JIN YUTAO
PORTFOLIO

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I'm

maker/
prototyper/
design engineer/

Education

University of California
Design Engineering: Master of Design

Expected December 2023

Shanghai Jiao Tong University
School of Design, Industrial Design

Skills

Mechinical Engineering
- 5 years experience in CAD, CAM, and generative design & Simulation Tools (PTC Cero, SolidWorks, OnShape);
- Proficient in both fast and traditional prototyping methods (3D Printing, Laser Cutting, Lathing, and CNC Milling); Deep knowledge on DFM process.

Electrical Engineering
- Bettery System Design(BMS, Thermal Control, Bettery Packaging)
- Skilled in electronics design ,PCB and PCBA manufacturing process.
- Experienced in Embeded Systen Develop and IOT applications (, C, C++, node.js, micro Python).

Design
Figma, Hand Sketching, Adobe Illustrator, InDesign, Photoshop, After Effect, Animation; C4D, Blender, Affinity design, Photo, Publisher; Unity, Processing.

Experience

Hylio
UAS Design Engineer — *7/2023 - Present*
- In charge of developing the next-generation UAS frame, with a target payload of 120kg
- Prototyping frame components in-house, with CNC, Fiber Laser, Sheet metal, and 3D printing
- Developing and sourcing components for the electric power-train system.

Autodesk
CAD Design Engineer & Lecturer — *10/2020 - 07/2021*
- Developed UAV design course – *Simple, Fast, and Flexible: Fusion 360 Can Accelerate Drone Development Process* – on how to utilize Autodesk Fusion 360 to support UAV design process based on personal experience.
- My course was selected as the only official course of Autodesk University 2021 in China; the course was aired worldwide on October 7th, 2021.

Cocube: Reconfigurable Educational Robot
Embedded System Engineer & Mectronics Designer — *05/2021 - Present*
- Develop Embedded System software, conduct PCB design, case Design, and external mechanism design.
- In charge of in-house PCBA Production with PnP & SMT process, test rig design, ans QA. as well as DFM optimized for out-sourcing mass production run.
- Engaged and led teams in completing tasks such as function definition, industrial design.
- Led UX research for marketing analysis, surveys, and sketching to usability testing.

Jianjiao Education Co.
Co-founder & Cheif Technical Designer — *05/2019 - 04/2022*
- Design, manufacture, and instruct STEM courses around physical computing, creative coding, IOT, Prototyping, and fabrication for K-12 & high school students.
- Held 30+ summer camps covering over 400 students, Instructed in person
- Guided 50+ STEM projects to compete in national Competitions

Shanghai Jiao Tong University Aero Sports Club
Lab Manager & Instructor — *08/2019 - 03/2021*
- Led 20+ projects, acquired 2 patents, and won 8 national awards during my term.
- Organized campus-wide events and competitions, attracting over 400 participants.
- Tutored members on aerodynamics, control theory, and electronics.

Design at Large

This summer, I had the privilege of interning at Hylio, an agriculture drone company in Taxus, as a UAS Design Engineer. My main focus was developing the next-gen UAS frame for a 120kg payload. I engaged in hands-on work, prototyping components using CNC, Fiber Laser, sheet metal, and 3D printing. Additionally, I played a key role in sourcing and developing components for the electric power-train system. This experience not only honed my technical skills but also provided valuable insights into the intersection of agriculture and drone technology.

hylio

Sofar

Meet the Team

Ananth Nayak
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Overview

Sofar is an interactive sofa that creates remote physical presence for people in long distance relationships. It provides an opportunity for distance couples to connect without staring at a phone or computer screen.

Design Process

01

IDEATION

We collectively brainstormed 100 ideas to explore a range of ways to accomplish our goal of creating remote physical presence.

02

PROTOTYPE

We sketched several approaches to envision how we might create a sofa that conveyed presence.

