altPersona: clusterTeratoma activeHomunculus reAnimation

By

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altPersona: clusterTeratoma activeHomunculus reAnimation

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Chair: Lin Stanionis

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Abstract

altPersona: clusterTeratoma activeHomunculus reAnimation is an art installation that uses the concept of a fictional artificial being to question our dark attraction that motivates the creation of alternative lifeforms. This thesis exhibition integrates elements of actual scientific and technological research to fabricate the fiction of a live cluster of tumor forms able to feel and respond to stress. Its uncanny aspect triggers a suspense in disbelief in the viewer as it is programmed to behave like a living organism, fearful of the bodies that surround it. The intention of *altPersona* is to trigger a visceral response to establish a form of empathy towards the illusion of an artificially fabricated being.

Acknowledgements

I owe this thesis to the people who made it possible, who believed in me, who pushed me further in all three years of this program.

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I'm in great debt with Jason Zeh, Brian Hawkins and Andy Stuhl for their unreserved collaboration to craft the audiovisual and digital programming of the piece. Thanks to them *altPersona* came to be *alive.*

I am forever thankful to Laura Rollins for her immense patience during this thesis year as well as my family that crossed continents and oceans to see *altPersona* exhibition. Their support kept me sane and helped me get through the toughest days.

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Thesis

The thesis of *altPersona* questions our human fascination with the possibility to create a different sentient organism through techno-scientific advancement. The concept of the homunculus, a fictional alternate being crafted by humans, is central to explore the fantasy of creating an artificial intelligence synthesized from hive cluster of tumors. These tumors are the main component of the work as they exploit the raw visceral quality of the silicon-crafted pieces, activated through patterns of vibration, to resemble the pulse of living organs. In addition, its behavioral response is programmed to mimic stress when the observer approaches. The interactive elements disrupt the atmosphere of the didactic space it was placed within. Thus, the viewers are confronted by their own visceral response to the piece caused by their own suspension of disbelief, a threshold that blurs the line in between science, fiction and reality.

Facts

The *altPersona* installation consists of the following elements:

exoskeletalContainment: slim 10x10x96 inch vertical frame fabricated from 1x1 square tube steel. Each face of the rectangular frame is made up of ¼ inch acrylic sheets secured with modified clamps to dampen the vibration and avoid unwanted metallic sound from the tubular metal frame. Attached to the acrylic sheets are the sound system, the sensor electrical equipment, and seven silicon clusters that appear like hybrid organs.

The sound system emits patterns of vibrations distributed by the acrylic sheets. Threaded into them are plastic lines that seem to be ligaments as they stretch, tense and interconnect the silicon

pieces in an ascending direction. The bundled cords that intersect every silicon piece resemble a spinal cord activated into tension by string instrument tuners that register everything in its place. The integrity of the structure ensures a smooth transmission of a vibration pattern emitted by the four 50 Watt transducers. These were located on every side of the rectangular frame at alternating heights and they can convert an electrical sound input into low frequency mechanical vibrations. The product of this motion enables the silicon crafted clusters to have the appearance of a living organism's pulse.

The sensor equipment consists of four Arduino ultrasonic proximity sensors in every acrylic face of the piece. Connected in parallel and 40 inches above the ground, these devices act like a radar to sense the proximity of bodies up to 20 inches. The data is collected and translated by an Arduino UNO transmitted to *controlModule*, as part of an active feedback system that allows the audience to interact with the piece.

clusterTeratoma: these are interconnected silicon-crafted pieces with the visual characteristics of human organs based on the forms of tumor growths. Their arrangement inside the *exoskeletalContainment* was meant to have the appearance of an interconnected hive cluster. The tumor forms were constructed with Smooth-On Dragon Skin, a highly elastic silicon rubber used in special effects makeup. The material's skin-like properties allowed the layering of various tissue-like colors around wax supporting structures, resembling the method in which bioengineers grow live tissues onto scaffolds. Each piece underwent a long refined process that entailed wax carving, mold-making, wax injection, silicon pigmentation, careful layering and de-molding. Their shapes were based on close observation of anatomical illustrations and video footages of tumors being removed in surgical procedures.

