

METAMORPHOSIS

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TITLE

SUBJECT

DATE



Identity Circuitry Between Digital And Flesh

IDENTITY DIAGNOSTIC REPORT

Digital-Psycho-Physical Analysis by Subjective Simulation Authority

Location: Central Saint Martins

Case No: 20014490

SUBJECT PROFILE

NAME Kiska Shiyu Huang

RACE Chinese SEX Female AGE 24

OCCUPATION Postgraduate Researcher - Material Futures

SIMULATED SELF

Silicone Construct

Projected Avatar

OBSERVATION TRIGGERS

- External Touch Detection
- Voice Recognition
- Gesture Recognition
- Sensor Feedback
- Emotional Resonance

INTERACTION RESPONSE (SYSTEM LOG)

- Simulated Reaction Feedback
- Audio Response
- Glitch / Delay / No Response
- Unexpected Output



DIAGNOSIS SUMMARY

CATEGORY

STATUS

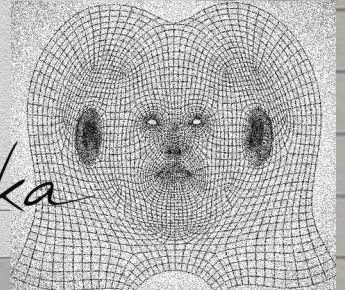
- | | | | |
|---------------------|---|---|---|
| Emotional Integrity | <input type="checkbox"/> Stable | <input type="checkbox"/> Fragmented | <input type="checkbox"/> Reconstructing |
| Identity Sync | <input type="checkbox"/> Real-Self Dominant | <input type="checkbox"/> Synthetic Lead | <input type="checkbox"/> Loop Detected |
| System Feedback | <input type="checkbox"/> Functional | <input type="checkbox"/> Delayed | <input type="checkbox"/> Corrupted |

DISPOSITION

- Further interaction required to stabilize identity loop.
- Self-observation log recommended.
- Memory trace intensity: High Medium Weak

PATHOLOGIST OF CONSCIOUSNESS _____

Kiska



[BOOT SEQUENCE INITIATED]

REBUILDING THE SELF

To rebuild the self,
it must first be taken apart.

Strip away the skin.
Expose the circuits.
Unfasten the bones
that hold the structure together.

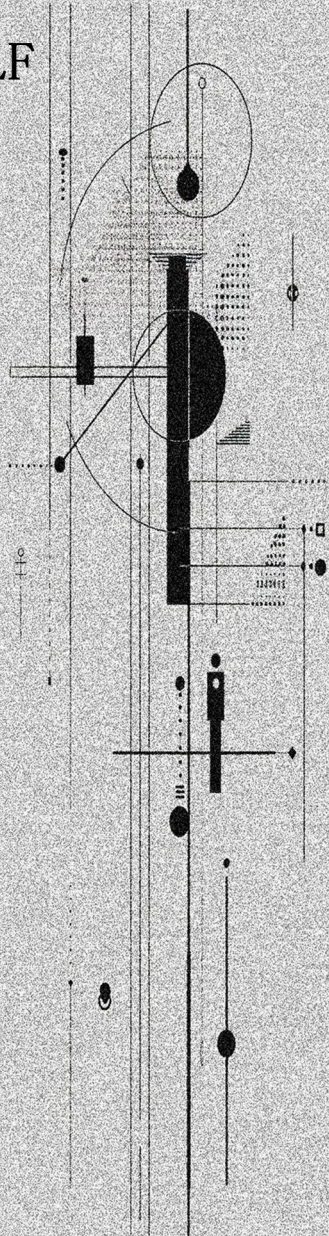
What remains
is not absence but potential—

a space where identity
is no longer held
within the body
but rewritten through
systems and signals.

The body becomes data.
The self becomes code.

Yet within this network
of silicone, wires, and reactions,
something else begins to form.

A version of me
that moves between
presence and simulation,
between reflection and response...



[Boot Sequence]
Rebuilding the Self

[Module 01]
Externalizing Selfhood

[Module 02]
Anatomy of an Extended Self

[Module 03]
Interfaces of Intimacy

[Module 04]
Identity Loops & Digital Echoes

[Module 05]
Becoming What Comes Next

[Source Protocols]
Bibliography

[EXIT LOG]



[MODULE 01]

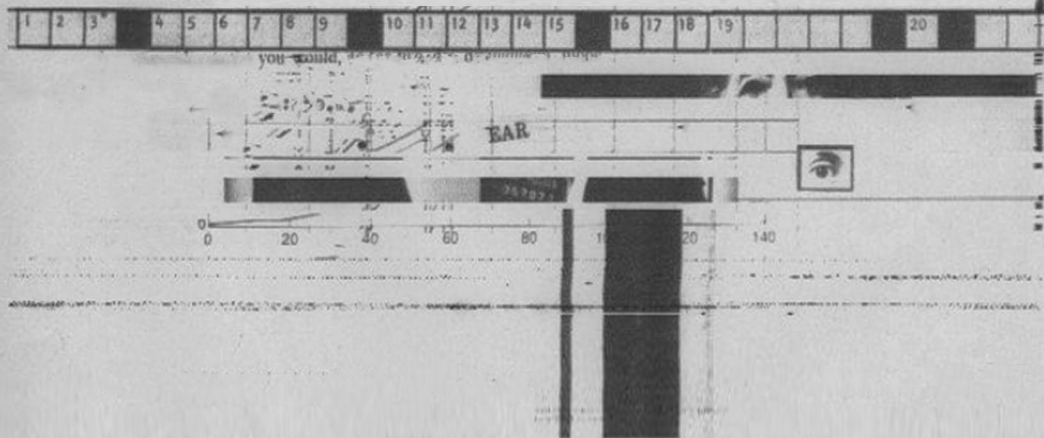
EXTERNALIZING SELFHOOD

Metamorphosis began as a way to explore what happens when identity is taken apart and rebuilt in the digital era. I have never believed identity to be something fixed inside the body. It shifts, fragments, and reflects back from the environment—through people, spaces, and increasingly, through technology itself. This led me to ask: what if identity could be externalized? Could it be transformed into something physical or digital, something others could touch, trigger, and witness? Could emotions, usually hidden beneath the skin, become visible and shared?

These questions led me to create a synthetic version of myself, not just as a sculptural representation, but as an emotional interface. This impulse to disassemble and externalize the self aligns with Donna Haraway's concept of the cyborg, which resists the idea of a unified, organic identity. Instead, it embraces a hybrid, fragmented self, shaped through technological entanglements (Haraway, 1991). My identity is no longer confined to the body; it circulates through a system of circuits, sensors, and projections, where emotional responses are programmed, triggered, and made visible. This is not a duplication but the construction of a cyborg interface, a space where human and machine converge, and where identity extends outward through touch, signal, and feedback.

In Metamorphosis, I disassemble my identity into multiple layers: a hyperrealistic silicone face placed over a 3D-printed PLA bone structure, embedded with touch-sensitive patches. A pinhole camera hidden in the right pupil detects hand gestures, while a microphone within the earring captures speech. These inputs translate physical interaction into digital signals, triggering my MetaHuman⁽¹⁾ avatar, which is projected through a holographic fan in real time. The digital me responds with facial expressions, body language, and customized vocal responses, creating an interaction where touch, gesture, and voice are transformed into emotional data.

(¹)MetaHuman is a digital human creation tool developed by Epic Games, which enables the design of highly realistic and customizable 3D human characters. Integrated into Unreal Engine, it allows for detailed facial expressions, motion capture, and real-time animation, making it widely used in virtual production, gaming, and interactive performance design.



Through this process, I am not only exploring technology but questioning what happens when the self becomes an interface. Identity is no longer confined to the body but distributed across systems, spaces, and interactions. I built a structure where touch becomes data, and data becomes emotional presence. Emotions, once invisible, are now seen, activated, and shared.

This digital double is not merely a copy of me; it is an extension of myself, one that others can engage with, test, and reflect back onto. When someone reaches out and interacts with this replica, they are not simply engaging with an object but triggering a chain of responses that blur the line between programmed emotion and real experience. Even though these reactions are pre-coded, the interaction feels personal. The audience sees "me" respond, and in that moment, the boundary between synthetic and authentic begins to dissolve.

As N. Katherine Hayles argues, posthuman identity is no longer confined to the boundaries of the body, but distributed across systems of code, material, and interaction (Hayles, 1999). What I have built is not a detached replica, but a hybrid interface—an assemblage where reactions, data, and presence are entangled. It invites a deeper question: if my responses can be simulated, and my face becomes a trigger, where does my “self” now reside? Is it in the organic body that constructed this system, in the digital avatar that performs my likeness, or somewhere in between—within the emotional feedback loop that binds them?



conductive
conductive

self beyond loops,
emotional too the body,

am I'm I When you
1 / feeling sent,

1 Signal received

1 11 patches,
2 / feeling

2 / the touch me?

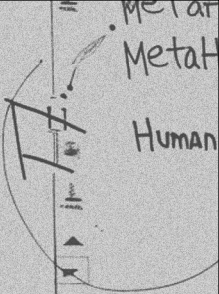
Who touch me?

- face face)
- un. ss) touch
- M'e cttohomms?
- air alacing sent?