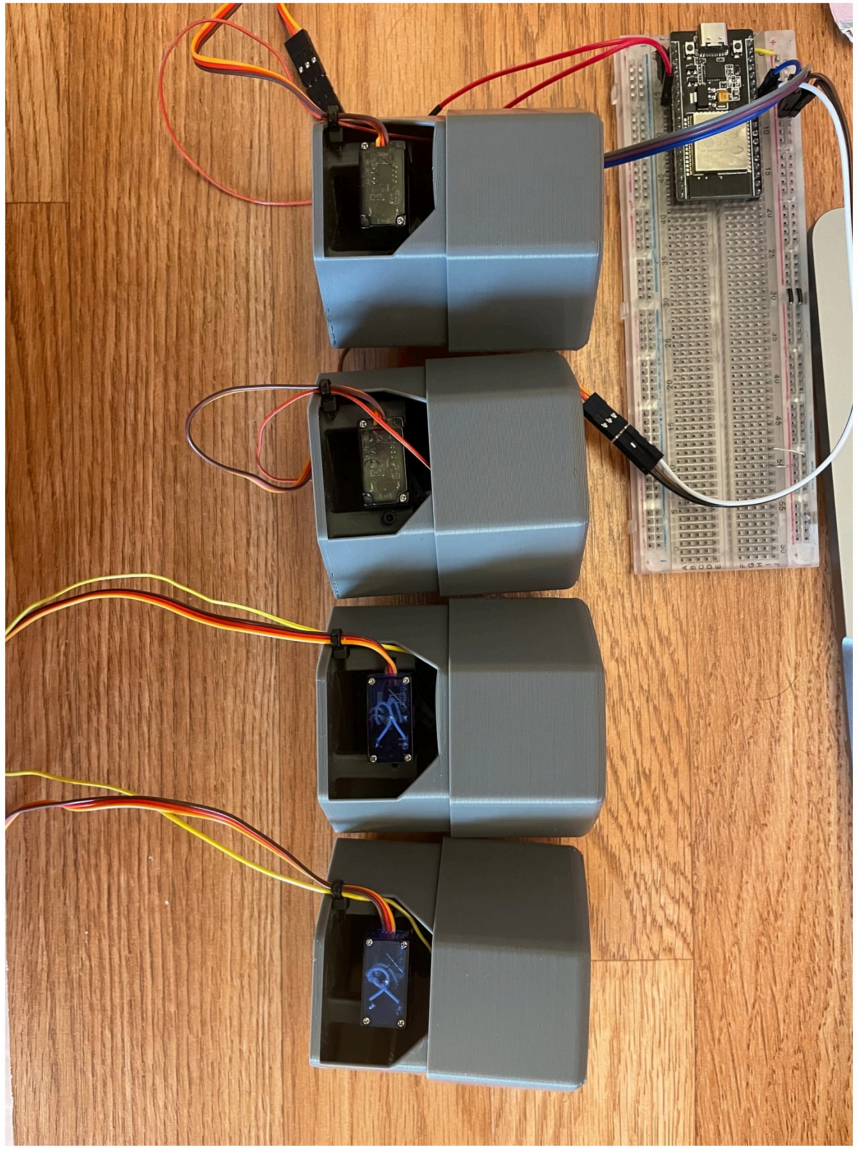
03

MANUFACTURE

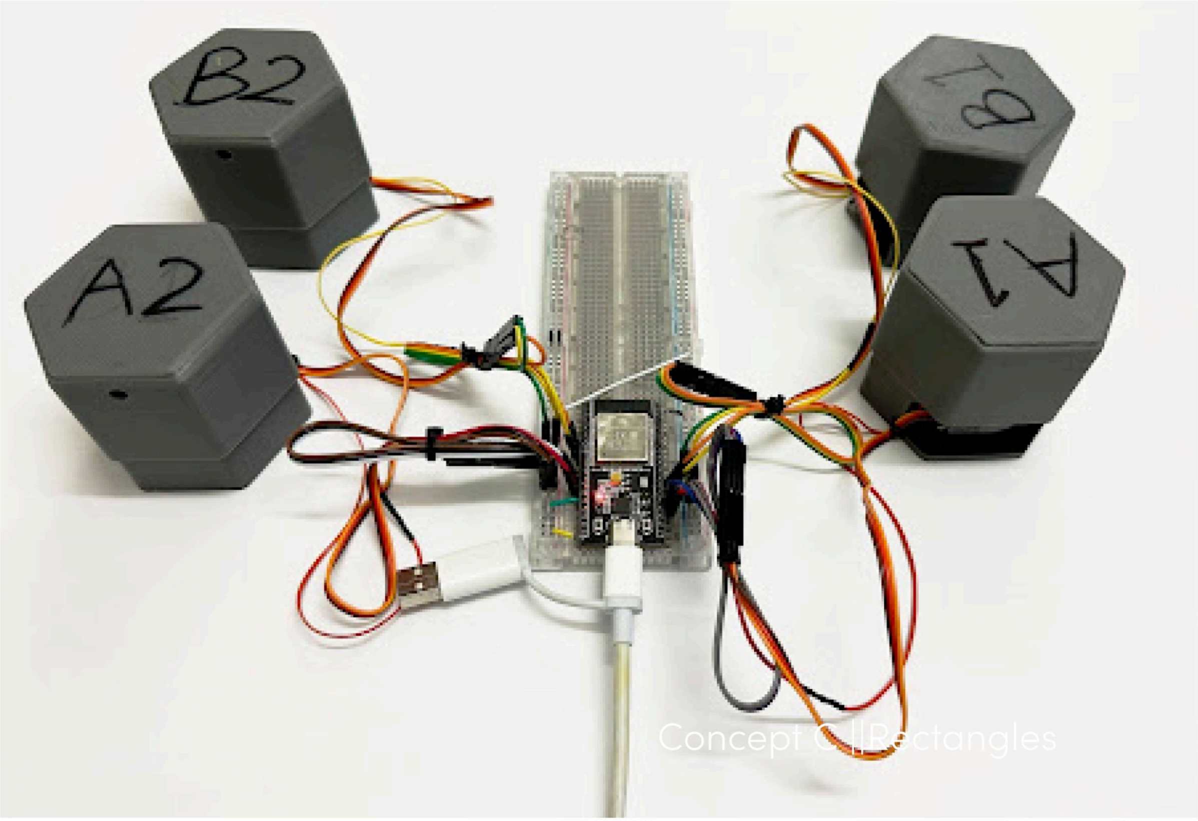
Finally we had the form and the aesthetic established. We cut, primed, sanded and painted the plywood that assembled into 8 seats.

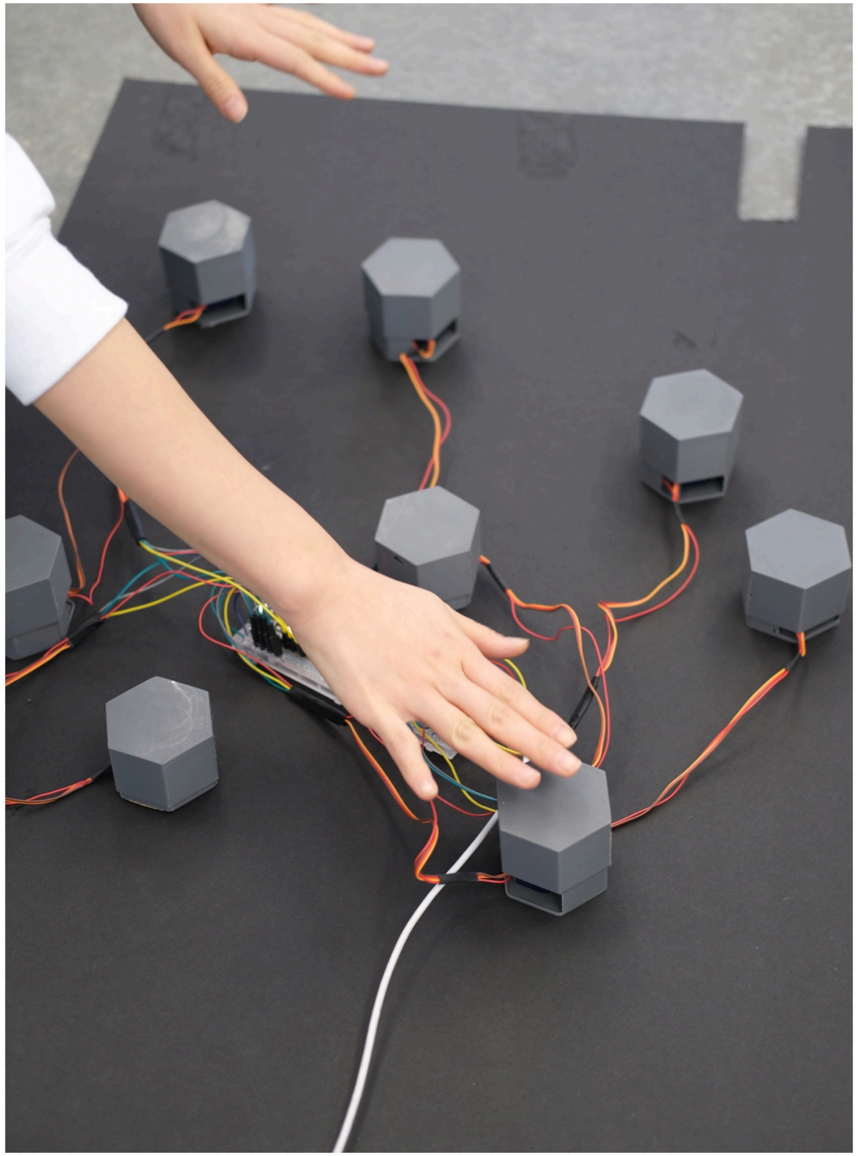
Ideation

As a product design engineer, I always ideate with a working prototype to test the mechanism and gain user feedback.



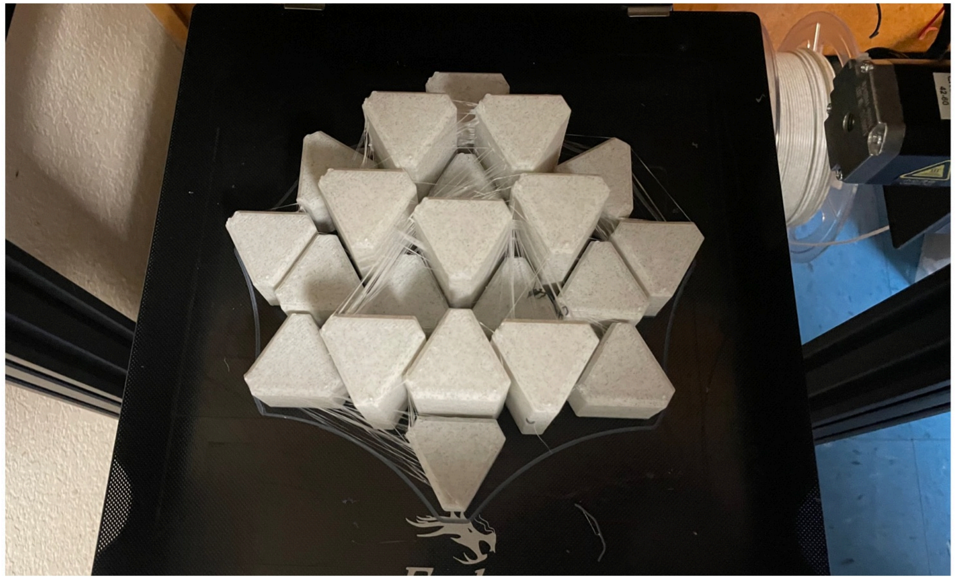
I designed the circuit and 3D printed the shape and whole sets to conduct user testing and understand how people feel about long distance connection. I conducted 2 rounds of low-fidelity prototypes and decided to make this into a real-life size sofa that people can sit.