controlModule: is a discrete cart situated against the wall that houses the computer and a large

horizontal flat screen monitor. All the electrical cords and input data from the sensors are

collected from the *exoskeletalContainment* and transmitted to this module. The interactivity of

the installation is made possible with the use of a custom code written for the Max 7. This

multimedia program interprets and responds to the input data from the Arduino unit in the

following layers:

> 01_Baseline_Passive.mov: no proximity stimulus. Lowest pulse frequency pattern in between 6-8Hz. Display random segment of video file 1, "baseline_passive".
>
> 02_Gentle_Manipulation.mov: one sensor is triggered. Pulse frequency pattern raised in between 9-11Hz. Display random segment of video file 2, "gentle_manipulation".
>
> 03_Stress.mov: two sensors are triggered. Pulse frequency pattern raised in between 12-14Hz. Display random segment of video file 3, "stress".
>
> 04_Distress.mov: three sensors are triggered. Pulse frequency pattern raised in between 15-17Hz. Display random segment of video file 4, "distress".
>
> 05_Panic.mov: four sensors are being. Pulse frequency pattern raised in between 18-20Hz. Display random segment of video file 5, "panic".

The computer is programmed to alternate between the layers that control the output of sound and

video. Depending on the number of sensors being triggered: when left alone it remains on a loop

of the *baseline_passive* layer awaiting further stimulus, but when stimulated, the vibration

patterns from the transducers will increase in volume. In parallel to this response, more intense

visceral video segments sre displayed on the flat screen. The footage is made up of a

combination of close-ups and birds-eye views of my gloved hands articulating surgical

equipment on the silicon tumors. To add intensity, I gradually manipulate the pieces in an

increasing violent and incisive manner that goes beyond their breaking limits. The way the

silicon tissues are handled is based on the physical behavior of real organic tissues during surgical procedures.

Fiction

altPersona clusterTeratoma activeHomunculus reAnimation is the product of the speculation from science-fiction as a literary mechanism that carefully draws out informed conjectures to make predictions of the future to contemplate our present situation. *altPersona* was fabricated as a proposition on present technological and scientific issues related to the manipulation of the essential components of life. This body of work aims to blur the spaces in between fiction/reality and organic/artificial. The visceral quality of the silicon-crafted tissues is meant to pulse and resonate with the viewer's own organs. These are contrasted with the clean and inorganic aspect of the structural and electrical components. However, the interactive element of the installation that is meant to trigger a feeling of uncanniness, forces the viewers ask themselves: *is it alive?*

The *altPersona* thesis installation deals with a moment in our time where humanity is on the verge of *giving birth* to an autonomous and complex artificial intelligence. Recent developments in bioengineering make it easier to grow organs in scaffolds or in surrogate organisms. Genetic technology is now able to write, edit and condition core DNA structures. Additionally, computational science has been experimenting with the memory and storage capabilities of DNA to leap into an era of quantum processing. The underlying desire to create a new entity crafted by the hand of human technological advancement is central to what this thesis installation represents.

The *altPersona* represents a hybrid of the organic and the digital, a fictional cyborg of science and technology that suggests that the roots of the algorithm of intelligence are part of a survival instinct that all organisms possess. When this entity is *reAnimated*, it senses other bodies outside its contained environment that stimulate it to resonates more violently and display more gruesome images as a sign of stress. *altPersona's* response is meant to raise the tension in between itself and the viewer's foreign body as an interaction in between two live beings.

The mutual stress in between the observer and *altPersona* is essential for the establishment of a relationship in between stress and sentience, a crucial component found in complex forms of intelligence. The interactive element of the work is based on our own bodies' physiological response to fear. The human response to fear engages the stress mechanism of fight/flight mode as it releases a mixture of hormones to minimize brain function and enable a swift instinctive response towards its immediate environment. *altPersona* is programmed to simulate its own artificial physiological response to stress when interacting with the observer's body.