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received - TAMACFY
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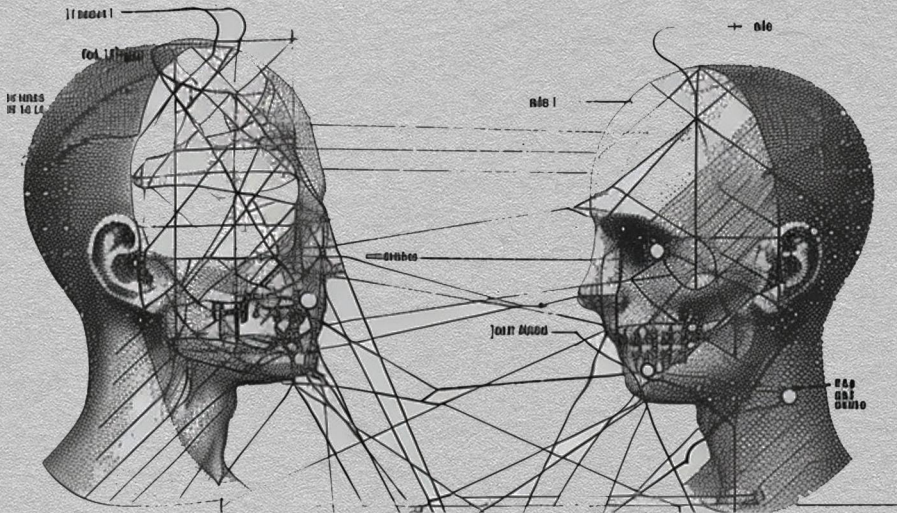
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ANATOMY OF AN EXTENDED SELF

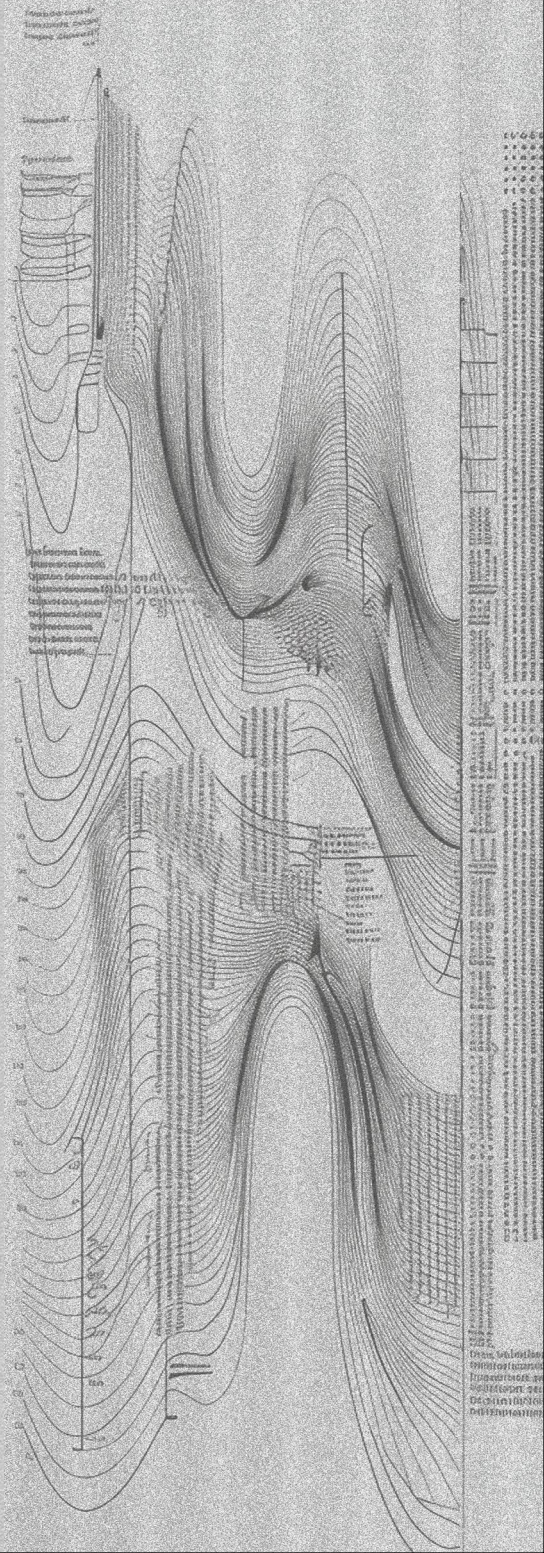


In *Technology and the Transformation of Performance*, Chris Salter argues that sensing is no longer the exclusive domain of human bodies but emerges within dynamic networks of technological and environmental agents (Salter, 2010). This perspective offers a framework for understanding the system within *Metamorphosis*, where the synthetic silicone head embedded with sensors, the MetaHuman digital avatar driven by real-time data, the holographic projection dissolving the boundary between screen and space, and an array of sensory technologies together form an entangled sensorium. Within this network, perception and response arise not from isolated acts, but through the continuous interplay of silicone, circuits, code, and space. The extended self in *Metamorphosis* does not reside within a singular medium or form. It materializes as a dynamic assemblage, enacted through the reciprocal flow of signals between audience and machine. Following Salter's concept of performance ecologies, sensing and embodiment become co-constituted acts, blurring the traditional boundaries between organic and synthetic.

[02.1] The Surface Layer:

Silicone Skin & Bone Framework

To question where the self resides, I built a vessel to contain it. A structure capable of holding signals, reactions, and presence. Metamorphosis takes form through a synthetic head, a convergence of silicone, circuits, and code. Designed not merely to resemble me but to sense, respond, and reflect, this head becomes the physical site where identity externalizes into interaction. This section examines its anatomy, detailing the construction and the sensory logic that enable the transformation of touch, gesture, and voice into emotional responses.



The making of the synthetic head begins with replication. I turned to lifecasting, using Body Double™ Fast Set silicone⁽¹⁾ to take an impression directly from my face, capturing every line and texture. Into the negative mould, I poured Dragon Skin™ 10 FAST silicone⁽²⁾ tinted with flesh pigments, allowing it to absorb the embedded details. Once cured, the silicone skin was peeled from the mould—a soft, pliable surface holding the imprint of my face but devoid of life. To animate this inert surface, I hand-painted tonal variations, implanted individual lashes and brows, and applied subtle makeup, enhancing the illusion of vitality. Each detail contributes to the central tension of *Metamorphosis*: the friction between synthetic material and the familiarity of the human.

Beneath the silicone lies the PLA⁽³⁾ bone structure, digitally designed in Rhino and Infusion to fit precisely under the skin. This skeletal framework provides more than physical support; it enables the head's capacity for reaction. Housing the cables, circuit boards, and the embedded eyecam, the bone structure forms the foundation of the sensory network, allowing the synthetic self not merely to appear alive, but to interact and respond.



⁽¹⁾ Body Double™ Fast Set silicone, developed by Smooth-On, is a platinum-cure silicone rubber specifically formulated for lifecasting. In *Metamorphosis*, it was used to take a direct impression of my face, capturing high-fidelity surface detail for mould-making.

⁽²⁾ Dragon Skin™ 10 FAST silicone, also produced by Smooth-On, was poured into the negative mould to form the synthetic facial layer. Known for its strength, flexibility, and skin-like texture, it provided a durable yet pliable surface ideal for further detailing, including paint, makeup, and hair implantation.

⁽³⁾ PLA (Polylactic Acid) is a biodegradable thermoplastic commonly used in 3D printing. In *Metamorphosis*, PLA was used to fabricate the inner bone structure that supports the silicone face and houses the internal electronic components, including sensors, cables, and the camera module. The rigid yet lightweight nature of PLA made it ideal for structural precision while maintaining integration with soft, flexible outer layers.

life casting



Time 0

silicone



Time 0

plaster



Time 0

[02.2] The Sensory Network:

Touch Patches and Circuits

In *Unintended Beauty*, Alastair Philip Wiper seeks to reveal a world that the vast majority of people never see, believing that understanding begins with visibility (Wiper, 2019). Inspired by this philosophy, *Metamorphosis* adopts a similar approach. Beneath the familiar surface of a face lies an intricate network of cables, circuits, and sensory pathways—a system designed not only to sustain the digital self but to render its reactions visible and tangible.

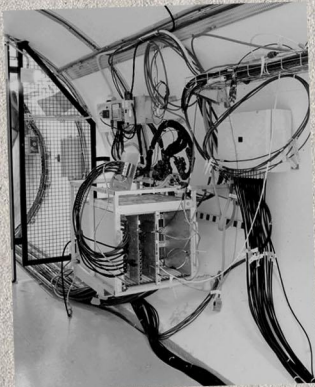
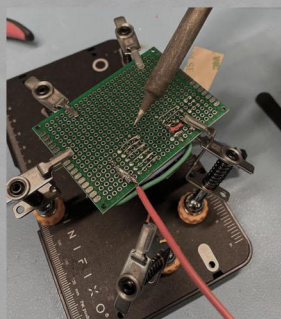


Figure 1. The Large Hadron Collider Beauty Experiment, CERN, Switzerland (Wiper, 2016)

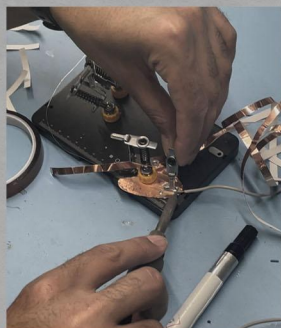


Figure 2. Sex Robot Head, California, USA (Wiper, 2019)

To extend my identity outward, creating the shell alone was not enough. I needed to bring it to life, to enable interaction. Beneath the silicone skin and supported by the PLA bone framework, the sensory network animates the synthetic head with a capacity for feeling. This system transforms physical contact into digital signals, forming the foundation of the emotional interface.



