

Denise Heredia

Designer-Engineer
Portfolio, 2022

Tumbleweed

A ~4-week, 2 person project exploring the idea of a nomadic, non-invasive robot.

Contributions: Design concept, silicone mold development in CAD + 3D printing, Arduino programming with pumps + air valves, poster sketches.



A Nomadic Robot

Most robots exist with the goal of a specific human-centered mission - optimized for sensing something in their environments and sending back data to human sponsors.

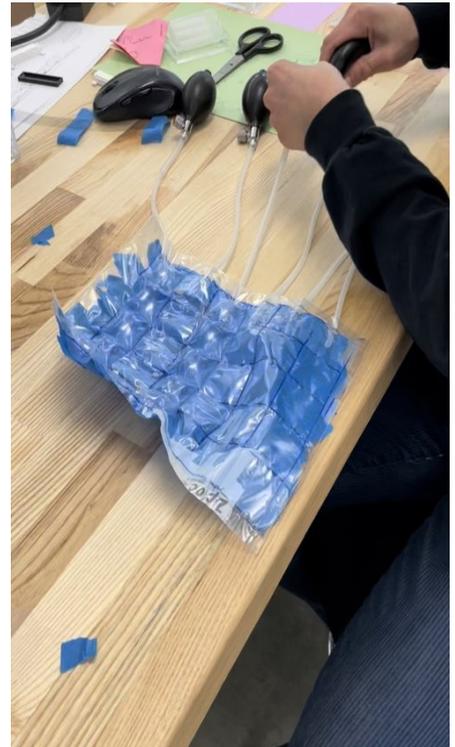
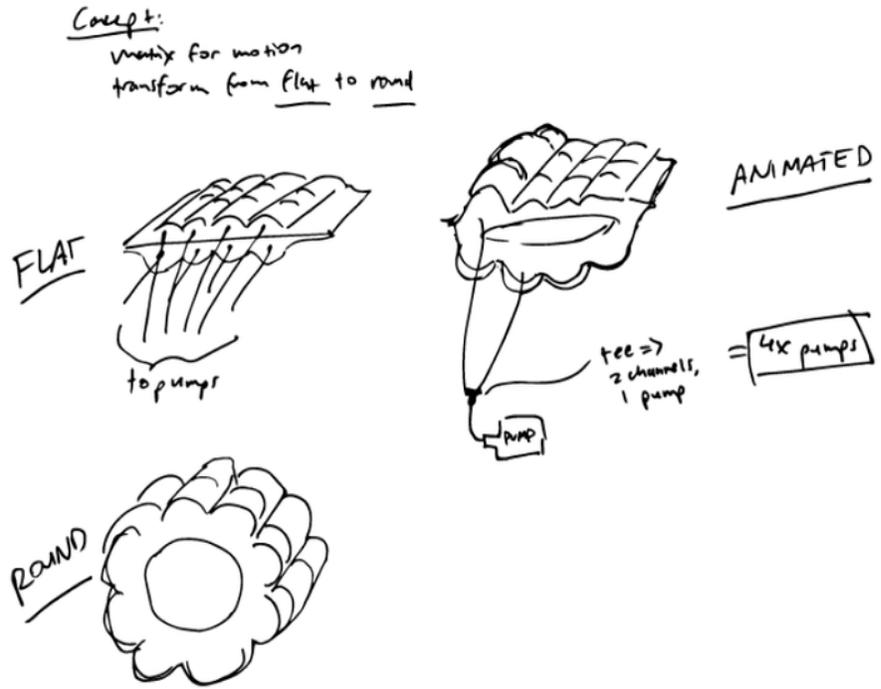
Soft robots - shaped from compliant materials and powered by air - can take on elegant forms, move about gracefully, and offer minimally invasive interactions with their environments due to their soft bodies. Taking these character traits to their fullest extents, Carolyn Nguyen and I designed a soft creature evoking the nature of a nomadic tumbleweed.

'Tumbleweed,' as a creature, is nomadic, non-invasive, and more often than not 'going with the flow.' We envision Tumbleweed exploring expanses in a non-invasive way and writing back notes about their exploration to us.



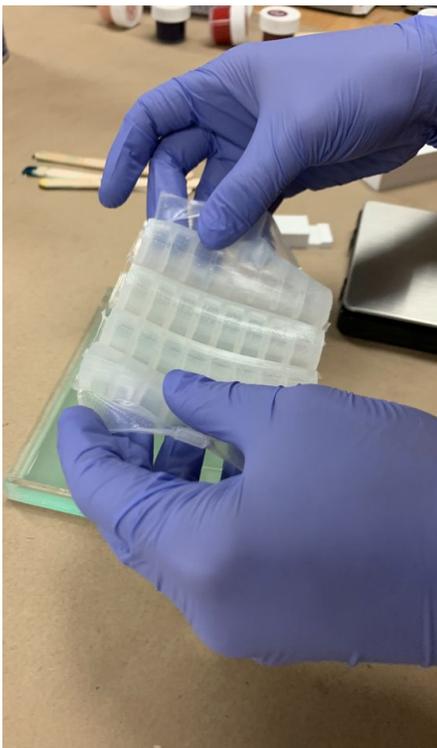
Form Experiments

We started out with plastic pouch motors due to the quick turn around from idea to prototype. We made grids with channels to act as a matrix for motion control. These were initial proof-of-concepts for a robot that could go from flat to round and rolling.