The *clusterTeratoma* is the name I gave to classify the interconnected silicon tumors inside the *exoskeletalContainment*. This *being* harnesses the potential of the tissue-growth in mature human ovarian and testicular tumors classified as teratomas. In actual clinical cases, the mature ovarian teratomas are benign. These consist of contained layers of bacteria that use the structure of the body to grow complex tissues like brain, liver, lung tissues, teeth and hair. In other more unusual cases, the teratoma has been found to have a functional primitive brain-nerve system or the resemblance of a malformed fetus classified as a *fetiform homunculus*.

The concept for the *altPersona* is based on the multiple meanings of the homunculus term. Originally based on the lore of the mandrake root that on occasion resembled a small human, it

was believed that it could grant alternative powers due to its strong hallucinogenic effects. This fully formed being was later classified as a homunculus and its influence spread through ancient western religious and esoteric texts. The folklore of the homunculi became a recurring theme in fiction that would later include aspects of alchemy as a magical proto-chemistry with the ability to reanimate the dead. It was not until Mary Shelly's *Frankenstein* that the first homunculus based on elements of modern science at the time was brought to life and *reAnimated*. This story is still relevant today as science attempts to recreate tissue growths whilst technology tries to craft an artificial intelligence. This is one of the areas where science fiction thrives and fuels our imaginations with tales of powerful alternate beings like zombies, cyborgs, artificial intelligences, humanoids, aliens, amongst other representations. These narratives represent the fear and fascination with human medical advancement and its possible consequences. Thus, the task of *altPersona* is to become a contemporary homunculus to question the future of the nature or artificiality of life.

To complete the illusion of life, the homunculus inside *clusterTeratoma* needs to be *reAnimated*. This activation is only possible in the mind of the spectator where science fiction allows a suspension of disbelief mediated by the interactive elements of the installation. The observer is immersed into an uncanny spectacle of bare pulsating organs and a video feed that shows surgical procedures performed onto the tissues. Everything was situated against the background of scientific facts offered by the Natural History Museum's permanent exhibits. Whether it is driven by fascination or horror, the goal is to evoke a visceral response as a reminder of one's pulsating interior and the primitive elements that bind us to any living organism.

Location

altPersona was installed in the Cassaday Gallery at the KU Natural History Museum through February 4th to the 28th of the year 2017. The exhibit on the 5th floor defines key aspects of evolution and how it relates to us. The gallery has a low ceiling with gentle white artificial illumination where most of the displays have an interactive element and include specimens from the collection of the Museum. The existing exhibitions had a very important role of bringing the right scientific context to the *altPersona.* The thesis installation takes advantage of the information provided within its exhibits and mentally prepares the audience to its unexpected addition. The nature of the space conditions its audience to take its contents as factual scientific research allowing the *clusterTeratomas* to be considered seriously and exist in a space in between art and science. It is my belief that unlike an art gallery, this museum space enhanced the experience of the viewers who were fascinated when they interacted the *activeHomunculus* in a space that has been radically changed by its mysterious pulsating presence.

Personal Considerations

As a visual artist and curious individual, I take pleasure in the study of the disruptive nature of the otherness in relation to the notion of selfhood. It's a constant struggle to define the limits and the borders of the body when so much of it is considered alien. Individualism has made our skin into a fortress that holds our image and notion of selfhood. However, uncovering the raw physicality and physiology of our organs and tissues has the power to erase the distinction between oneself and the other. This otherness comprehends everything we are not, all within the dual nature of our body as a vessel that contains life and death. These elements are brought forth

in this thesis to exacerbate the tension of the body of the other and reveal a hybrid nature that can exist as any form, image or text to evokes a visceral reality within which we are not prepared to confront.