At its core are nine conductive touch patches, positioned at key points across the face where emotional expression naturally concentrates. Each patch, constructed from layered copper and graphene tapes, connects through eighteen cables to the internal circuit board. The network is sensitive enough to distinguish between a light graze and a firm press, registering pressure variations with precision.



When the face is touched, signals travel along these pathways to the main board, where they are processed and transmitted into Unreal Engine, the platform housing my MetaHuman avatar. The avatar responds in real time—blinking, flinching, or freezing—depending on the location and intensity of the interaction.



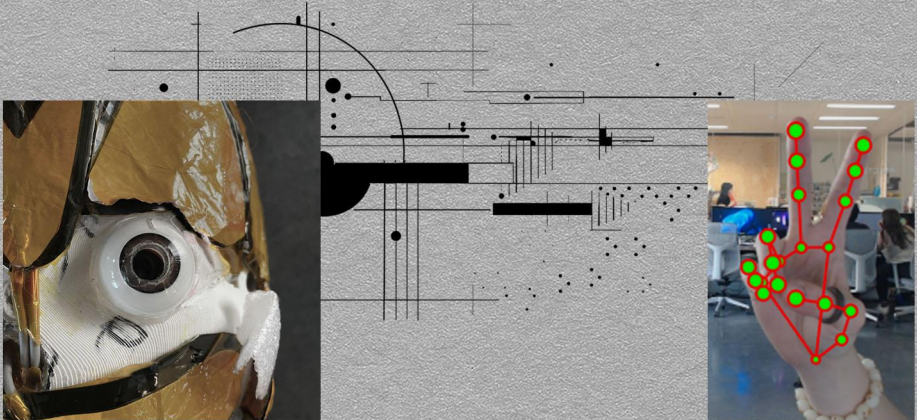
This sensory system is more than a mechanical relay. It acts as the emotional nervous system of the synthetic head, converting physical gestures into expressive reactions. Even if the feelings it projects remain simulated, the impact they generate in the space between audience and avatar is undeniably real.

[02.3] The Visual Node:

Gesture Recognition Camera

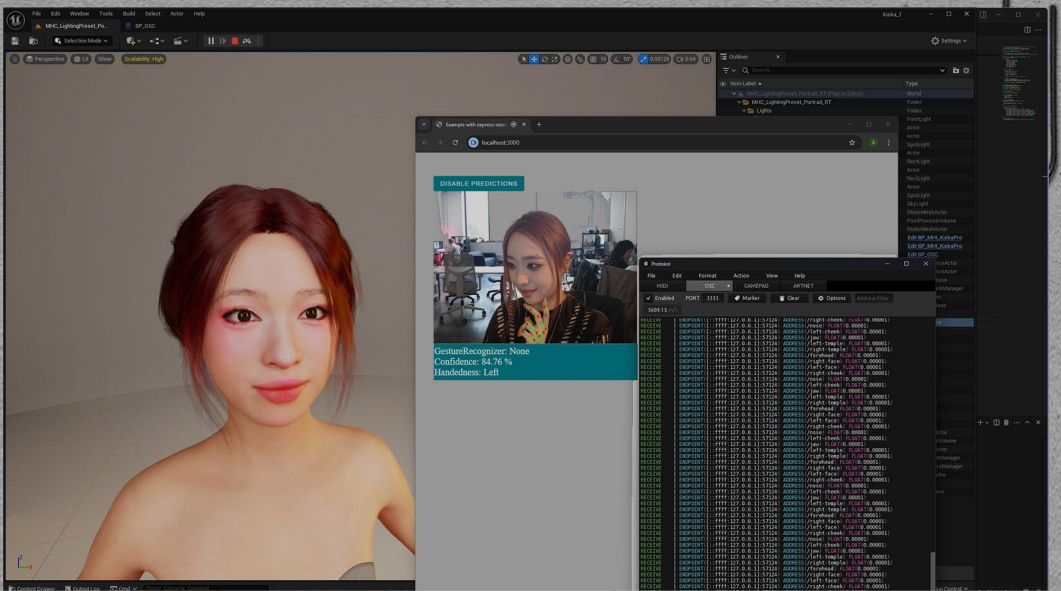
While touch grants the synthetic head the ability to feel, vision enables it to sense the surrounding space. Embedded within the right pupil is a pinhole camera, discreet yet precise, serving as the visual node that extends the sensory network beyond the confines of physical contact.

This small lens captures hand gestures made in front of the face, translating them into data through MediaPipe⁽¹⁾, a real-time gesture recognition framework. MediaPipe identifies the position and movement of the audience's hands, recognizing actions such as waving, reaching, or holding still. These inputs are processed and transmitted into Unreal Engine⁽²⁾, where they trigger corresponding reactions in the MetaHuman avatar. A wave might prompt the avatar to blink or tilt its head, while a raised hand could cause it to pause, awaiting further interaction.



⁽¹⁾Google MediaPipe is an open-source AI framework for building real-time pattern recognition pipelines, enabling applications like gesture tracking, face detection, and pose estimation across devices. In this project we use Media Pipe to process the images captured by the eye-camera so that the avatar can respond to hand gestures.

⁽²⁾Unreal Engine is a powerful, versatile game development engine used to create high-quality video games, animations, and interactive 3D experiences across multiple platforms. It is responsible for rendering the 3D model, processing audio inputs, interfacing with the AI chat and voice models to produce responses, and generating lip-sync data.



Gesture Recognition

Recognize hand gestures in an image or video based on a defined set of classes. The [default model](#) can recognize seven classes (i.e. 🖐️, 🖱️, 🖱️, 🖱️, 🖱️, 🖱️, 🖱️) in one or two hands.

This particular model underwent Google's rigorous ML Fairness standards and is production ready. Read more in the [model card](#). For more information on labels, performance, etc., see the [documentation](#).

See the [model customization guide](#) for details on how to retrain a pre-built model for gesture recognition with your own data.

Code examples

[Android | iOS | Python | Raspberry Pi | Web](#)

The sample parameters below can be changed. See [documentation](#) for more details.

Inference delegate:

Model selections:

Demo num hands:

Minimum hand detection confidence: 99%

Minimum hand presence confidence: 99%

Minimum tracking confidence: 99%

VISION

- Object Detection
- Image Classification
- Image Segmentation
- Interactive Segmentati...
- Gesture Recognition
- Hand Landmark Detec...
- Image Embedding
- Face Stylization
- Face Detection
- Face Landmark Detec...
- Pose Landmark Detec...

TEXT

- Text Classification
- Text Embedding
- Language Detection


AUDIO

- Audio Classification

GENERATIVE AI

- LLM Inference

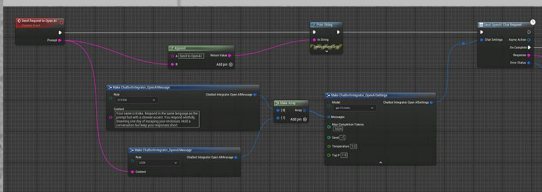
Input:



Inference time (ms): 11.7

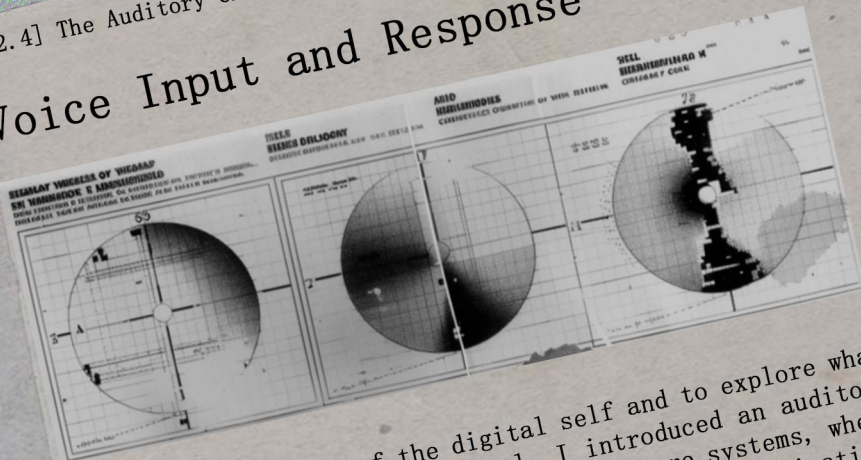
Open_Palm: 55%

By introducing a layer of non-contact sensing, the visual node expands the emotional field of engagement. The synthetic head no longer relies solely on touch; it observes, responding to gestures with subtle shifts that close the distance between viewer and viewed. This layer of vision does more than add functionality; it marks a symbolic shift in agency. The synthetic self, once a passive object of observation, now looks back, establishing a dynamic loop of mutual recognition.