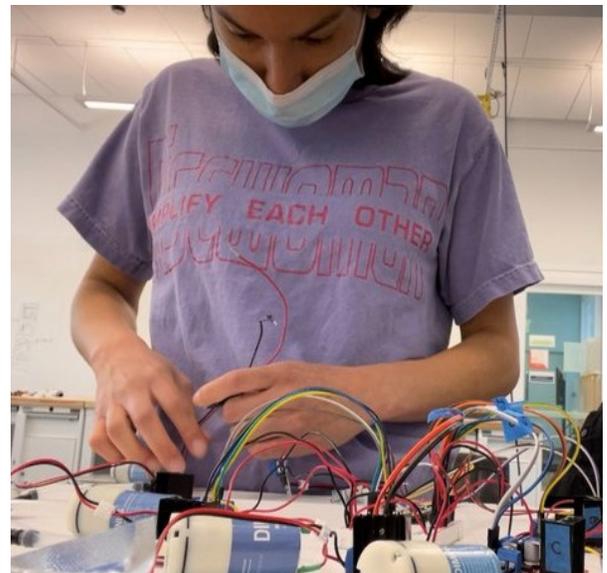
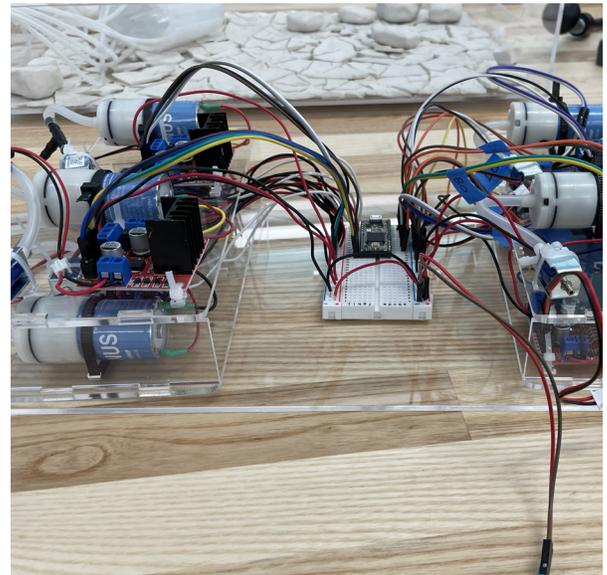
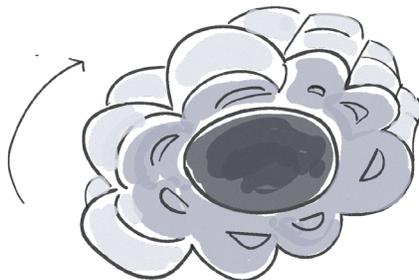
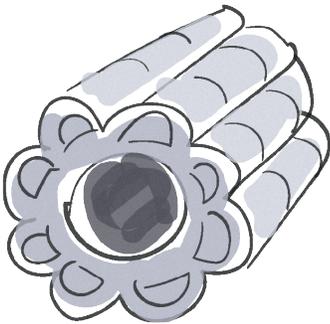
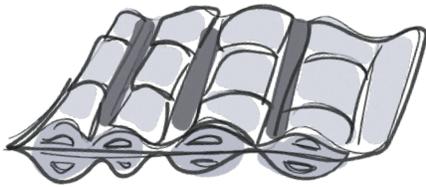
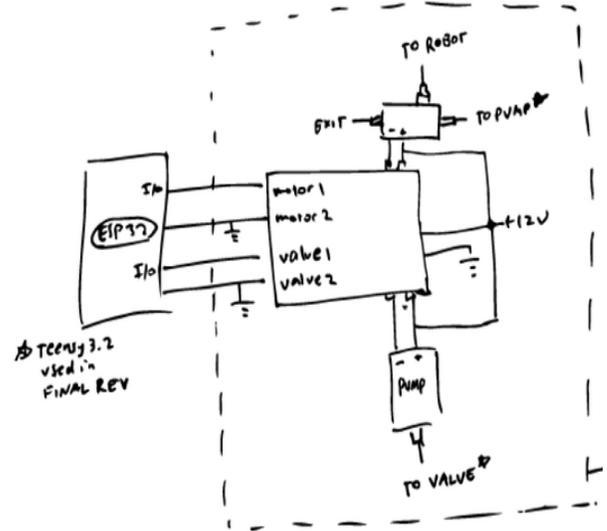
Silicone Casting

After testing out the initial concept with plastic film pouch motors, I modelled and 3D printed casting molds to create a more finished prototype out of silicone. The elasticity and look-and-feel of silicone was more suitable for the finished product. Much of this work involved design for manufacturing and assembly through trial and error.



Programming Animations

Our form + electronics were designed to enable different modes of motion, or animations. These modes would correspond to Tumbleweed's current state and inject some personality into our soft robot creature.