The thesis of *altPersona* is the product of a science fiction designed to remind the observer of the visceral nature beyond their skin; the horrors of the hybrid nature of its homunculus; and a fascination with the possibility to create a sentient organism through techno-scientific advancement. I believe the installation a successful starting point that begins to convey these elements in the minds if the spectators as hints of fascination and horror surfaced when they interacted with it. A big part of this creative endeavor was the motivation to craft the *altPersona* to better understand myself by confronting the otherness of my own insides. Every process from development, fabrication, to installation was intimately related to my own experience and fascination with the ever-present medical discussions that were part of my upbringing. It wasn't until the installation was *reAnimated* that I fully related the *clusterTeratomas* to my own organs and tissues. Its pulse is based on my own body rhythms and primal physiological reactions led to an experience of empathy towards the *activeHomunculus* when I witnessed its struggle with stress and crash over the excess of stimuli. Thus, even in its artificiality, *altPersona* managed to bring to surface a visceral response in me that links every living organism into the same evolutionary network.

Appendices

Process and Hardware

Silicon rubber two-part molds were used to make duplicates of wax carving modules based on shapes of human tissues and organ structures. The molds where clamped with simple hardware to make the wax injection and de-molding process easier.

The pink wax injection castings demolded and joined with others to elaborate more complex structures. The Dragon Skin silicon rubber was then layered in different colors, one at the time. Every layer took approximately 30 minutes to finish.

Birds-eye view of the work bench. Silicon layers were applied with the help of plastic wrap that allowed its own texture and made it easier to demold and reuse. The Dragon Skin is a two-part mix that must be measured precisely, the color has to be applied in the initial mix.
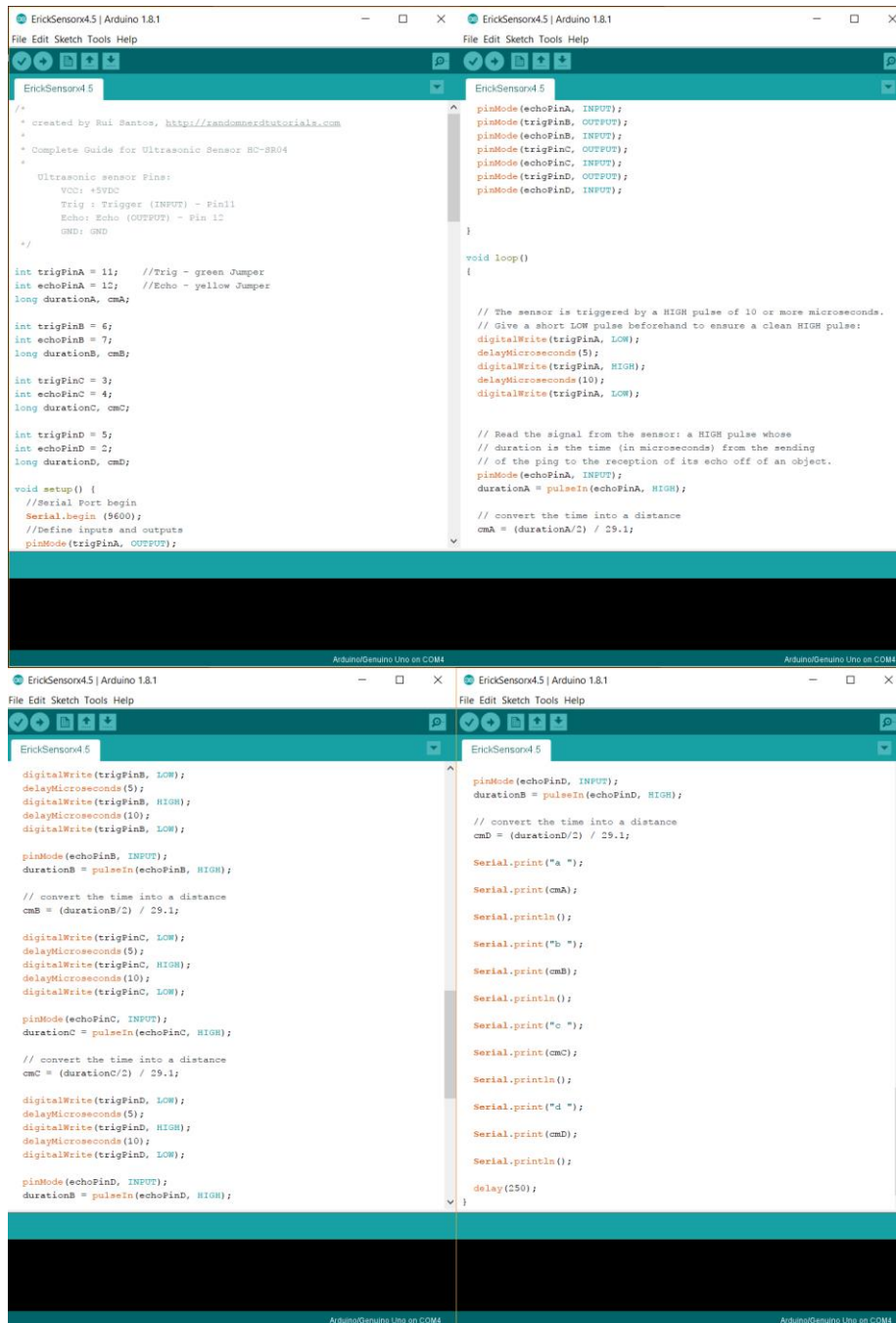