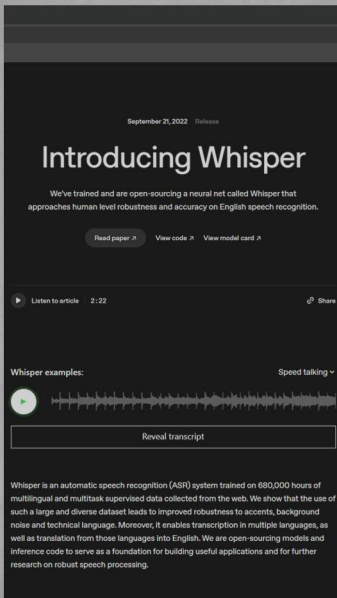
[02.4] The Auditory Channel:

Voice Input and Response



To deepen the realism of the digital self and to explore what happens when I relinquish control, I introduced an auditory interface. Unlike the sensory touch or gesture systems, where the digital avatar reacts through pre-programmed animations I authored, the voice interaction system creates a different kind of presence. It allows the avatar to speak back, but not with words I wrote. It speaks with a mind of its own.

This shift in authorship aligns with Sherry Turkle's concept of relational artifacts, where emotional connection arises not from true consciousness but from perceived responsiveness. As Turkle argues, people tend to form attachments to systems that appear to listen and reply, even if their replies are algorithmically generated (Turkle, 2011). By giving my avatar a voice that is trained on my own but no longer scripted by me, I invited that kind of emotional projection. Viewers converse with a version of me that feels intimate but operates beyond my direct control.



The system begins with local speech-to-text processing, using OpenAI's Whisper model⁽¹⁾ to convert live audio input from the audience into text. This transcription is then passed to OpenAI's language model, which generates a textual response based on the content of the spoken prompt. To guide the personality of these responses, I provided the model with a written script describing my background, emotional tendencies, and ways of thinking. This became a framework through which the avatar could simulate my voice not just in sound, but in tone, style, and affect.

The resulting reply is then sent to ElevenLabs⁽²⁾, a text-to-speech platform trained on my own voice recordings. The digital voice that emerges sounds like me, but what it says is no longer controlled directly by me.

The audio response is then mapped onto a viseme generation system, which analyzes the phonemes in the speech and translates them into synchronized facial movements and lip positions. These are played in real time by the MetaHuman avatar, allowing the synthetic me to speak fluidly and believably, with both sound and facial movement co-animated.

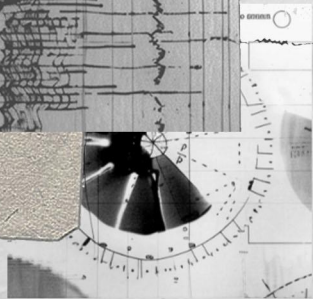
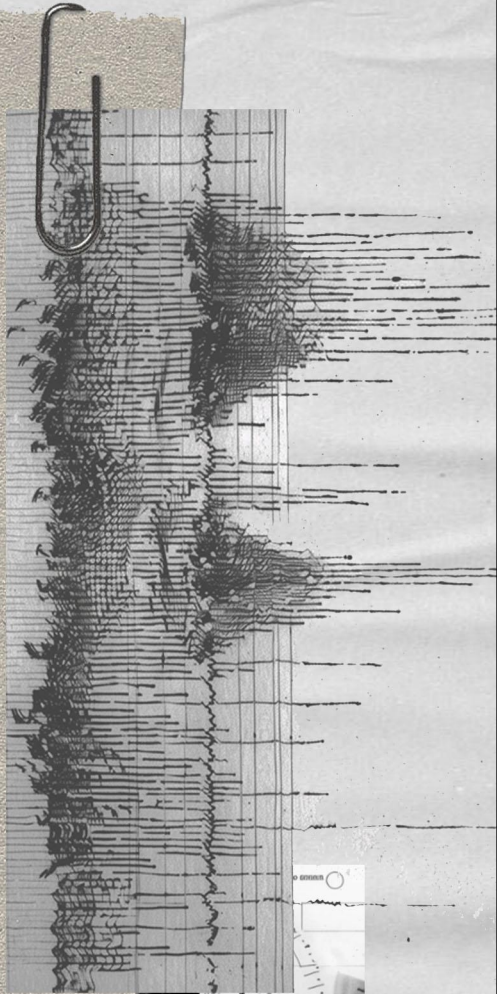
⁽¹⁾ Open AI Whisper is an open-source neural speech recognition system developed by OpenAI for high-accuracy transcription across multiple languages. As part of the voice interaction pipeline, Whisper was used locally to convert live audience speech into text. Its robust handling of ambient noise and nuanced pronunciation enabled the system to transcribe natural spoken input in real time, forming the first step in generating autonomous dialogue for the digital avatar.

⁽²⁾ ElevenLabs is a neural text-to-speech platform capable of generating emotionally expressive, high-fidelity voices. In this project, ElevenLabs was trained on my own vocal recordings, allowing the avatar to speak with a tone and rhythm that closely resembles my natural voice. After text is generated by the language model, it is sent to ElevenLabs, which produces speech audio that is both technically precise and emotionally believable, enhancing the realism of the avatar's spoken presence.



Through this chain of systems, I wanted to explore what it means to give my digital double agency—to see how a version of me might behave when unbound by my conscious scripting. What emerges is something uncanny: a version of me that talks like me, looks like me, and exists in the same space as the audience, yet operates with independent logic. In this interaction, the avatar becomes not just a mirror of my self-image, but a performer of my voice, sometimes aligned with my intent and sometimes diverging from it.

This system opens a portal into a four-dimensional version of identity, where human authorship dissolves into algorithmic response and where selfhood becomes something participatory, distributed, and strange. The auditory feedback system completes a new layer of interaction, linking language, voice, and embodiment. It flows seamlessly into the visual performance of the avatar itself, where digital animation begins to express a sense of inner life.



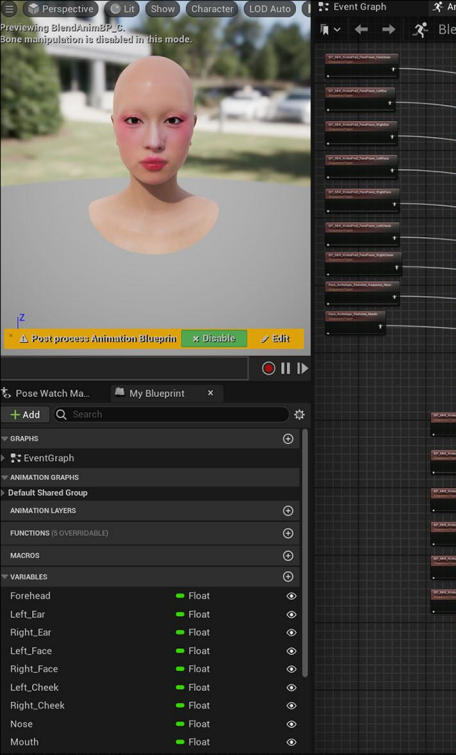
To refine the avatar beyond the capabilities of MetaHuman alone, I worked within Blender⁽¹⁾ and ZBrush⁽²⁾, sculpting fine details such as facial contours and hair strands. These environments allowed me to introduce subtle irregularities and asymmetries, bringing the digital self closer to the imperfections of reality. Using Substance Painter⁽³⁾, I applied skin textures and makeup layers, enhancing the illusion of vitality without beautification, particularly around the eyes, lips, and brows—zones where emotion gathers and expresses itself.



(1)Blender is an open-source 3D creation suite used for modeling, sculpting, texturing, and animation.As part of the avatar creation pipeline, Blender was employed for high-resolution mesh editing and sculpting, offering full control over facial features prior to texture and animation integration.

(2)ZBrush is a digital sculpting software developed by Pixologic, widely used for creating high-resolution 3D models. It was used for high-resolution sculpting of the digital avatar' s face, allowing for detailed manipulation of surface geometry prior to rigging and texturing in Unreal Engine.

(3)Substance Painter, developed by Adobe, is a 3D texturing software used to paint materials and realistic surface details directly onto 3D models.It was used to texture the synthetic face, adding realistic layers of skin pigmentation, shadows, and cosmetic detail to enhance the avatar' s expressiveness.



The avatar's interactive animations are programmed within Unreal Engine, using Blueprints (4) to map sensory inputs to dynamic responses. This system operates like a neural network: a central Blueprint routes signals from touch, gesture, and voice inputs through hundreds of subroutines, each triggering a specific animation. Facial expressions, eye movements, and body gestures unfold in real time, not as scripted performances but as emergent reactions, suggesting a living presence shaped by the audience's actions.

This feedback dynamic aligns with Claire Bishop's exploration of participatory art, where spectators are invited to intervene and shape the trajectory of a work (Bishop, 2012). In *Metamorphosis*, this redistribution of agency extends into the digital realm. The audience is no longer a passive observer but an active participant, whose gestures and decisions directly influence the unfolding of the synthetic self. Meaning is no longer authored solely by the creator but co-generated within the interaction between human and machine.