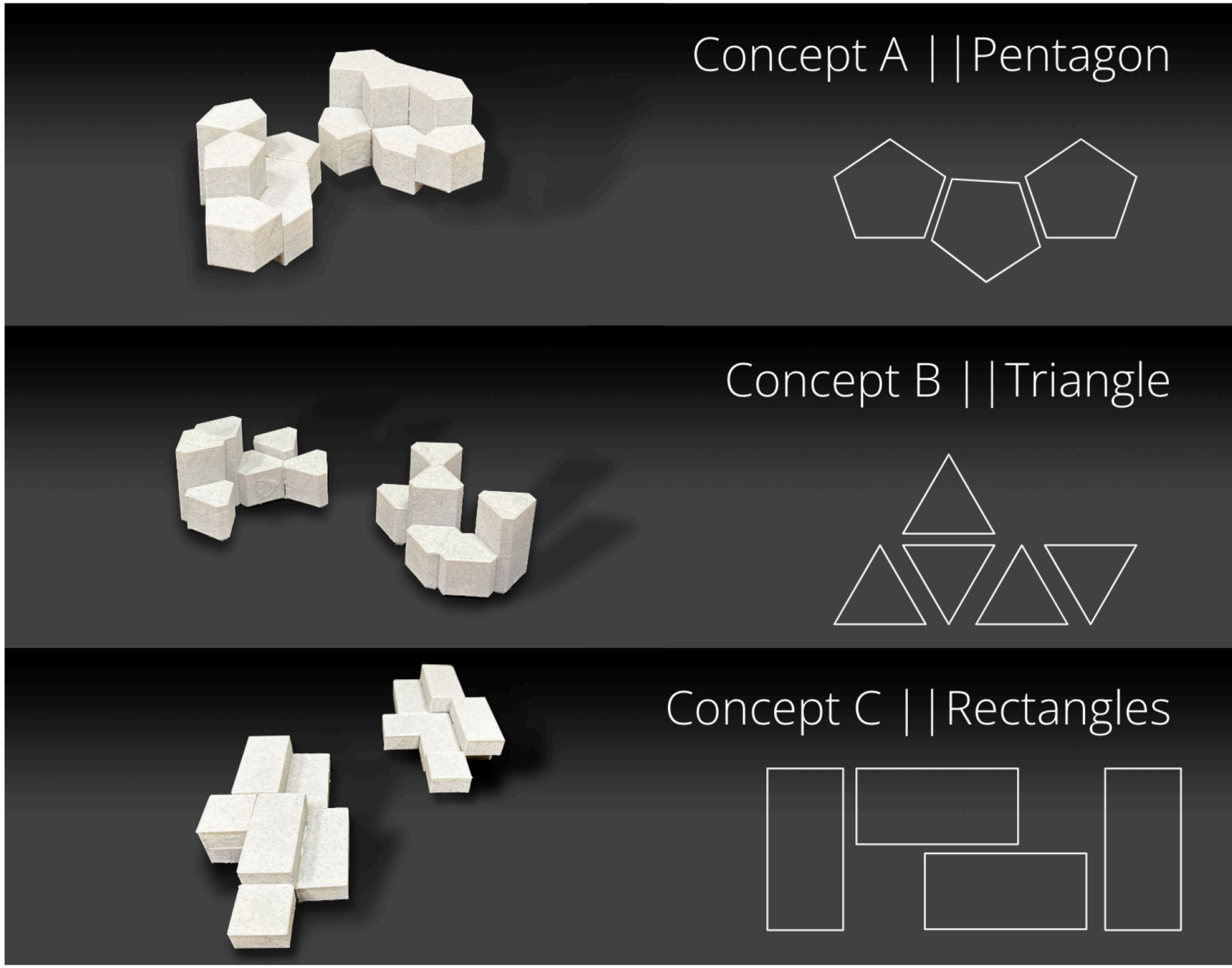




Form Study

After the testing of working prototypes, I decided to move forward to the testing of the sofa forms. I tried three different forms: Pentagon, Rectangles, and Triangle. I 3D printed and tested the manufacture costs and time to better organize the timeline.

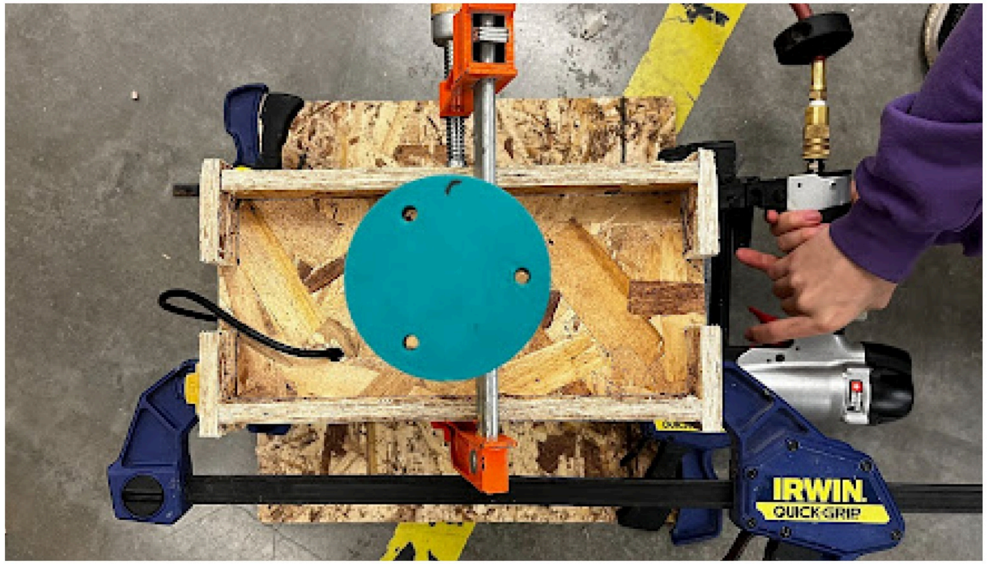




Proof of Concept

To build the concept into full scale, I wood shopped the shape and assemble the sofa to test the shape and see whether it is strong enough for people to sit on. After this I decided to pursue with wood and wood is a good material for design our product.

This is the manufacture and assemble process after the wood is cut. I add the sensors to the wood for working prototype.



Assemble one set of sofa. In order to make sure it's tightly connected I use tools to tight the parts together.