Detail of one of the silicon-crafted pieces with the plastic lines ready to be put inside the frame

Details on the process and finish of the hardware. The clamps were refinished to be able to hold cymbal felts to dampen the vibration. All the metallic pieces were darkened with a gun blue patina sealed with paste wax.

Software

```
/*
 * created by Rui Santos, http://randomnerdtutorials.com
 *
 * Complete Guide for Ultrasonic Sensor HC-SR04
 *
   Ultrasonic sensor Pins:
      VCC: +5VDC
      Trig : Trigger (INPUT) - Pin11
      Echo: Echo (OUTPUT) - Pin 12
      GND: GND
 */

int trigPinA = 11;    //Trig - green Jumper
int echoPinA = 12;    //Echo - yellow Jumper
long durationA, cmA;

int trigPinB = 6;
int echoPinB = 7;
long durationB, cmB;

int trigPinC = 3;
int echoPinC = 4;
long durationC, cmC;

int trigPinD = 5;
int echoPinD = 2;
long durationD, cmD;

void setup() {
  //Serial Port begin
  Serial.begin (9600);
  //Define inputs and outputs
  pinMode(trigPinA, OUTPUT);
```

```
  pinMode(echoPinA, INPUT);
  pinMode(trigPinB, OUTPUT);
  pinMode(echoPinB, INPUT);
  pinMode(trigPinC, OUTPUT);
  pinMode(echoPinC, INPUT);
  pinMode(trigPinD, OUTPUT);
  pinMode(echoPinD, INPUT);

}

void loop()
{


  // The sensor is triggered by a HIGH pulse of 10 or more microseconds.
  // Give a short LOW pulse beforehand to ensure a clean HIGH pulse:
  digitalWrite(trigPinA, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPinA, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPinA, LOW);

  // Read the signal from the sensor: a HIGH pulse whose
  // duration is the time (in microseconds) from the sending
  // of the ping to the reception of its echo off of an object.
  pinMode(echoPinA, INPUT);
  durationA = pulseIn(echoPinA, HIGH);

  // convert the time into a distance
  cmA = (durationA/2) / 29.1;
```

```
  digitalWrite(trigPinB, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPinB, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPinB, LOW);

  pinMode(echoPinB, INPUT);
  durationB = pulseIn(echoPinB, HIGH);