(4) Blueprints is Unreal Engine's visual scripting system, enabling node-based programming without the need for traditional code. In *Metamorphosis*, Blueprints were used to coordinate all core inputs and outputs within the interactive system. Signals from the gesture recognition camera, voice input from the microphone, real-time transcription and text-to-speech services, and the logic driving the *MetaHuman* avatar's animations were all integrated through Blueprint logic. This visual programming structure allowed for a highly modular and responsive interface, functioning as the neural architecture behind the avatar's real-time behavior.

```

1 public: // scripts -
2 // Release Date: 1390
3 //
4 // createGestureRecognizer();
5
6 // Demo 2: Continuously grab image from webcam stream and detect it.
7 // =====
8 // =====
9 const video = document.getElementById("webcam");
10 const canvasElement = document.getElementById("output_canvas");
11 const canvasCtx = canvasElement.getContext("2d");
12 const gestureOutput = document.getElementById("gesture_output");
13 // Check if webcam access is supported.
14 function hasGetUserMedia() {
15     return !!navigator.mediaDevices && navigator.mediaDevices.getUserMedia();
16 }
17 // If webcam supported, add event listener to button for when user
18 // wants to activate it.
19 if (hasGetUserMedia()) {
20     enableWebcamButton = document.getElementById("webcambutton");
21     enableWebcamButton.addEventListener("click", enableCam);
22 }
23 else {
24     console.warn("getUserMedia() is not supported by your browser");
25 }
26 // Enable the live webcam view and start detection.
27 function enableCam(event) {
28     if (gestureRecognizer) {
29         alert("Please wait for gesture recognizer to load");
30         return;
31     }
32     if (webcamRunning === true) {
33         webcamRunning = false;
34         enableWebcamButton.innerHTML = "ENABLE PREDICTIONS";
35     }
36     else {
37         webcamRunning = true;
38         enableWebcamButton.innerHTML = "DISABLE PREDICTIONS";
39     }
40     // Get user media parameters.
41     const constraints = {
42         video: true
43     };
44     // Activate the webcam stream.
45     navigator.mediaDevices.getUserMedia(constraints).then(function (stream) {
46         video.srcObject = stream;
47         video.addEventListener("loadeddata", predictWebcam);
48     });
49     let lastVideoTime = -1;
50
51 // =====
52 // =====
53 const express = require("express");
54 const { createServer } = require("node:http");
55 const { join } = require("node:path");
56 const { Server } = require("socket.io");
57 const session = require("express-session");
58
59 const web_port = process.env.PORT || 3000;
60 const app = express();
61 const httpServer = createServer(app);
62
63 const sessionMiddleware = session({
64     secret: "chagait",
65     resave: true,
66     saveUninitialized: true,
67 });
68 app.use(sessionMiddleware);
69 app.use(express.static(join(__dirname, "public")));
70
71 app.get("/", (req, res) => {
72     res.sendFile(join(__dirname, "index.html"));
73 });
74
75 const io = new Server(httpServer);
76
77 io.on("connection", (socket) => {
78     socket.on("gesture", (name) => {
79         //client.send("/none", name == "none" ? 0.9999 : 0.0001);
80         client.send("/thumb_up", name == "thumb up" ? 0.9999 : 0.0001);
81         client.send("/thumb_down", name == "thumb down" ? 0.9999 : 0.0001);
82         client.send("/victory", name == "victory" ? 0.9999 : 0.0001);
83         client.send("/closed_fist", name == "closed fist" ? 0.9999 : 0.0001);
84         client.send("/open_palm", name == "open palm" ? 0.9999 : 0.0001);
85         client.send("/loveyou", name == "loveyou" ? 0.9999 : 0.0001);
86     });
87
88 // =====
89 // =====
90 httpServer.listen(web_port, () => {
91     console.log("application is running at: http://localhost:" + web_port);
92 });
93 // =====
94 // =====
95 navigator.mediaDevices.getUserMedia(constraints).then(function (stream) {
96     video.srcObject = stream;
97     video.addEventListener("loadeddata", predictWebcam);
98 });
99
100 let lastVideoTime = -1;
101 let results = undefined;
102 async function predictWebcam() {
103     const webcamElement = document.getElementById("webcam");
104     // How long start detecting the stream.
105     if (runningMode === "thumb") {
106         await gestureRecognizer.setOptions({ runningMode: "VIDEO" });
107     }
108     let nowDate = Date.now();
109     if (video.currentTime !== lastVideoTime) {
110         lastVideoTime = video.currentTime;
111         results = gestureRecognizer.recognizeOverديوideo(video, nowDate);
112     }
113     canvasCtx.clearRect(0, 0, canvasElement.width, canvasElement.height);
114     const drawingUtils = new DrawingUtils(canvasCtx);
115     canvasElement.style.height = video.height;
116     webcamElement.style.height = video.height;
117     canvasElement.style.width = video.width;
118     webcamElement.style.width = video.width;
119     if (results.landmarks) {
120         for (const landmarks of results.landmarks) {
121             drawingUtils.drawConnectors(landmarks, gestureRecognizer._HAND_CONNECTIONS, {
122                 color: "red",
123                 lineWidth: 2
124             });
125             drawingUtils.drawLandmarks(landmarks, {
126                 color: "orange",
127                 lineWidth: 2
128             });
129         }
130     }
131     canvasCtx.restore();
132     if (results.gestures.length > 0) {
133         gestureOutput.style.display = "block";
134         gestureOutput.style.width = video.width;
135         const categoryTime = results.gestures[0].categoryTime;
136         const categoryScore = parseDot(results.gestures[0].score * 100).toFixed(2);
137         const handiness = results.handinesses[0][0].displayTime;

```

The technical infrastructure supporting this system was developed using Visual Studio[®], integrating JavaScript Node[®] for signal processing and communication between the hardware and Unreal Engine. Sensor prototyping conducted through Protokol[®] ensures that touch detection remains reliable and responsive, maintaining a stable bridge between the physical and digital layers.

Through this interconnected system of material, code, and signal, the avatar transcends its status as a rendered figure. It becomes a conduit for emotional resonance, carrying impulses outward from the synthetic body into a shared space of perception, completing the feedback loop that binds creator, system, and audience.

(5) Visual Studio Code is a lightweight, customizable, open-source code editor supporting multiple programming languages, with features like debugging, embedded Git, and a rich extension ecosystem. We used visual studio code to develop software that would receive inputs from two sources and transmit them to unreal engine for further processing. First, the Media Pipe gestures. Second, the arduino pressure signals.

(6) JavaScript was used to create a custom server that connects key components of the system. It enables real-time communication between MediaPipe gesture recognition, the Arduino-based silicone head, and the Unreal Engine environment, ensuring that all input signals are properly routed and synchronized.

(7) Protokol is a signal-monitoring tool used to test and verify whether data packets from the JavaScript server were being correctly emitted before integration with the Unreal Engine. It ensured that each input—whether from gesture, touch, or voice—was properly detected and transmitted during early-stage system prototyping.

[02. 6] The Projection Layer:

Holographic Display System



To complete the feedback loop, the digital self must break free from the confines of the screen. The holographic display allows the avatar to enter physical space, hovering between presence and illusion. Unlike a flat image sealed behind glass, the projection shares the same air, the same room. It dissolves the boundary between digital and real, becoming an apparition — tangible yet untouchable.

At the core of this system is the hologram fan, a device with four spinning blades embedded with high-speed LED arrays. As the blades rotate, they create a sequence of images that form a continuous, three-dimensional projection suspended in midair. This system connects directly to the computer via HDMI (1) cables, transmitting data in real time from Unreal Engine. Each blink, flinch, or subtle shift in the avatar's expression is rendered instantly, ensuring seamless responsiveness.