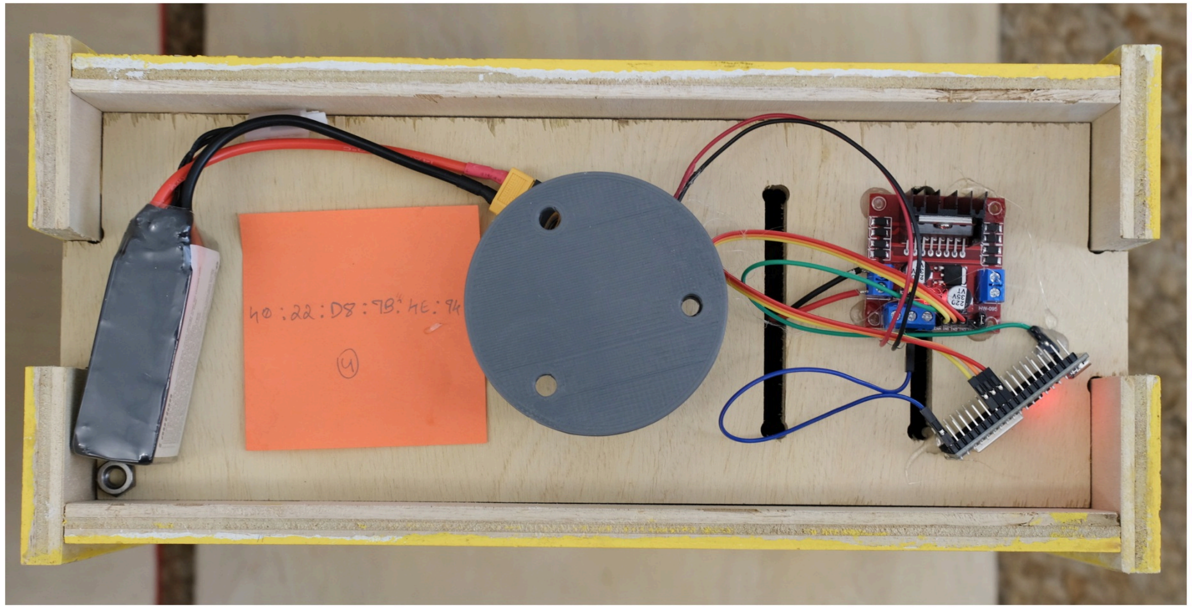
I also sit on it to make sure the chair can hold the weight while not tear apart.

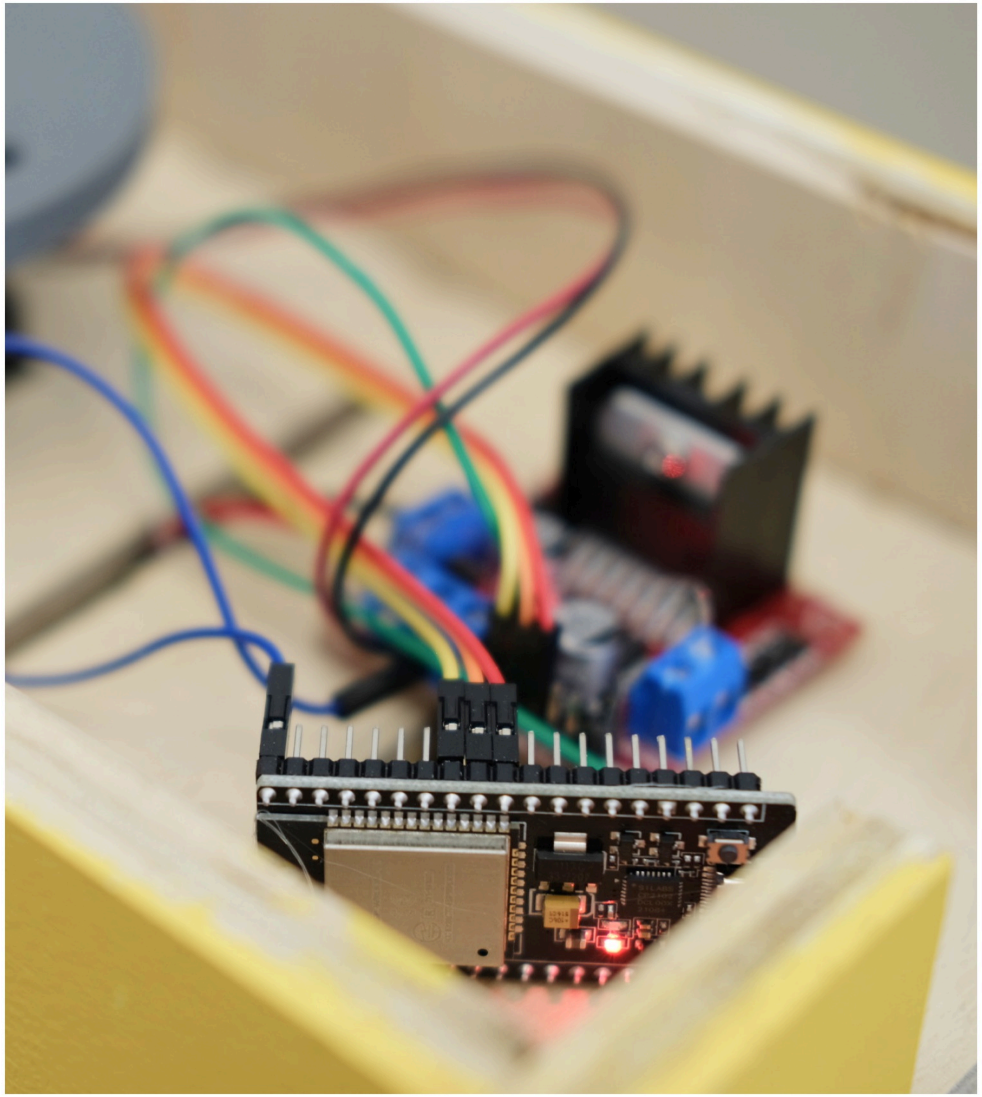
Build to Scale

After we decided on the color of the sofa, we painted the wood and labelled each piece with their number for easy assembly.

Build to Scale

After we decided on the color of the sofa, we build to scale and move to the final manufacture process. Because we need to make 8 sofa (4 sets), we label each component and sensors with its own name. We first wood-shop the shape of sofa, then we painted it in the color code shown in the previous images.