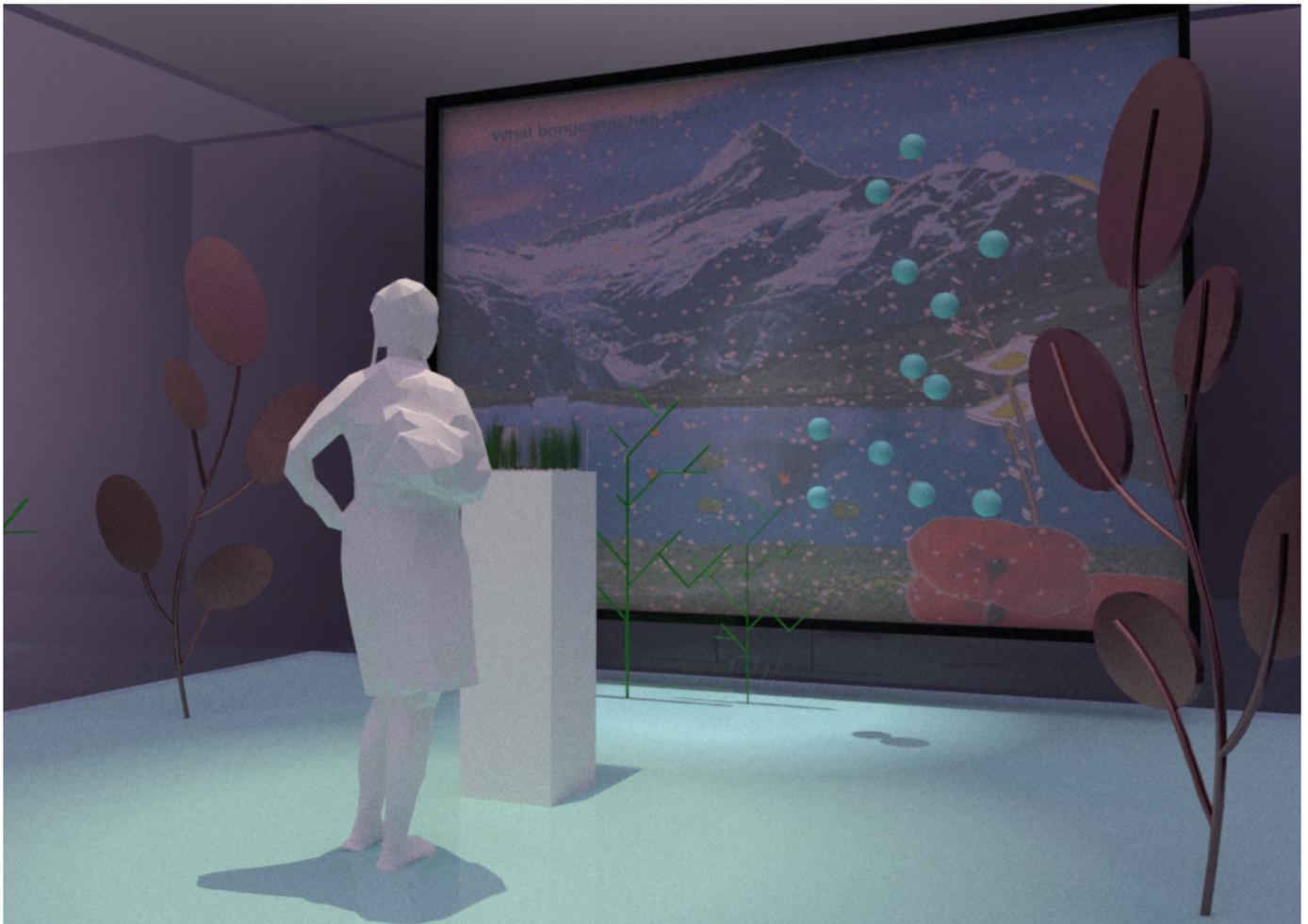




Reflection Pool

A ~4-week, 4 person pop-up style installation that allows for individual reflection through audiovisual communication.

Contributions: project leadership, contextual research + synthesis, p5.js programming, space design + construction



Motivation

A common point of tension in the age of social media and ubiquitous computing is overconsumption and a move further away from a mindful state of being. Our motivation behind this project was to explore a way to encourage emotional reflection and personal expression in young adults through technology. We were also interested in how a visual abstraction of emotions could be a starting point for speaking to others about our feelings, or even just understanding them for ourselves.

Context Building

We spoke to a range of young professionals, college students, creatives, and a student advisor to explore existing and missing outlets for emotional expression.