  // convert the time into a distance
  cmB = (durationB/2) / 29.1;

  digitalWrite(trigPinC, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPinC, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPinC, LOW);

  pinMode(echoPinC, INPUT);
  durationC = pulseIn(echoPinC, HIGH);

  // convert the time into a distance
  cmC = (durationC/2) / 29.1;

  digitalWrite(trigPinD, LOW);
  delayMicroseconds(5);
  digitalWrite(trigPinD, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPinD, LOW);

  pinMode(echoPinD, INPUT);
  durationB = pulseIn(echoPinD, HIGH);
```
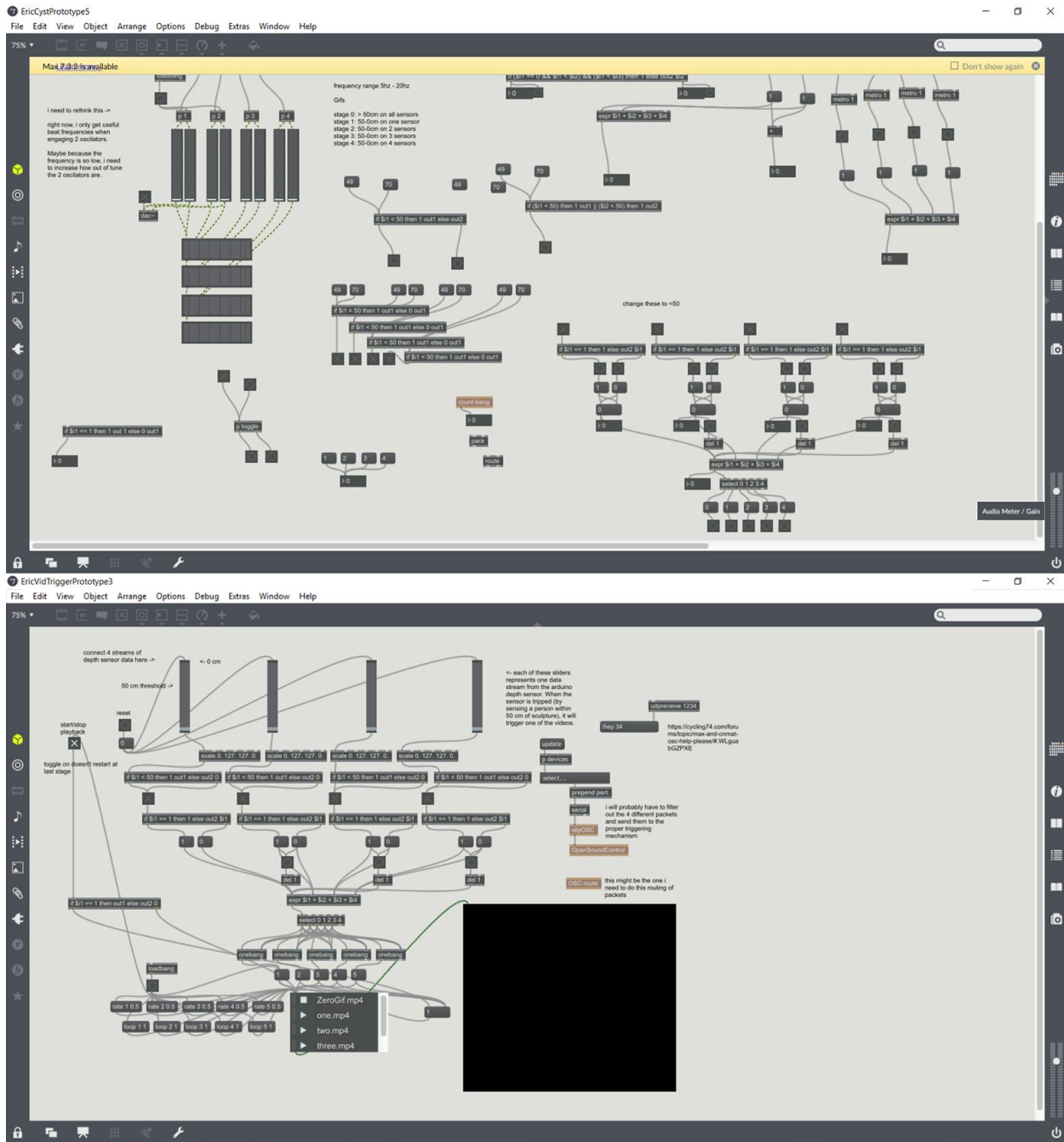
```
  pinMode(echoPinD, INPUT);
  durationB = pulseIn(echoPinD, HIGH);

  // convert the time into a distance
  cmD = (durationD/2) / 29.1;

  Serial.print("a ");

  Serial.print(cmA);

  Serial.println();

  Serial.print("b ");

  Serial.print(cmB);

  Serial.println();

  Serial.print("c ");

  Serial.print(cmC);

  Serial.println();

  Serial.print("d ");

  Serial.print(cmD);

  Serial.println();

  delay(250);
}
```