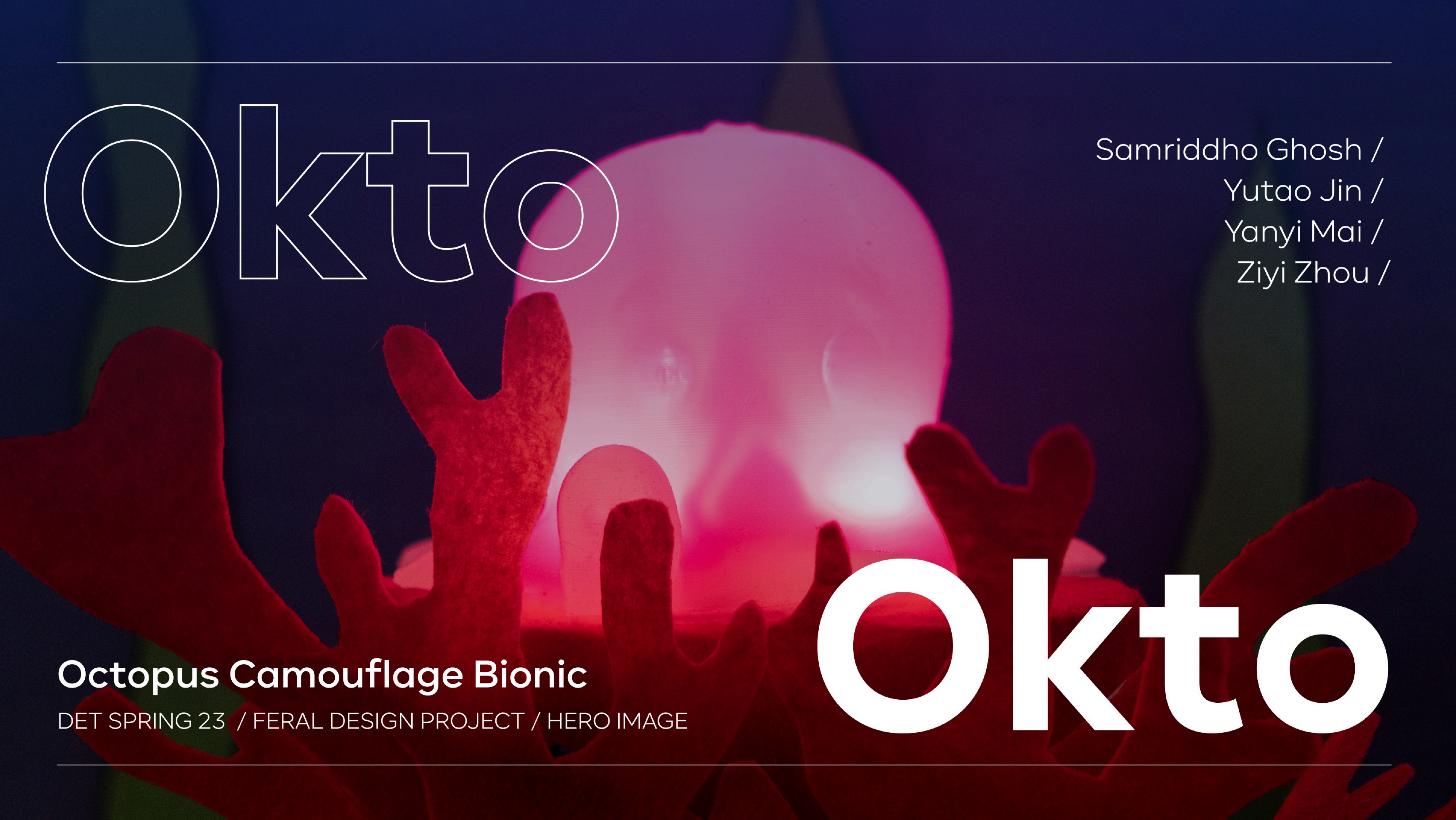


Build to Scale

The sofa shape can change when people sitting on it, provide a dynamic interaction and accompany for long distance friends and family. This is a demo of sofa working stage.


sofar
yet so close

Sofar


Okto
Samriddho Ghosh /
Yutao Jin /
Yanyi Mai /
Ziyi Zhou /
Octopus Camouflage Bionic
DET SPRING 23 / FERAL DESIGN PROJECT / HERO IMAGE
Okto

Project Description

Okto is an innovative octopus-shaped bionic robot, designed with a focus on soft robotics, which offers the unique ability to mimic the remarkable camouflage capabilities of its natural counterpart. Inspired by the resilient and persistent nature of octopi, Okto has been engineered to simulate the way these intelligent creatures blend seamlessly into their surroundings in response to potential threats or danger.

Harnessing the power of soft robotics, Okto is equipped with flexible, adaptive components that allow it to navigate through complex environments with ease, much like the real-life cephalopod. The robot's camouflaging ability is achieved through a combination of advanced materials, sensors, and control algorithms, which enable it to alter its appearance, texture, and color based on its environment.

This groundbreaking innovation has a range of potential applications, from underwater exploration and environmental monitoring to surveillance and search-and-rescue missions. By incorporating the adaptive capabilities of the octopus, Okto represents a significant step forward in the field of bionic robotics, opening up new possibilities for creating more resilient, adaptive, and efficient machines in the future.

Process
Pt.1 Research

Design Brief- Feral Design

Teams will interpret the words **persistence** and **resilience** with one key object and two supporting artifacts.The interpretation is up to the team: make a critical provocation; make a system, product or service; or do something else entirely.

↓

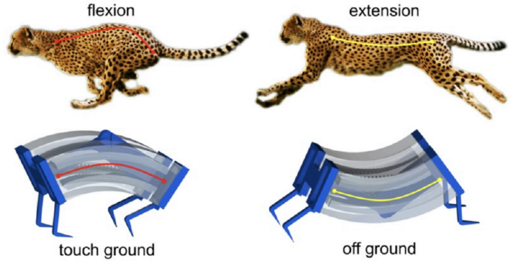
What is Feral Design?

Feral design is not like human centered design, instead it more **focus on environment and animals**.
-Adam

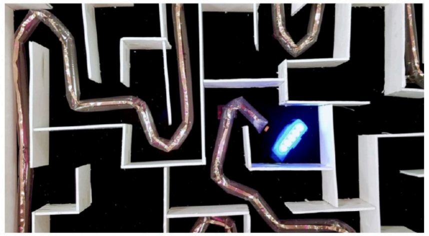
Direction

Based on the design brief, each of us come up with several direction with feral design related research.

Some of the protential topics are
1.Bionics(animal & plants
Show the persistence and resilience of animals

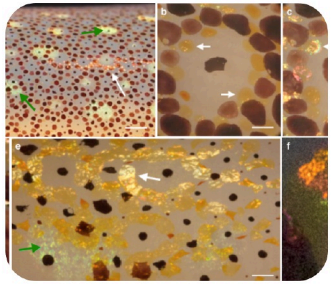


2.Material focus
Show the persistence and resilience of material itself



Process
Pt.2 Inspiration & Brainstorm

Inspirations
Inspired by the Chromatophores of octopi, we use RGB sensors to detect colors. To simulate the process of octopus detecting and changing color.