International Student



Student Advisor



Professional Illustrator



Content Creator

“Go to a place where I don't feel judged. This is often in my sketchbook”

“Adults need more outlets for joy and expression”

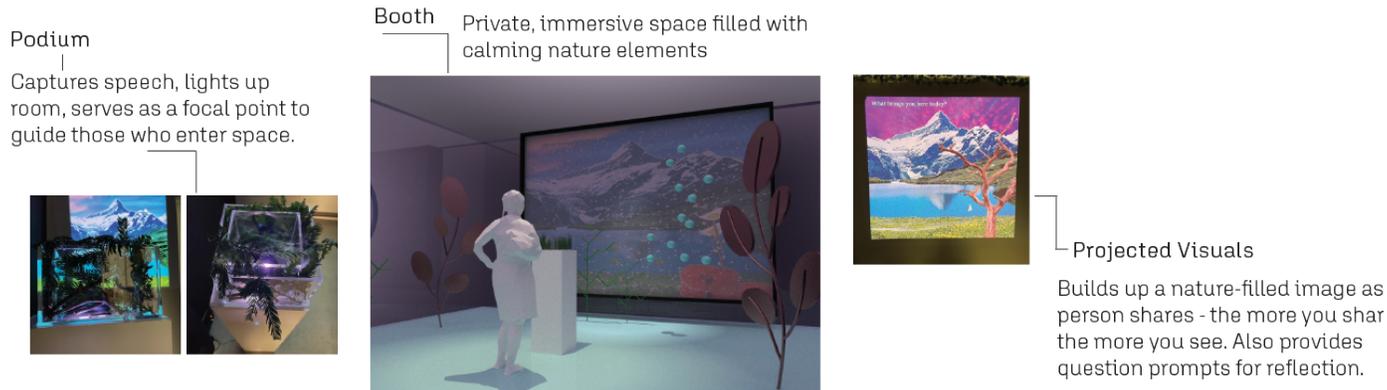


Following initial conversations, lo-fidelity prototypes were created to gain more detailed insights about creative expression, emotional reflection, and visualization of feelings.

Main insights included the need for a private space when sharing emotions, the desire to get something in return, and curiosity around abstracting their feelings into something expressive and outside of oneself.

An Audiovisual Meditation

Our final direction consisted of an interactive audio journaling exercise which guided participants through a set of reflective questions. Speech and emotion-responsive visuals were generated as a way of providing a personalized expressive output and encouraging sharing in the experience.



Tuning the Interaction

In addition to tying together the space and experience, I focused on tuning the animations for the visual assets that my teammates gathered. This involved scripting transitions from dark to light scenes and designating zones of randomized placement for overlaid graphics.

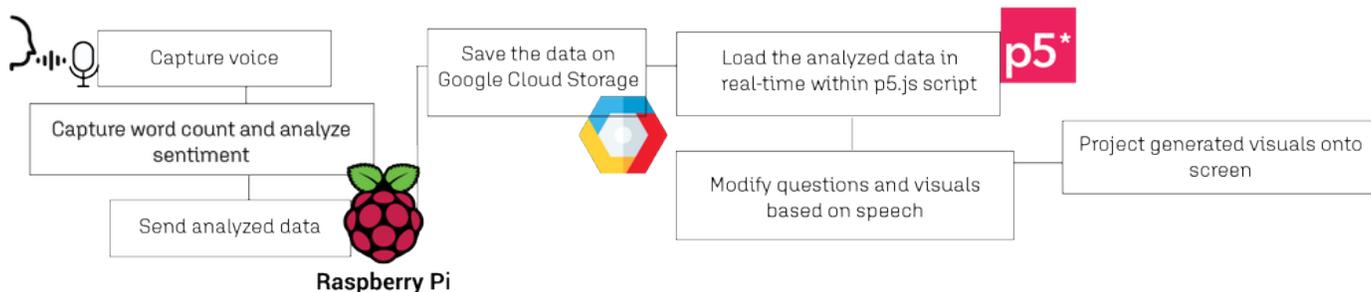
```

function decide_sentiment(sentiment) {
  if (sentiment <= 0.4) {
    return 21; // dark night
  } else if (sentiment <= 0.1) {
    return 18; // evening
  } else if (sentiment < 0.1) {
    return 5; // sunrise
  } else if (sentiment < 0.4) {
    return 8; // bright morning
  } else {
    return 14; //afternoon
  }
}

//this class describes the properties of a single particle. (fireflies in night scene)
class Particle {
  //setting the co-ordinates, radius and the speed of a particle in both the co-ordinates axes.
  constructor() {
    this.x = random(0,width);
    this.y = random(0,height);
    this.r = random(1,8);
    this.xSpeed = random(-2,2);
    this.ySpeed = random(-1,1.5);
  }

  //creation of a particle.
  createParticle() {
    noStroke();
    fill('rgba(255,255,51,0.5)');
    circle(this.x,this.y,this.r);
  }

  //setting the particle in motion.
  moveParticle() {
    if(this.x < 0 || this.x > width)
  
```





Electronic Textiles

Overview of a two-month internship at Bilio
labs, an R&D technical soft goods company.

bilio

*Contributions: electronic integration
with conductive textiles, bringup for
automated embroidery machine*