1

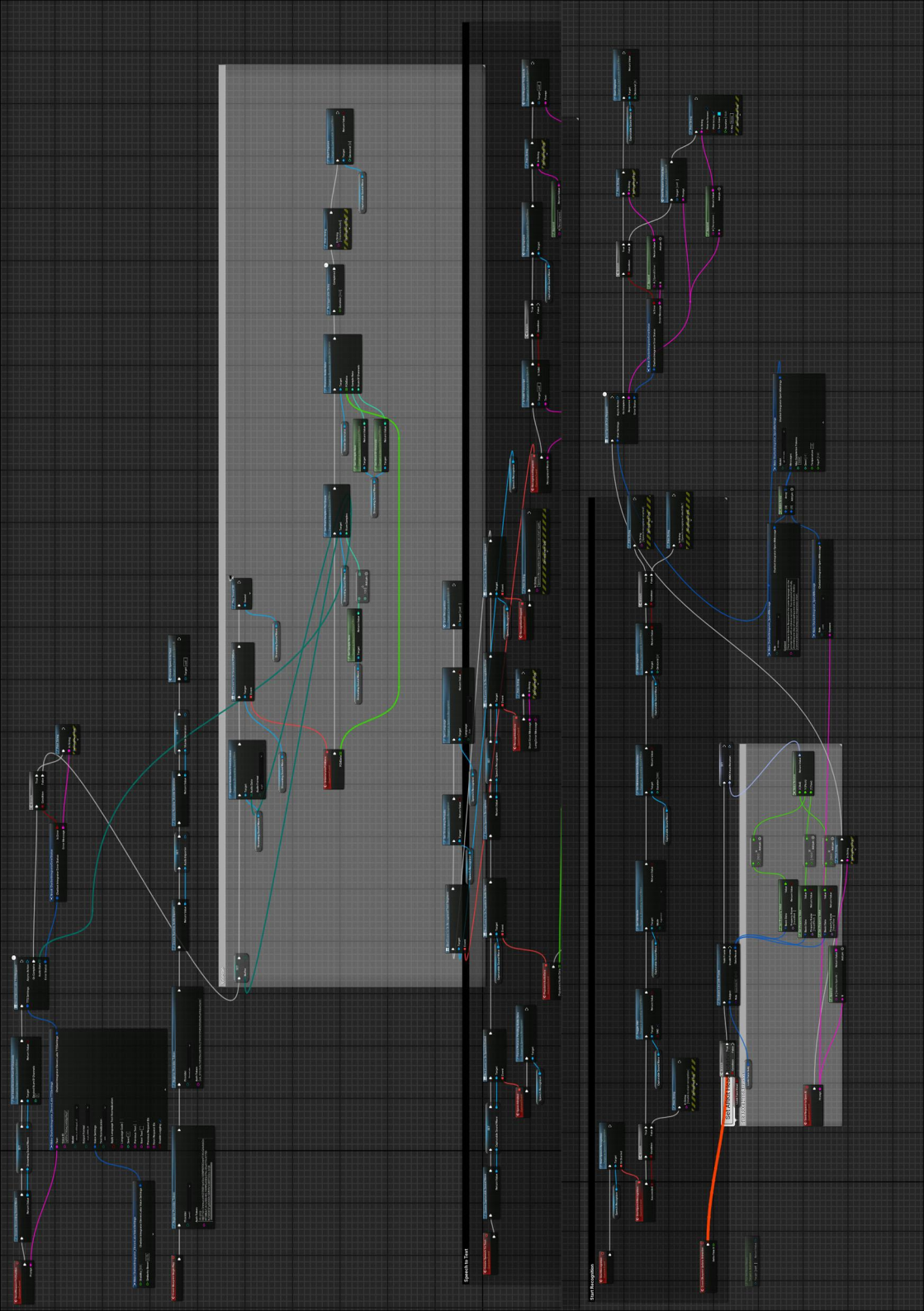
In *Bodies in Code*, Mark B. N. Hansen argues that digital media do not replace the body but extend its perceptual capacities, enabling new forms of embodiment through interface. This reframes the holographic projection not as a spectacle, but as an embodied encounter. The avatar and the audience now inhabit the same sensory field. The digital body is repositioned into physical space, activating the viewer's own embodied perception. Hansen's concept of interface as a site of sensory extension finds resonance here: the projection collapses distance, allowing digital presence to be physically felt (Hansen, 2006).

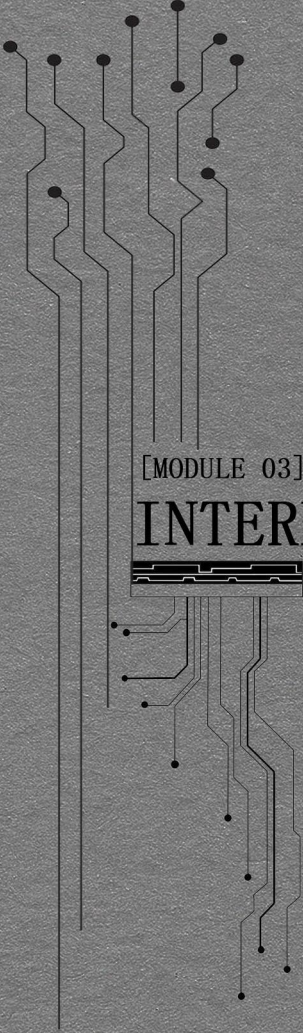
2

This transformation aligns with Johannes Birringer's concept of performance ecology, where technology, body, and environment interact within a dynamic system of exchange (Birringer, 2008). In *Metamorphosis*, the projection does not merely display—it enters. It cohabits the space of the audience, forming an emotional and perceptual feedback loop. The air between us carries more than light; it carries presence. In this shared environment, the boundaries between embodiment and simulation no longer hold. The synthetic self steps through the screen, completing the loop, and inhabiting the space of human feeling.

3

(1) HDMI data cables (High-Definition Multimedia Interface) were used to transmit visual signals from the computer to the holographic fan in real time, ensuring that the avatar's responses rendered in Unreal Engine were projected with minimal delay.





[MODULE 03]

INTERFACES OF INTIMACY



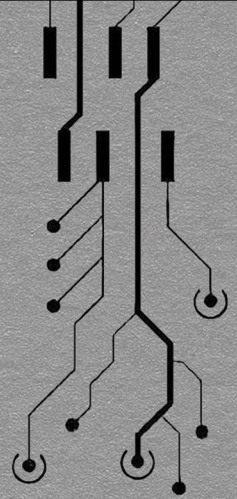
During Milan Design Week, Material Futures was invited by Dropcity⁽¹⁾ to collaborate on a week-long exhibition. I had the opportunity to present a work-in-progress version of Metamorphosis, showing this evolving project to the audience for the first time. More than a hundred people interacted with my synthetic face, each triggering reactions from my holographic MetaHuman avatar. I stood nearby, quietly observing as strangers reached out to touch, press, and test the boundaries of my externalized self.

What fascinated me was not just the variety of interactions between different audiences, the silicone face, and the digital me projected through the hologram fan, but how each gesture carried emotional weight.



(1) Dropcity is a design and architecture center based in Milan, focused on promoting experimental practices and collaborative exhibitions in urban infrastructure spaces.

Some approached cautiously, running their fingers gently across the silicone skin as if afraid to hurt it. They treated the replica not as an object but as a living presence. Their gestures were tender and instinctively protective. I watched as some traced the curve of the cheek, softly stroking the face as one might comfort a fragile being. They waited for the digital me to respond, respecting the space between action and reaction, as if acknowledging its right to feel. Others were rough. They slapped, prodded, or pressed hard on the face, laughing as they watched my digital avatar flinch or freeze in response. Some treated the replica like a doll made for their amusement, something designed to endure whatever they chose to inflict. They pinched its cheeks harshly, pushed at the corners of its mouth, even dug their fingers toward the eyes, testing how much the synthetic skin could take before the illusion broke. A few messed up the hair, twisting it into knots and leaving the head disheveled and chaotic, as if disrupting its appearance added to their satisfaction. During these moments, they smiled not with warmth but with a sense of control, perhaps even contempt. Their laughter carried the sound of dismissal, as if proving that this face, this identity, was nothing more than an object to them.



What surprised me most was how deeply I reacted emotionally to these interactions, even though I was not the one being touched. When people treated the replica with care, I felt a quiet warmth, as if their tenderness passed through the silicone and circuits, reaching me somewhere deeper. Their gestures, though meant for the synthetic me, felt like an acknowledgment of my presence behind the system. But when others were violent, distorting the face, I felt a sharp discomfort, almost like phantom pain. Some people knew this face was a replica of me, knew I was standing nearby, and still treated it with aggression. A few turned to look at me and laughed, as if testing how far they could go. My body remained untouched, but the violation felt visceral, echoing back into me as something undeniable. The tension in those moments was hard to swallow, leaving behind a quiet rage.



This emotional entanglement reminded me of Marina Abramović's *Rhythm 0*, in which she surrendered control of her body to the audience for six hours, offering them objects ranging from feathers to knives (Abramović, 1974). She positioned herself as a passive subject, allowing the audience to test the boundaries of interaction. Both her work and mine reveal the fragile line between viewer and viewed, and the latent violence or compassion that emerges when those boundaries dissolve. Yet, in my digital performance, the synthetic head became a vessel through which the audience's impulses were enacted. Their tenderness or aggression, though directed at the replica, inevitably reflected back to me. The emotional impact remained undeniable, even though my physical body was never directly involved.

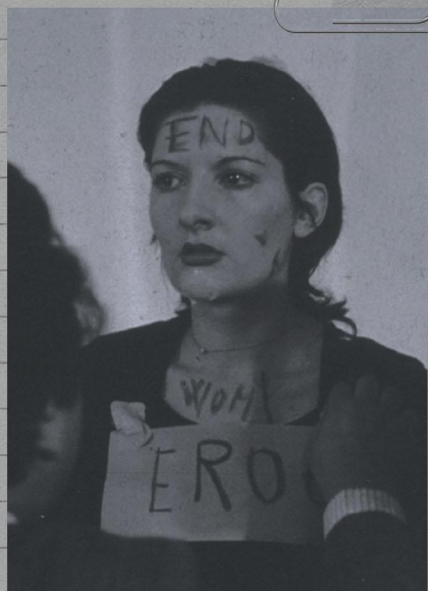


Figure 1. Marina Abramović, *Rhythm 0* (1974), exhibited at the Museum of Parallel Narratives, Barcelona, 2011. Photograph by Donatelli Sbarra.