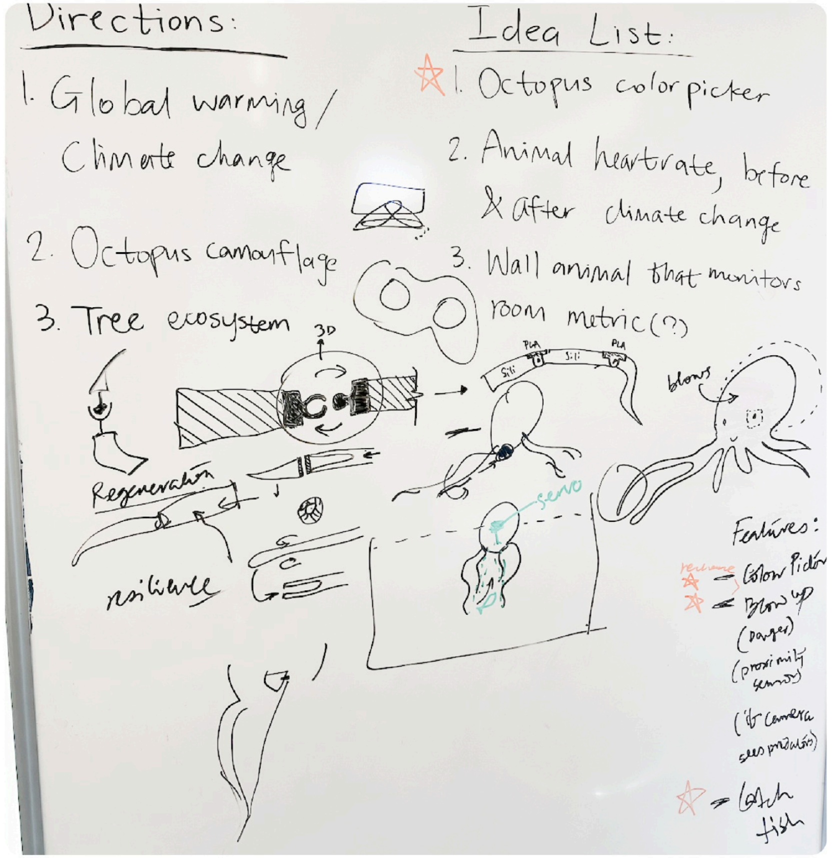


Chromatophores

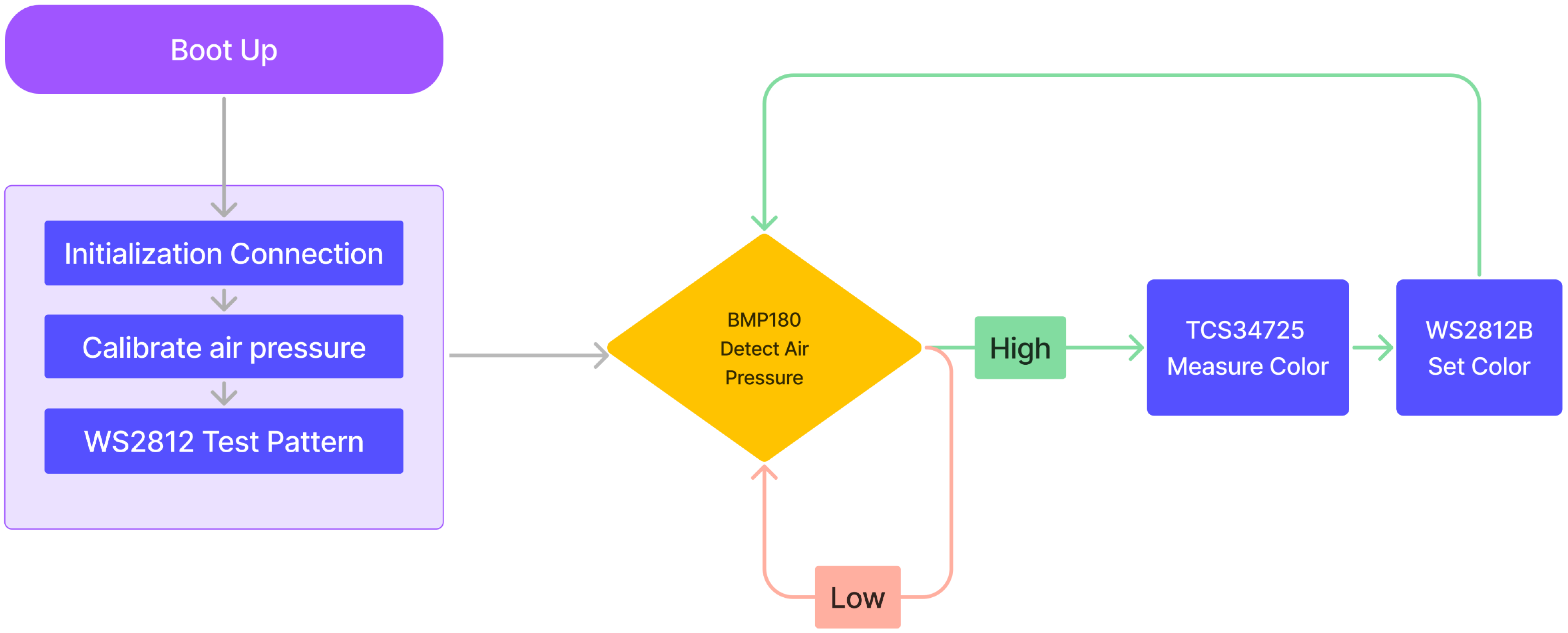
→

RGB Sensor
(Detect Color)

Form & Feature Brainstorm



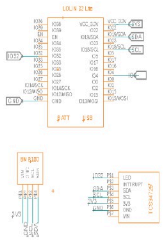
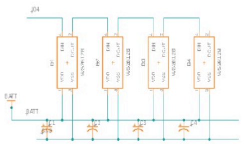
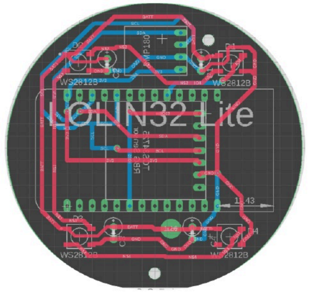
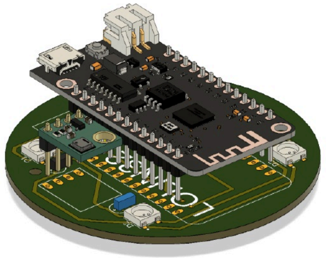
Process
Pt.3 System Design Diagram



Process
Pt.4 Prototype Process

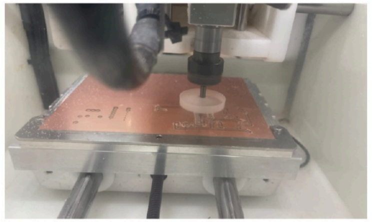
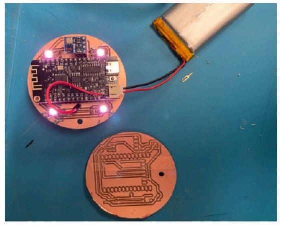
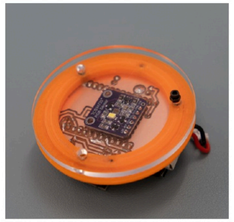
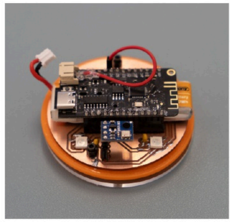
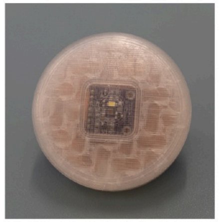
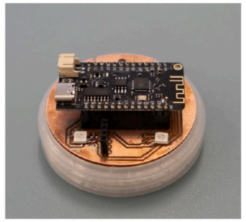
1. Circuit board design

We choose to make a PCB because it helps us to better scale the project and make it less prone to human error.
Utilizing the existing sensor break-out boards, we did not have to start from scratch. Quick validation of the function of each component on the breadboard, we use Fusion 360's electronics workspace to create a custom components library, schematics, layout, and 3D model accordingly.

2. Milling & Install Process

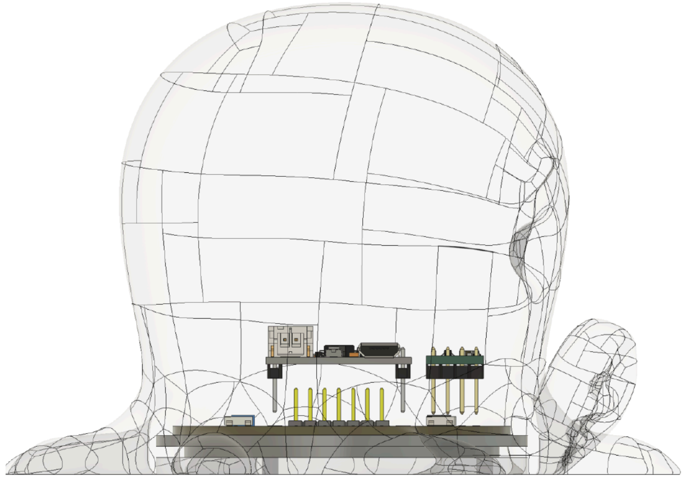
Due to our time budget, we choose to manufacture the PCB by ourselves using Othermill down in the maker space.
The PCB comes out nicely.
Soldering SMD components is not as hard as we thought.
Everything comes along nicely in the end.