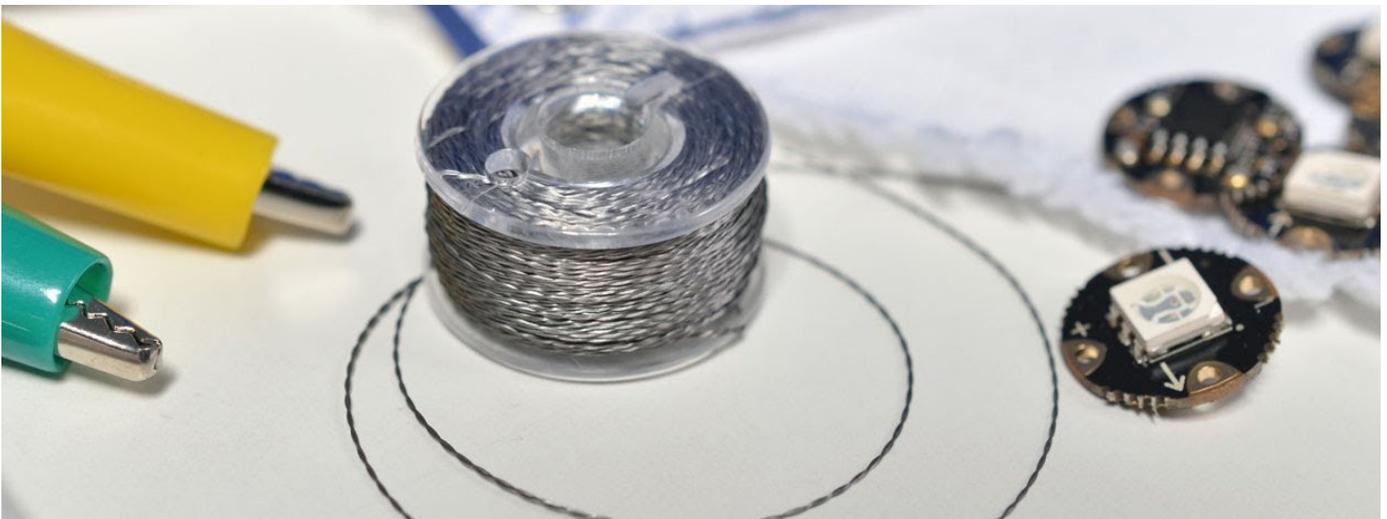


Crafting Technical Textiles

As part of my internship at Bilio, I collaborated with a textile expert and soft goods designers to help bring up an automated embroidery machine. One of the issues in current e-textile technology is a gap between building functional electronic integration into textiles, and crafting aesthetic, scalable products from a design perspective. My role involved helping to bridge this gap, coming from an engineering and electronics lens - but also utilizing design sensibilities.



Conductive embroidery. (ZSK)