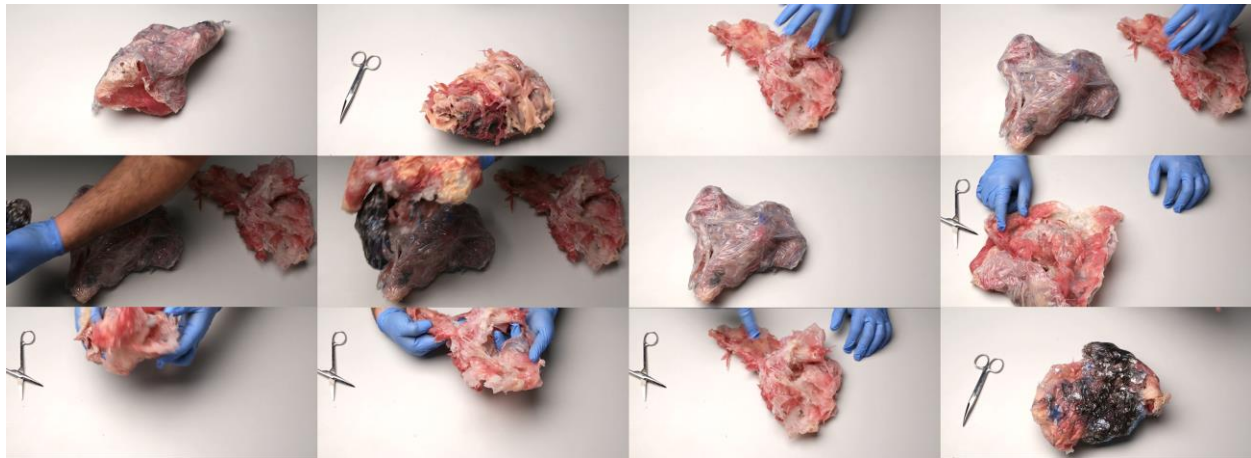
These are screenshots of the open-source Arduino code taken from their webpage and adapted to run the sensors. This code had to be installed into the Arduino UNO unit to allow it to interpret the input signals from four separate HC-SR04 ultrasonic proximity sensors.
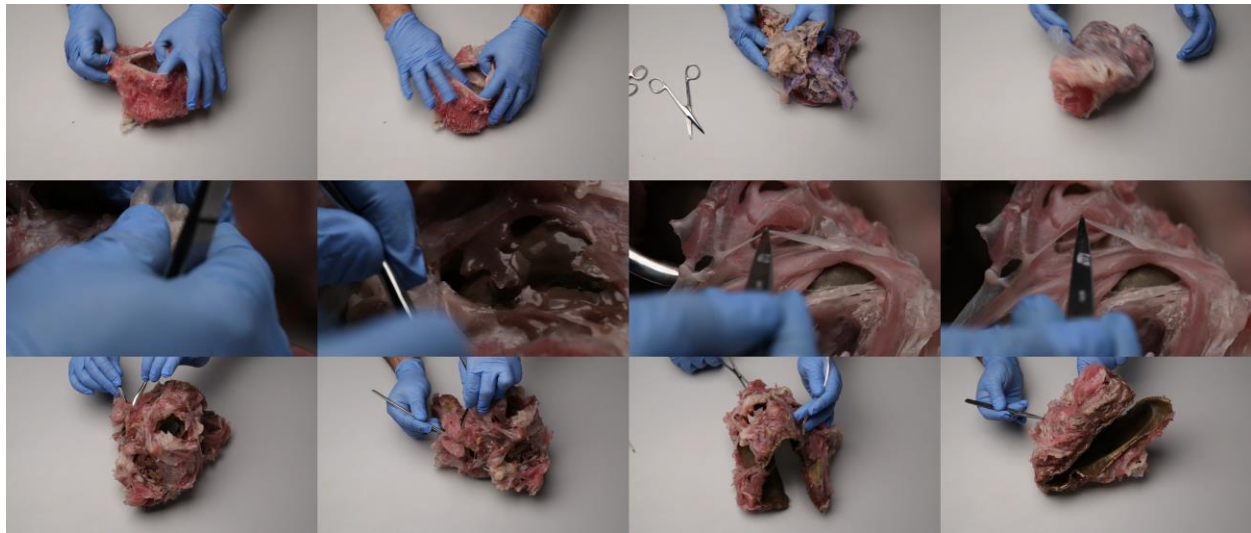
These are screenshots of the Max 7 program patches and subpatches programmed by Jason Zeh. The program had to read the input signals from the Arduino sensors to generate a random sound pattern and choose a random segment of the video.
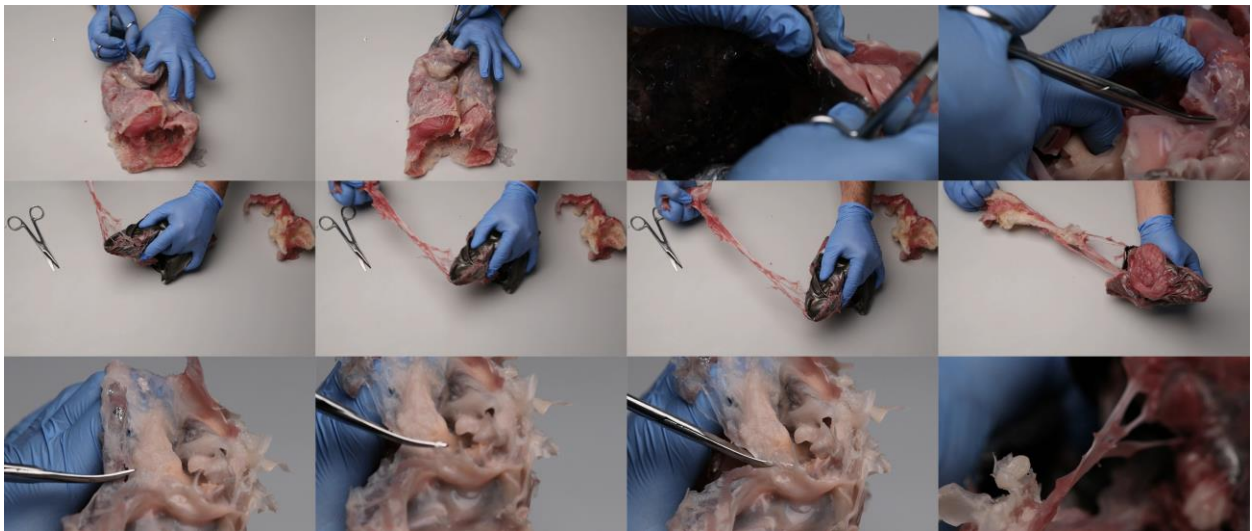
Video samples

Excerpts of the *Baseline_passive.mov*

Excerpts of the *Gentle_manipulation.mov*

Excerpts of the *Stress.mov*

Excerpts of the *Distress.mov*

Excerpts of the *Panic.mov*

Details of the *clusterTeratoma*

Individual silicon-crafted piece

Individual silicon-crafted piece

Detail of the texture of one of the silicon-crafted pieces

altPersona in the gallery

Installation being observed by family members