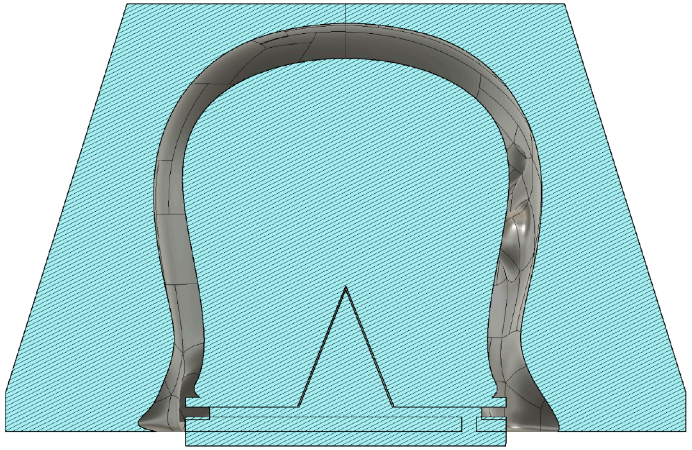







Process
Pt.4 Prototype Process

3. 3D modeling & 3D Printing

Making them mold has two main challenges: First, We want to cast Okto with very thin skin to form an empty space inside and save material. Second, the product has to become air-tight after assembly. These requirements made our mold design extremely hard.
The basic shape of the Okto comes from the famous Makerbot's Octopus Design. As expected, the downloaded STL file never worked fine with Fusion 360, so we converted it from mesh to solid. Even then, some tools like offset and shell still don't work on the model at all, which causes a lot of trouble in the process.
The final mold is designed in 3 parts due to the negative shape of the Okto. Two parts on top form the outer mold, and one part in the middle form the inner mold. We tried multiple casting directions and three different skin thicknesses just to find out casting from the open bottom was the best option, and 5mm skin thickness provided the balance between the structural rigidity and squishiness
3D printed mount and laser cut disk were also implemented in stead of the 3d printed one from the V1 design to form air-tight enclosure as the design needed it to function, but we still could not figure out to make it work perfectly.



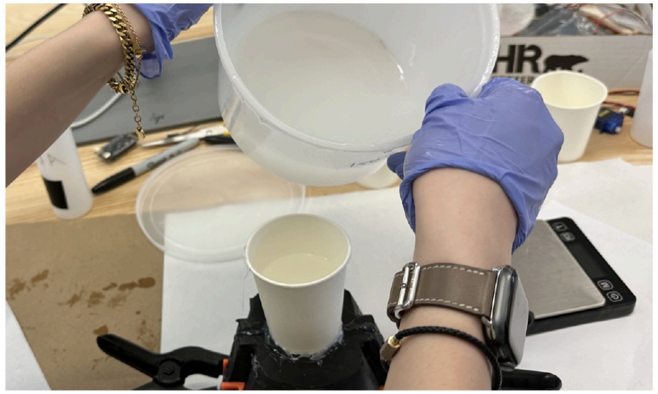


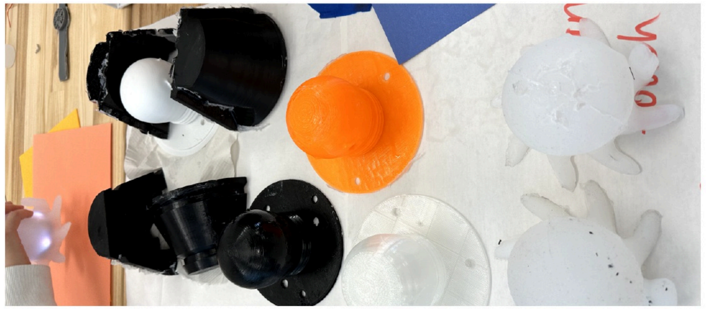
Process
Pt.4 Prototype Process

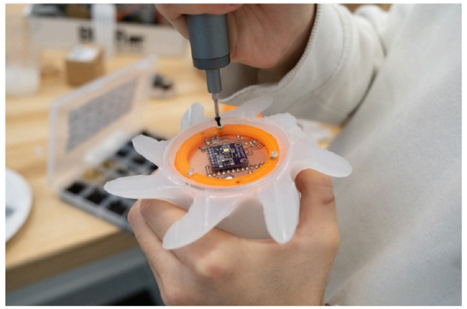
4. Silica gel Casting

After two failed castings, our third casting finally succeeded. And here is the process:

We first seal the edges of the mold with a glue gun to avoid leaks. We fixed the 3D-printed mold with pliers. Then we fuse the A/B gel 1:1 at a ratio of 400g each. And a funnel was made on the top of the 3d mold to facilitate the pouring of silicone. After slowly pouring silica gel through the hole, we put the mold filled with silica gel into the vacuum machine to extract the excess air bubbles in the silica gel. After resting for another 1.5 hours, we took the model out and carefully cut off the edges with scissors. Finally, we put the circuit board into the bottom of the octopus, and adjust the position for usable testing.



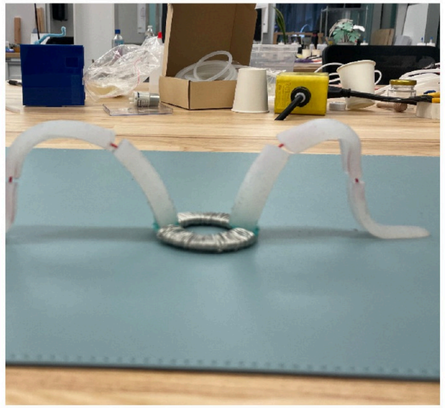


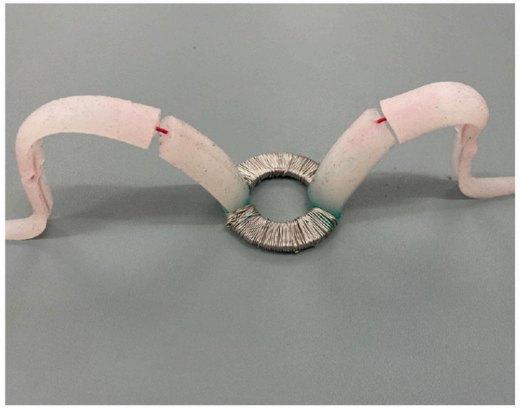


Process
Pt.5 Artifact Process

Artifact 1: Tentacle

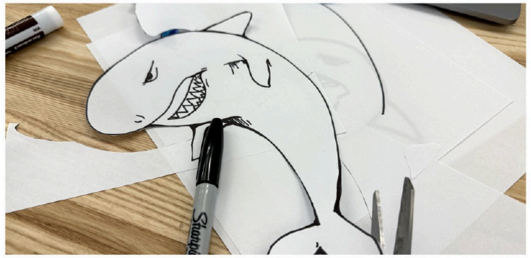
This artifact was aimed at replicating the tentacles and it's mechanism for octopus locomotion. The tentacles were casted with silicone, with break points in between that enable these pieces to be connected with ductile wire in order to emulate movability. These two tentacles were housed by a 3D printed platform with space in the middle to allow electronics for the movement mechanism.

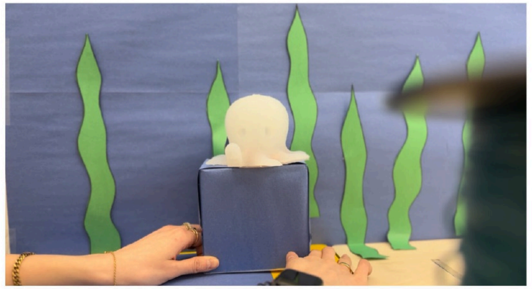


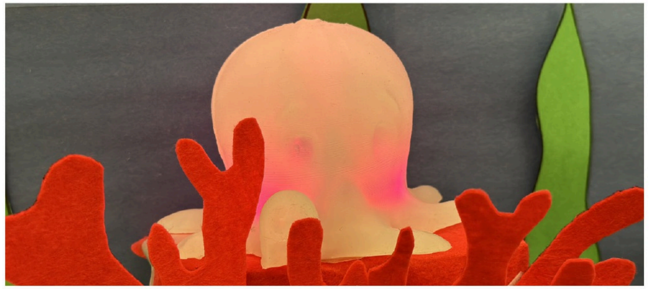


Artifact 2: Narrative Video

We first discussed the story board with the team members to determine the plot of the video. We simulated a scenario where an octopus changes color to defend itself when encountering a predator. We decided to choose the predator of the octopus - the shark as an example. Then use cardboard, colored cloth, brushes, and scissors to make display props.