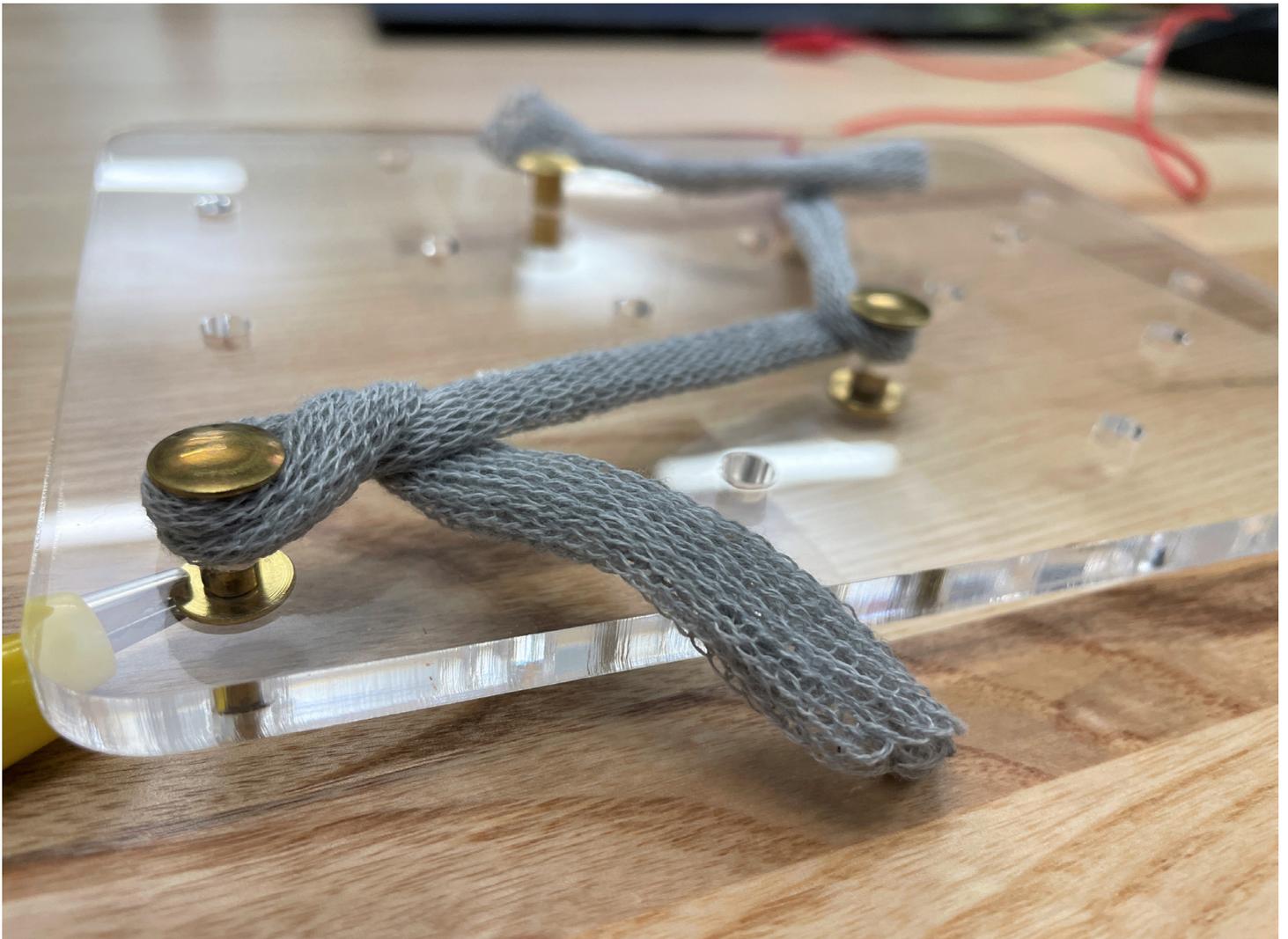


Conductive thread + electronics. (Adafruit)

Tuning-In

Berkeley MDes thesis exploring a tangible interface for interaction with sound-based memories.

Skills: PureData, Python, Arduino, Raspberry Pi, Tangible Interface Design



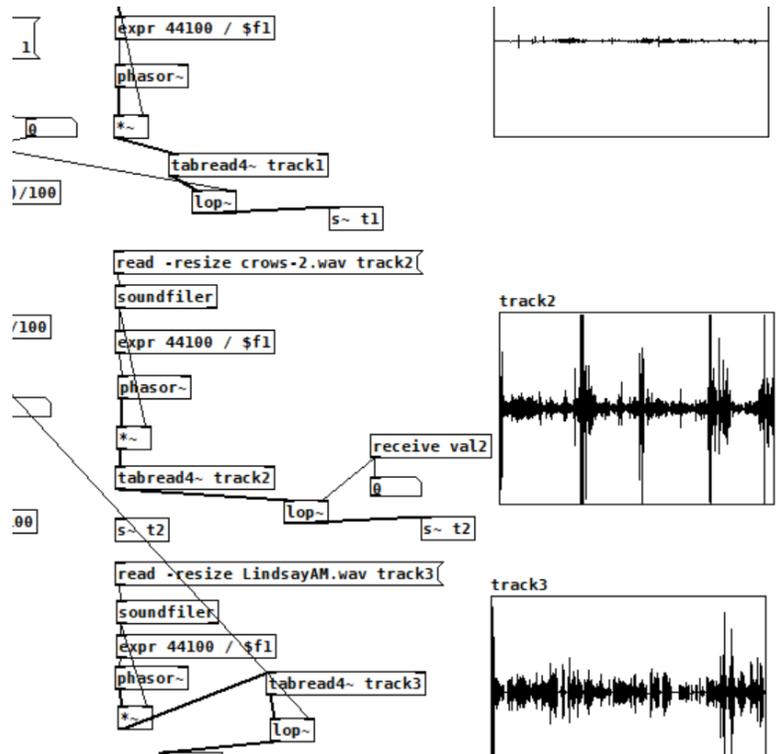
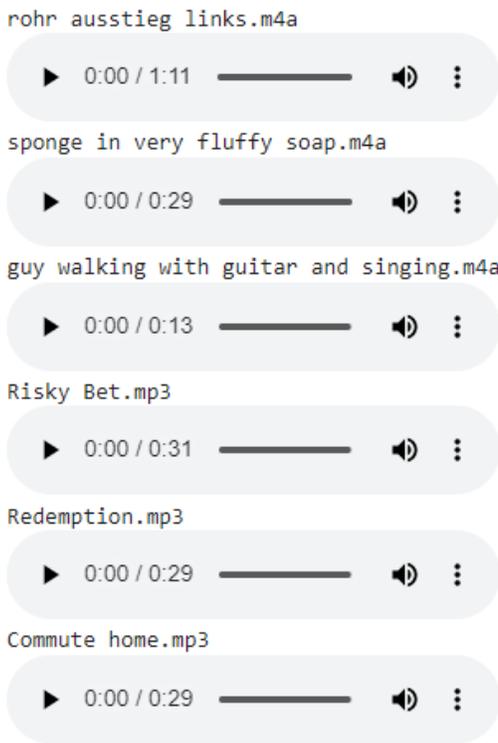
Mindful Technologies

Everyday, personal, and home technologies are growing in their ubiquity. Currently, these devices are designed to seamlessly integrate and assist with functional tasks in our lives.

Tuning-In explores an alternative narrative for everyday technologies - one which encourages collaborative curation and exploration of content, as well as presence in the everyday via close listening.

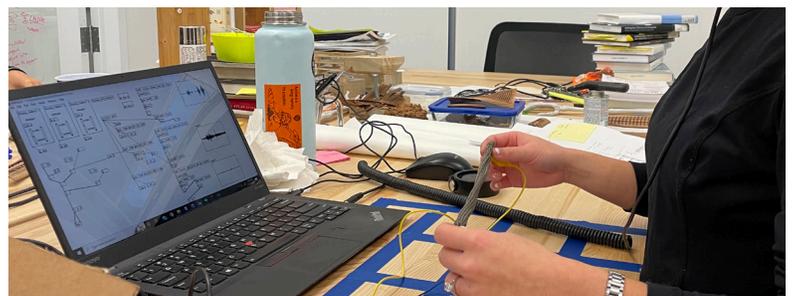
Sound Collection

To craft an experience around everyday listening and personal curation, I first organized a study in which I asked 12 participants to collect sounds from their everyday. Captured sounds were analyzed and clustered, revealing what sonic content participants deemed worthy of recording, and informing what types of replay interactions heighten the re-experiencing of a recorded sound.