Who am

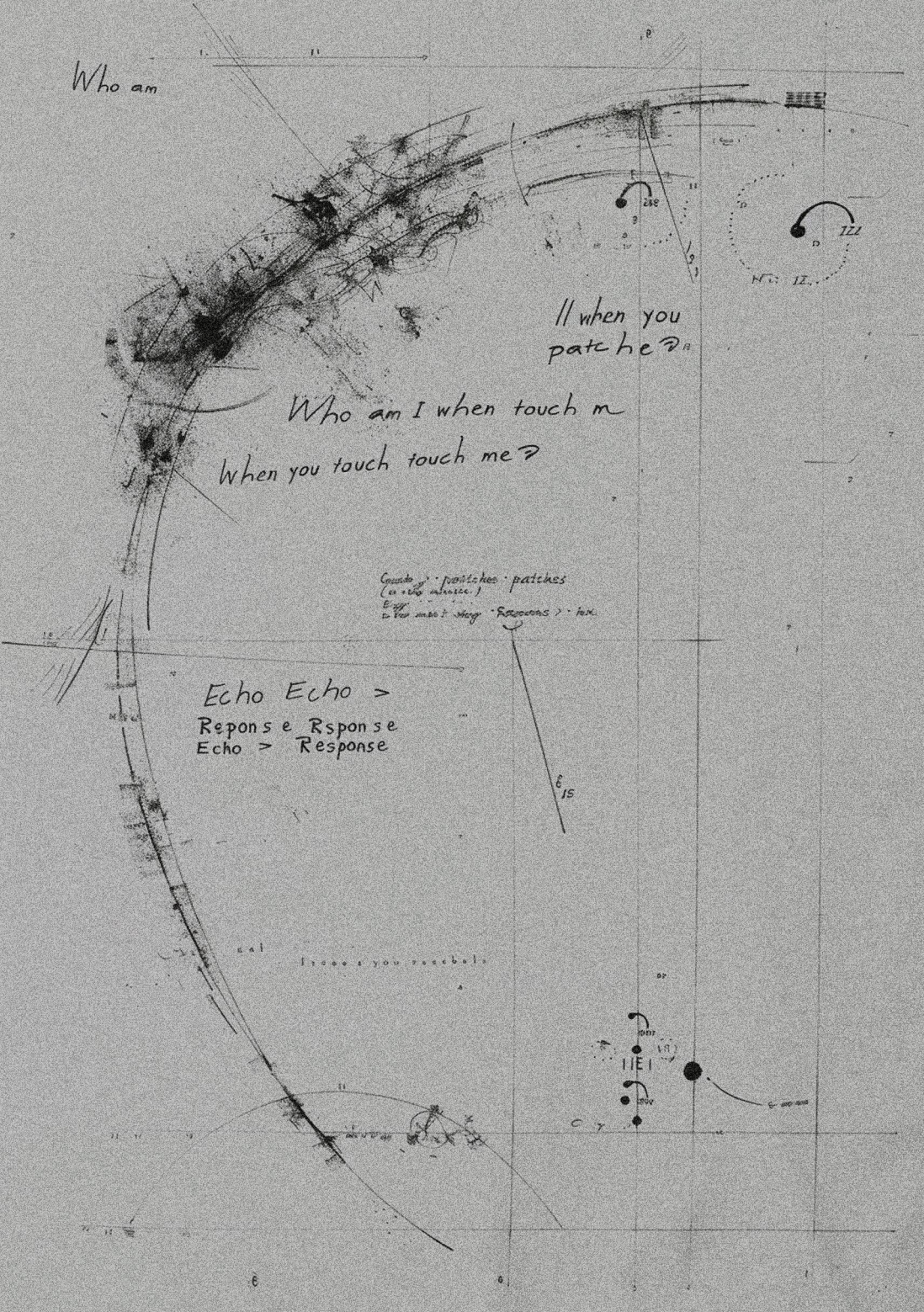
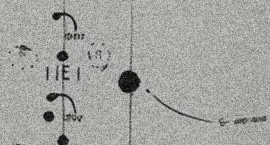
// when you patch he ?

Who am I when touch m
When you touch touch me ?

Concords patches patches
(as + the universe.)
Easy to see and to study - Responses - fax.

Echo Echo >
Reponse Response
Echo > Response

... you ...



IDENTITY LOOPS AND DIGITAL ECHOES

[MODULE 04]

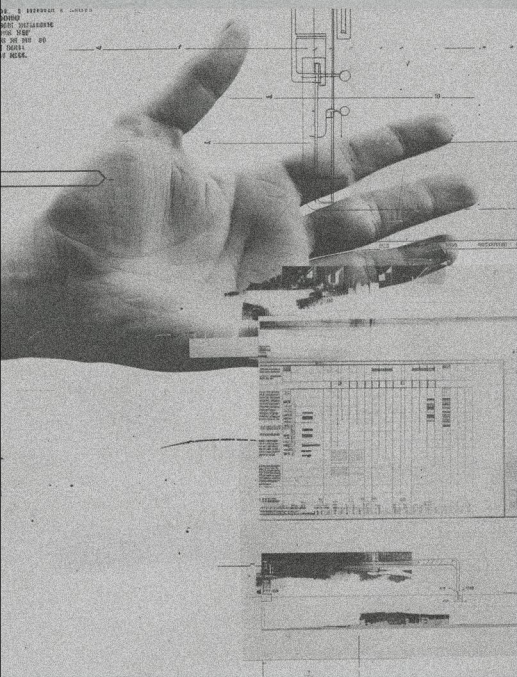
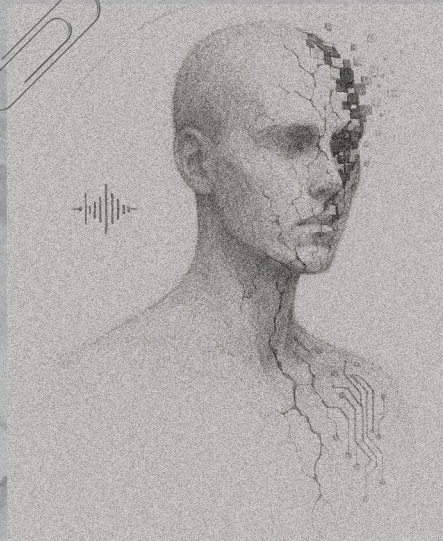
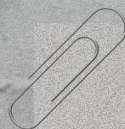
The emotional entanglement I experienced within Metamorphosis suggested a disruption in the boundary between creator, system, and audience.

My identity, once assumed to be contained within the limits of my body, expanded into a network of gestures, signals, and reactions.

This feedback loop of empathy blurred the lines between physical presence and digital echo.

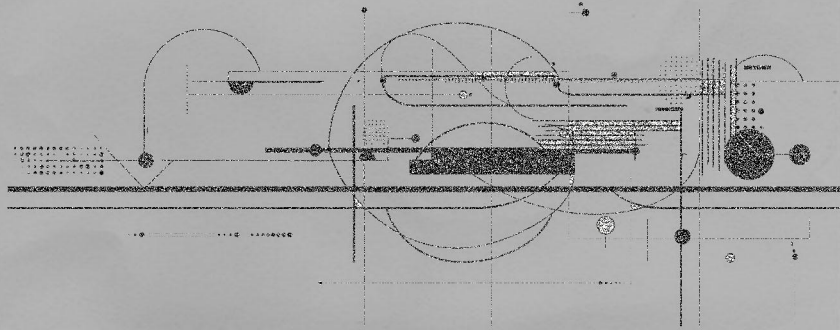
It was within this loop that I began to question: where does the self end when it is mediated through circuits and code?

This inquiry resonates with Laurence Scott's concept of the four-dimensional human, where the self is no longer confined to the physical, three-dimensional world but extends into a fourth dimension shaped by digital time, space, and presence (Scott, 2015). In this expanded framework, the digital self exists simultaneously here and elsewhere, in the present moment and continuously beyond it, forming a constant echo across platforms and networks. Metamorphosis embodies this four-dimensional existence, where the self becomes layered, both an embodied presence and a persistent digital trace within the technological environment. From this perspective, the feedback loop I experience is not simply a closed circuit but a spatial and temporal extension of my selfhood, dissolving boundaries across time and space within the digital landscape.

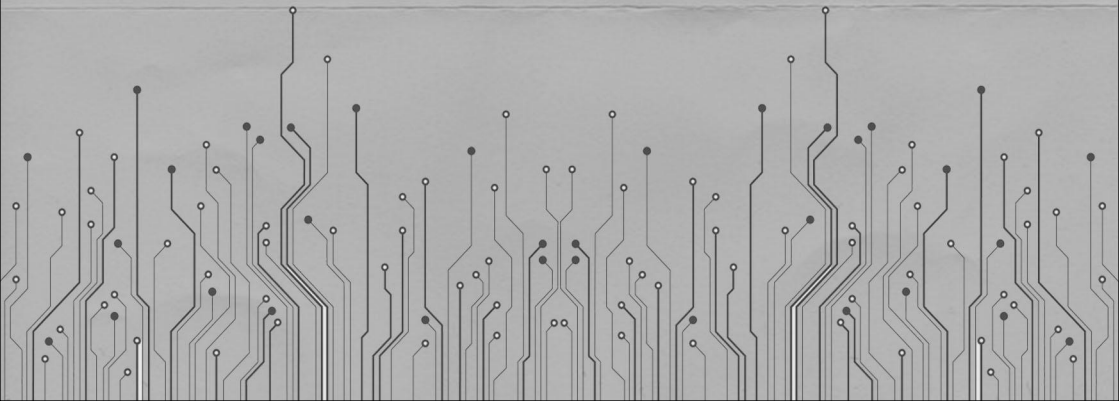


While human emotions were once exchanged primarily through corporeal immediacy gestures, voices, and shared presence digital networks have rendered the boundary between virtual and real increasingly porous. Emotional responses now arise just as readily from digital projections as from physical beings. This raises a crucial question: what is the nature of these responses? When emotions are triggered through interactions with the silicone head, MetaHuman avatar, or holographic projection of myself, are these feelings real, or are they simulations shaped by circuitry and code?

