defaults.









Here, the colliding Glitch reveals itself as a valuable lesson, exposing the hidden assumptions embedded within the software itself. We must remind ourselves once again that no technology is ever neutral. From the very beginning, the system was designed to accommodate only a certain type of body, thereby (co-)fashioning virtual bodies and forcing them into thinness as a default condition. Virtual bodies deviating from the fashionable ideal become inconveniences that the system struggles to process smoothly. Behind the promises of unlimited representational possibilities in virtual spaces, Esmay Wagemans argues, lies the reality that "their underlying structures privilege certain bodies (...) over others".

40: de Perthuis, K. (2005). *Fashion Theory.*
41: Fedorova, A. (2022, September 6). *Our Digital Selves – From Chat Rooms to the Metaverse.*
42: Wagemans, E. (2025). *From Cyberfeminism to code control: Cyborg fashion under the technological gaze.*
43: Wajcman, J. (2004). *Technofeminism.*

Curious about defaults?
Navigate to [D-I] DEFAULT CONDITIONS
Want to continue this discussion?
See [V-II] VIRTUAL (FASHION) BODIES

[W-I] WRAPPING UP

Thank you for slipping through the *Glitchy Virtual Fashion Handbook*. Hopefully, somewhere along the way, the various Glitches opened unexpected paths, allowed minor absurdities to coexist with critical reflections, and made the increasingly expanding and sometimes confusing field of virtual fashion feel a little less intimidating – and perhaps a little more enjoyable.

Rather than offering clear answers or conclusions, this handbook has hopefully encouraged a different way of paying attention. *Thinking with(in)* Glitches invites attentiveness toward disruptions, contradictions, and entanglements, recognizing them not simply as failures to overcome but as opportunities to ask different questions. In doing so, the handbook has attempted, through many small interventions, to gently challenge anthropocentric assumptions and dominant imaginaries of virtual fashion, while never forgetting that working with software should also remain engaging and fun.

As Jack Halberstam reminds us, Glitches do not need to be understood as failure in the conventional sense, but rather as "unbounded forms of speculation, modes of thinking that ally not with rigor and order but with inspiration and unpredictability". Glitches embody precisely this possibility. They reveal the fragility of human mastery of software, creating unexpected detours that allow us to recognize the significance of all the agency we collectively exercise in the creation of virtual fashion, and to allow the emergence of different forms of knowledge and meaning through slippery encounters. Sometimes the most productive moment is precisely the one that wasn't part of the plan.

Like the field of virtual fashion itself, this handbook remains unfinished. New Glitches will appear, and new questions will undoubtedly follow. Hopefully, these pages have offered a small collection of vocabularies, ideas, and companions for continuing that journey through all the complexities of the world of virtual fashion –with a little more attentiveness, a little more curiosity, and a little more patience.

44: Halberstam, J. (2011). *The queer art of failure.*

[INDEX] ALL GATHERED SOURCES TO THINK WITH

[A–■] AGENCY
09: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.
10: Braidotti, R. (2022). *Posthuman feminism*. Polity Press.
11: Neimanis, A. (2018). Material feminisms. In R. Braidotti, & M. Hlavajova (Eds.), *The posthuman glossary* (pp. 242–243). Bloomsbury.

[C–■] CLO
12: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.
13: CLO Virtual Fashion (n.d.). Retrieved June 10, 2026, from https://www.clo3d.com/en/.
14: Hookway, B. (2014). *Interface*. MIT Press.

[D–■] DEFAULT CONDITIONS
15: Haraway, D. J. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, 14(3), 575–599. https://doi.org/10.2307/3178066.
16: Wajcman, J. (2004). *Technofeminism*. Polity Press.
17: Wagemans, E. (2025). From Cyberfeminism to code control: Cyborg fashion under the techno logical gaze. *IMAGE. Zeitschrift für interdisziplinäre Bildwissenschaft*, 42(2), 274–292. https://doi.org/10.1453/1614-0885-2-2025-16677.

[D–■■] DELEUZIAN VIRTUALITY
18: Deleuze, G. (1991). *Bergsonism*. (H. Tomlinson & B. Habberjam, Trans.). Zone Books. (Original work published 1966).
19: Shield, R. (2003). *The virtual*. Routledge.

[D–■■■] DISTRIBUTED AGENCY
20: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.
21: Halberstam, J. (2011). *The queer art of failure*. Duke University Press.
22: Hookway, B. (2014). *Interface*. MIT Press.

[D–■] EXPLODING GARMENTS
23: Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.

[F–■] FRAGMENTED COMMUNICATION
24: Callander, A. (2016). "Unable to establish a connection": Interpreting empathy within the interface. In F. Halder & J. Haupt (Eds.), *Interface critique* (pp. 207–222). Kulturverlag Kadmos.
25: Kemper, J., & Jankowski, S. (2024). Chapter 18 Silicon Valley's frictionless future: The design philosophy of frictionlessness. In V. Fors, M. Berg, & M. Brodersen (Eds.), *The De Gruyter handbook of automated futures: Imaginaries, interactions and impact* (pp. 287–302). De Gruyter. https://doi.org/10.1515/9783110792256-018.

[G–■] GLITCHES TO THINK WITH
26: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.
27: Halberstam, J. (2011). *The queer art of failure*. Duke University Press.
28: Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.
29: Merriam-Webster. (n.d.). *Glitch*. In Merriam-Webster.com dictionary. Retrieved June 3, 2026, from https://www.merriam-webster.com/dictionary/glitch.

[S–■] SLIPPING IN
01: Halberstam, J. (2011). *The queer art of failure*. Duke University Press.

[S–■■] SIMULATION EQUALS ITERATION
30: Hayles, N. K. (2012). *How we think: Digital media and contemporary technogenesis*. University of Chicago Press.
31: Särmäkari, N., & Vänskä, A. (2022). *"Just hit a button!" – fashion 4.0 designers as cyborgs, experimenting and designing with generative algorithms. International Journal of Fashion Design, Technology and Education,* 15(2), 211–220. https://doi.org/10.1080/17543266.2021.1991005.

[T–■] TO WORK WITH // INTERFACES
32: Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.
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Footnote for CLO interface instruction

To make the handbook a little more pleasant to browse, some screenshots of the software interfaces have been slightly adapted for graphic design purposes. Colors and cropping may therefore differ from the original interface. However, no interface elements, layouts, tools, or software functionalities have been distorted – the screenshots remain faithful representations of the original software.