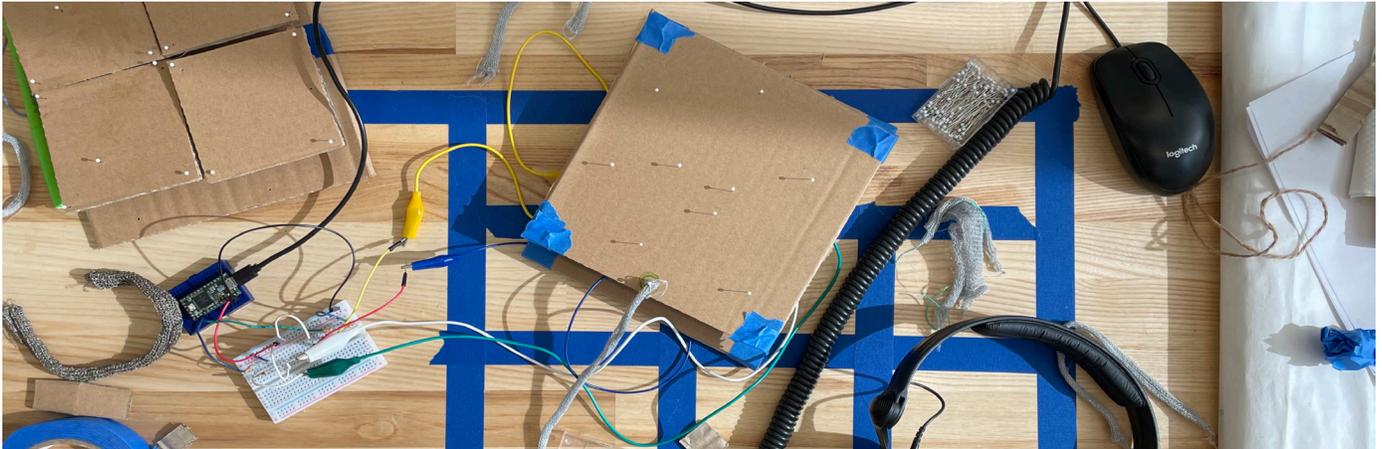
Interaction Concept

The core interaction concept consists of a dynamic, tangible exploration of curated sounds through a physical interface. Snippets can be dynamically revealed and mixed by interacting with a conductive textile sample, giving the feeling of physically unravelling a sound.



Interface Prototyping

A series of functional sound interaction boards and 3-D printed sound object prototypes were tested for ergonomics and ease of use. Conductive textiles were used for their dynamic resistance responses based on touch.



Conductive knit + cardboard (all knits c/o Jess Kim)



3D printed sound objects



System Design

The final design consists of interchangeable sound objects (each corresponding to one audio clip), as well as an interaction board with knit conductive cords to tension around brass pins.