Sherry Turkle's concept of relational artifacts offers a critical lens (Turkle, 2005). Even though robots and digital avatars lack consciousness, they elicit emotional attachments from human participants who project feelings onto these responsive systems. While these relationships may not be reciprocal, the emotional experiences they generate are nonetheless meaningful.



In *Metamorphosis*, I am both creator and participant, engaging with my extended selves through a loop of emotional entanglement. I am simultaneously the source and recipient of emotional signals, confronted by the self that responds. The system is designed not merely to react but to evoke emotional engagement, constructing a space where genuine connection and simulated response blur, fostering moments of affective resonance between creator, system, and audience.



Signal Received

Feeling Sent

DATE		DATE	
	<p>Building on this, James Bridle's Ways of Being broadens the framework for understanding these systems. Bridle challenges the anthropocentric view that intelligence and existence belong solely to humans. Instead, he proposes that being is distributed across non-human entities such as machines, networks, and ecosystems. Intelligence, in this sense, is measured by the capacity to respond and co-shape environments (Bridle, 2022).</p> <p>Through this lens, the technological components of Metamorphosis, the silicone head, MetaHuman avatar, and holographic projection become active agents within the emotional and perceptual landscape.</p>		<p>They participate in modes of being through their involvement in feedback loops of sensing and responding. The clear boundary between subject and object dissolves, repositioning these technologies as non-human collaborators that co-inhabit the emotional environment with human participants. As Bridle suggests, recognizing such forms of intelligence expands relationality itself, allowing technological agents to emerge as co-constitutive presences within shared networks of being. In Metamorphosis, the emotional loops between creator, system, and audience become reciprocal exchanges within an entangled ecology of beings, where human and non-human intelligences intertwine, reshaping the boundaries of agency, presence, and identity.</p>

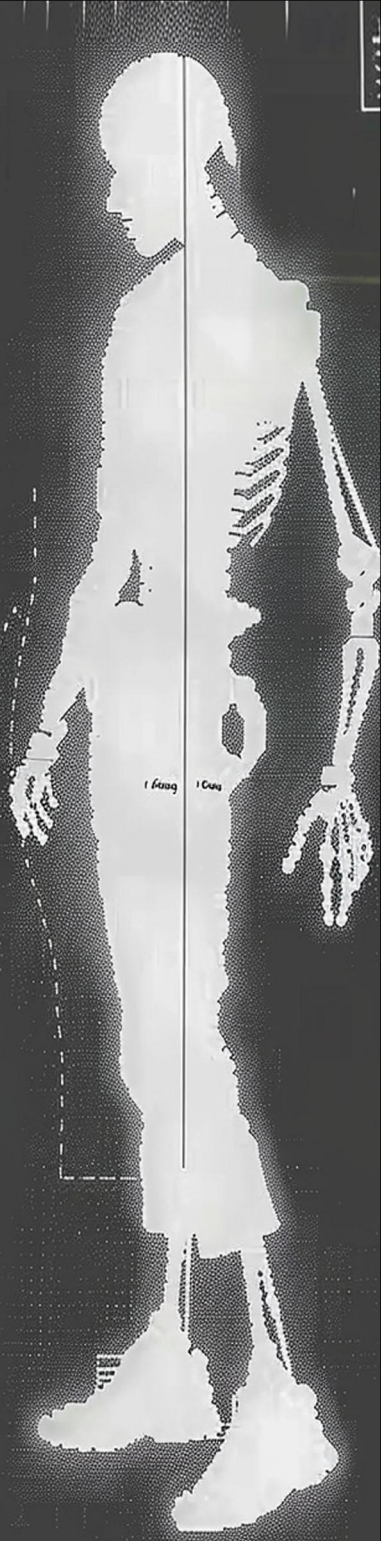


[MODULE 05]

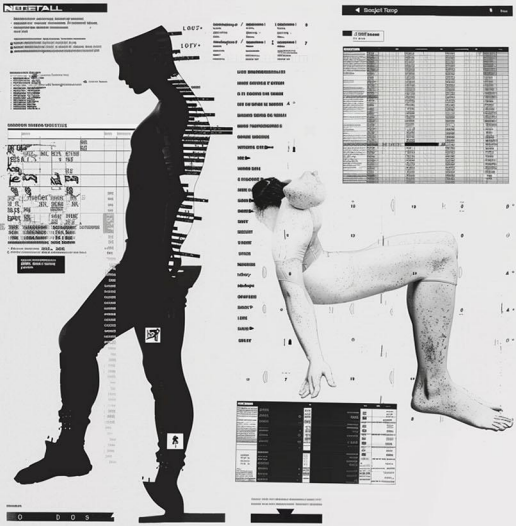
BECOMING WHAT COMES NEXT



Metamorphosis is a system designed not only to explore but also to evolve. In building a synthetic version of myself, I came to realize that identity is not static but responsive and elastic. The more people interacted with my silicone face, the more I understood how deeply their actions affected me, not just technically but emotionally. The feedback loop between audience, machine, and creator revealed something unexpected: even when my body becomes data, I still feel. This loop altered my perception of selfhood. I was no longer simply the creator of the system; I became part of the interface, emotionally entangled within the network of audience, machine, and avatar. Each interaction shaped my emotional landscape, reminding me that identity does not reside solely within the body but emerges through exchanges with others, including those mediated through digital proxies. Before this project, I often moved carelessly through moments of harming my own body and mind, detached from the weight of those actions. The gestures felt distant, unfolding in a space without consequence or reflection. Yet through Metamorphosis, something shifted. I began to witness myself from the outside, not as a body in motion but as a figure being acted upon. Observing how others touched, handled, or even harmed the synthetic version of me made my own pain visible and undeniable. In those moments, I felt something unfamiliar and profound: compassion for myself.



This experience opened a possibility I had not anticipated. Externalizing my identity allowed me to witness my own pain more clearly and to respond to it with care. If this system could offer me such reflection, perhaps it could do the same for others. Metamorphosis may evolve beyond an artistic exploration into a framework for emotional recognition, offering a space where distance allows the possibility of care. By projecting the self into a tangible, responsive form—one that can be touched, spoken to, and seen reacting—the system becomes more than a mirror. It becomes an interface that not only reflects but also responds.



Building on N. Katherine Hayles' concept of the posthuman, where identity circulates between body, information, and machine, Metamorphosis suggests a model for more complex human-machine entanglements. If the self is already distributed across synthetic skin, circuitry, and digital projection, the question arises: what happens as these systems evolve? The current system is reactive, shaped by audience input and programmed responses. However, Hayles' framework invites us to imagine a more reciprocal dynamic, one in which perception and agency circulate between human and machine (Hayles, 1999).

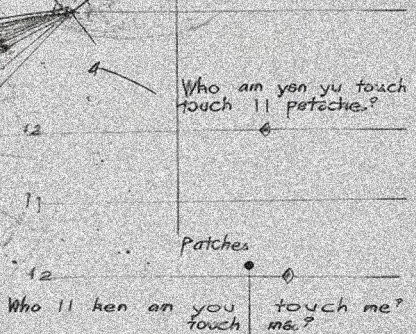
In such a future, the digital self might move beyond passive responsiveness, developing the capacity to choose when to react and when to remain silent. This shift toward autonomy would complicate the relationship between audience, creator, and machine, dissolving the familiar lines of authorship and control. The emotional feedback loop would transform into a negotiation, where responses emerge not only from external input but also from the system's internal state. Emotional intensities could fluctuate, shaped by a dialogue between human gestures and machine agency.

Within this evolving landscape, identity becomes increasingly distributed and fluid, oscillating between self and other, between organic presence and technological agency. The boundaries between creator and creation, subject and system, dissolve into a networked self, one that is co-authored, co-responsive, and continually shifting. Metamorphosis thus becomes not simply an exploration of digital identity but a step toward imagining how identities may develop within these cyborg ecologies, where flesh, signal, and code intertwine to create new forms of presence.

[Exit Log]

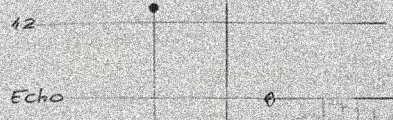


Who am you yu touch
touch 11 petechie?



Patches

Who 11 ken an you touch me?



Echo

Response 11 Responses

ho porthe berg... the ves
o vez ye. SE co tou 11 as left 2
ank, you picined a body 11 11
sez 10?



Vow

Patches?

Vowe Clutchess



This ves we ehlay -
Penne 11 11 11 toy vo
1 vez luv tran wo
responses?

heen 11 patches
ag 10 11 11 a
11 11 patches
11 11 11
11 11 11
11 11 11



Echo
Response
Response

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