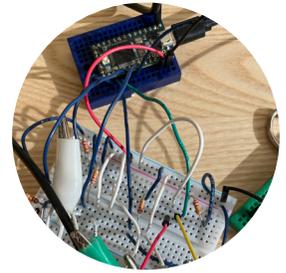
Load curated sound objects



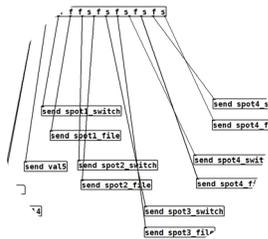
Tension around pins



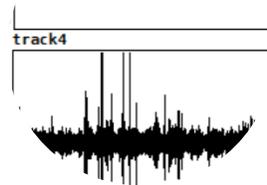
Arduino sense



Pure Data synthesis



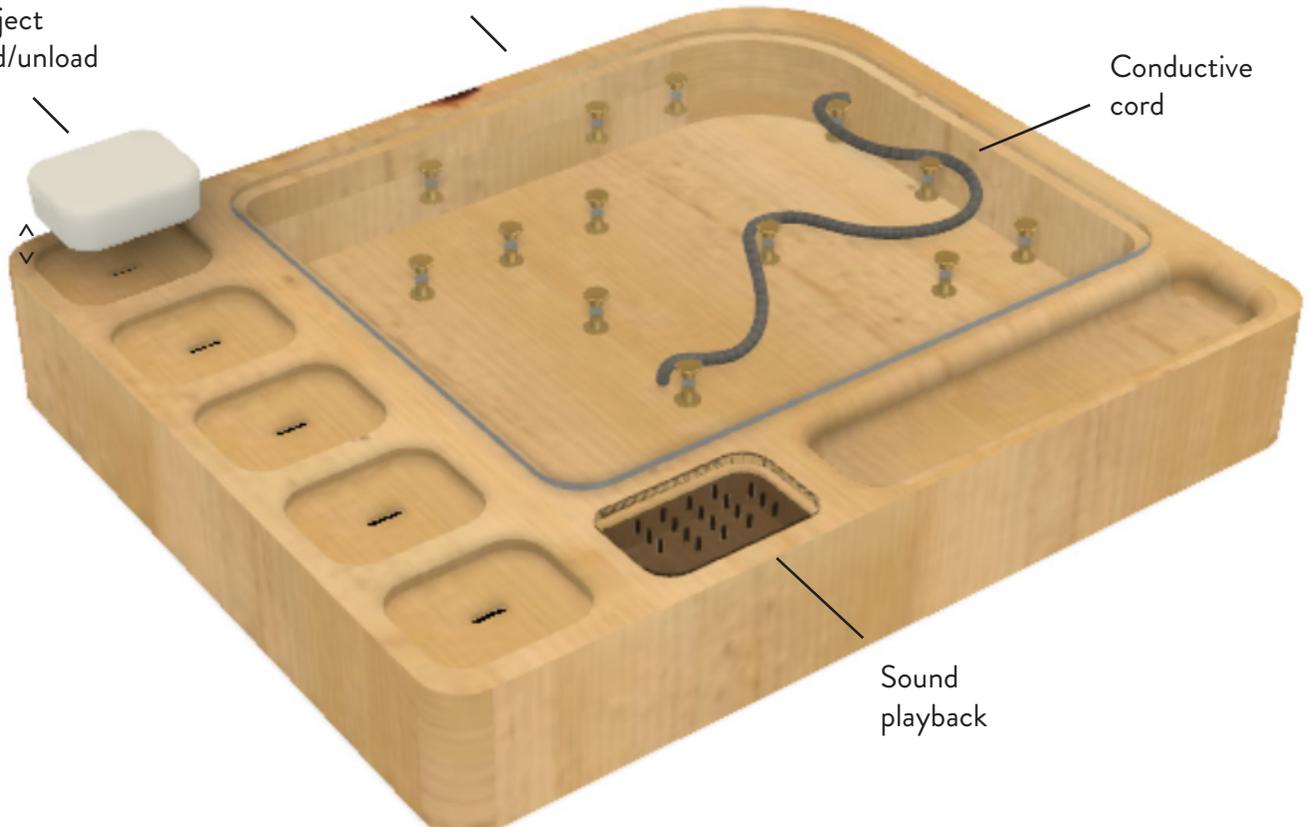
Sonic output



Sound Object load/unload

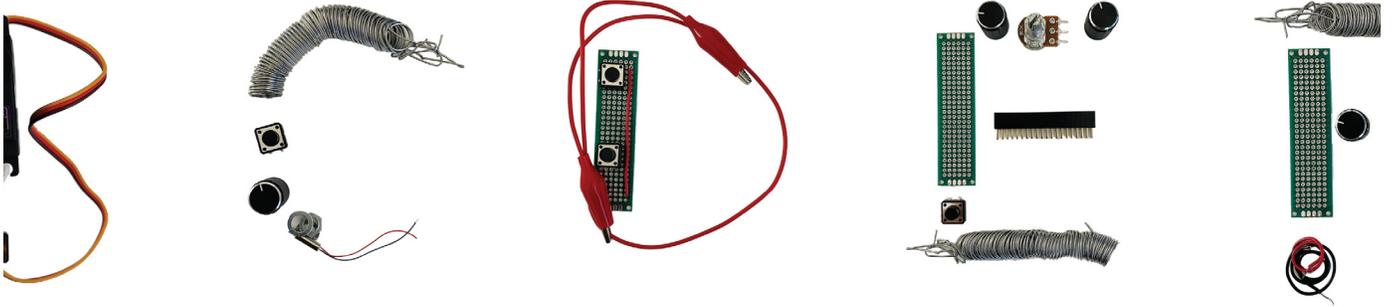


Brass pin sound board



Conductive cord

Sound playback



Resume

Work

UC Berkeley - Graduate Student Instructor

Courses Taught: Technology Design Foundations, Creative Programming + Electronics, Maker Launchpad, Introduction to Product Development, Design Innovation Lecture Series

2021-2022

Waymo, LLC - Camera Test + Manufacturing Engineer

Rapidly brought up camera characterization infrastructure (software, hardware, methods) to inform camera design decisions for self-driving vehicle fleets. Worked with overseas vendors and consulted team on key design and manufacturing decisions.

2017-2021

Waymo, LLC - Software Quality Associate

Supported autonomous driving software development by simulating interactions between a self-driving car and pedestrians, cyclists, other vehicles.

Education

University of California - Berkeley, CA

Master of Design - Product Design + HCI

2022

Northwestern University - Evanston, IL

Bachelor of Science - Mechanical Engineering + Design

2017

Community Involvement

Master of Design Students' Association

Cohort - elected officer serving as liaison between UC Berkeley's MDes student body and faculty

Gray Area Foundation for the Arts

Volunteer for setup and teardown of interactive art + technology programming

Skills

Rapid Prototyping, Arduino, Raspberry Pi, Python Programming, Electronics Prototyping, 3D Modelling (CAD), Adobe Illustrator + Photoshop, General Shop Skills, Design for Manufacturing