Link: https://drive.google.com/file/d/1oG1mFFyfTiqmjyVkqYGRGi9NvS3jymhr/view?resourcekey

Difficulties & Challenge

Difficulties #1 Bubbles and Stickiness

The first foreseeable but inevitable difficulty we encountered was with the airtightness of our silicone Okto. The initial model had small openings at the top and narrow passages that would hollow out our the inside and create a thin skin for our Okto. However, the first attempt showed us that we underestimated the density of silicone and our ability control the distribution of it.

Our first fix was using the vacuum chamber to withdraw all the air bubbles that remained inside Okto after the first pour. However, we noticed that we did not leave our silicone-filled mold in the vacuum long enough for the air bubbles to be fully withdrawn. After leaving the silicone-filled mold in the vacuum at a moderate level of intensity, we were able to prevent bubbling in the cast molding process.

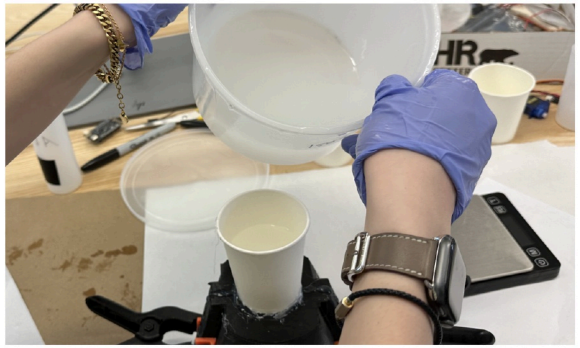
The stickiness, as a challenge, came when we first attempted to spray a primer inside our mold to help with dem-olding. However, not only did it not help us peel away our silicone Okto, it added this undesirable greasy texture that made Okto become every gross to touch.

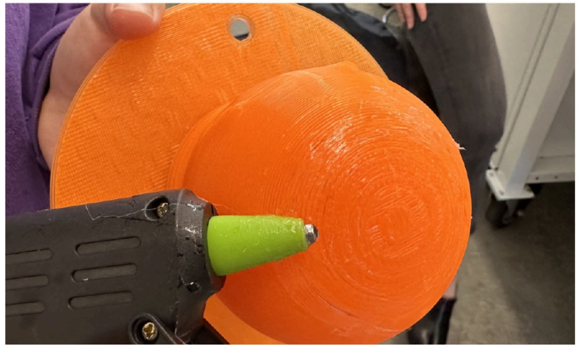
Difficulties & Challenge

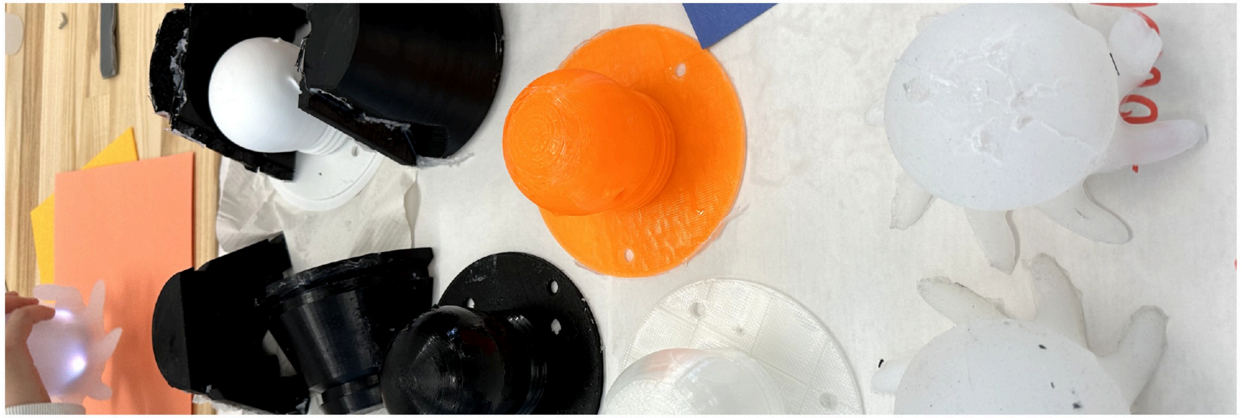
Difficulties #2 Silicone leakages

As we iterated on our 3D-printed molds, we explored ways to dissect the mold into 3 separate parts to solve the silicone distribution issue we had in the earlier prototypes. However, the assembly process following the silicone pouring sought failures with tightening mechanisms such as rubber bands or clamps. The leakage was as catastrophic as leaking up to 50% of the silicone we poured.

One immediately effective solution was applying hot glues to seal all of the seams, but this method led to tremendous difficulty with breaking apart the mold once cured. It adhered the plastics and to the plastics too well and required breaking the mold eventually in order to de-mold. As a result, this round of mold prototypes became disposable and no longer reusable after one use since we had to ply apart all of the hot-glued seams and gaps.







Thanks

Okto-Octopus Camouflage Bionic

RideP!n

Lingke Song
Yutao Jin

Improving the Joy of Cycling: A Tangible User Interface for Map Annotation and Collaborative Sensory Network Navigation

01

01 Hero shot of RideP!n final product

This initiative of RideP!n is aimed at transforming the urban navigation experience by encouraging more environmentally friendly modes of transportation, particularly cycling. It aligns with the United Nations' Sustainable Development Goal 11, which focuses on building sustainable cities and communities. As urban populations grow, the need for diverse and sustainable commuting options becomes more pressing. Cycling is becoming increasingly popular as an eco-friendly commuting choice, thanks to growing environmental consciousness and technological advancements. However, cyclists often encounter limitations in navigating their environment and sharing important road information. Conventional navigation systems are predominantly designed for cars, overlooking essential information beneficial for cyclists.

To overcome these hurdles, our project introduces a cutting-edge Internet of Things (IoT) bicycle accessory. This device captures cyclists' emotional reactions to their surroundings and connects effortlessly with a mobile app via Bluetooth. This connection allows cyclists to share their experiences and insights with the local cycling community, fostering a more collaborative and cyclist-centric navigation experience.

Our project is more than just an enhancement to cycling; it is a step towards building sustainable urban infrastructure with methodology of participatory sensory network and citizen science. By encouraging eco-friendly commuting and community involvement, it not only betters the experience of cyclists but also contributes to the creation of smarter, more sustainable cities.

With advancements in Information and Communication Technology, smartphones now offer more than just calls and messages. Equipped with smart sensors like GPS, these smartphones enable precise environment sensing with exceptional temporal and spatial accuracy. When mounted on bicycles, smartphones provide comprehensive functionality with minimal additional cost, offering a versatile platform for accessing various types of information. The ability to personalize sensor experiences for capturing live environmental and location-based data has spurred interest in participatory sensing navigation apps, where users can share data about their surroundings anytime, anywhere.

"Participatory Sensing emphasizes the involvement of citizens and community groups in the process of sensing and documenting life where they live, work, and play.

-Jeffery Goldman,2009

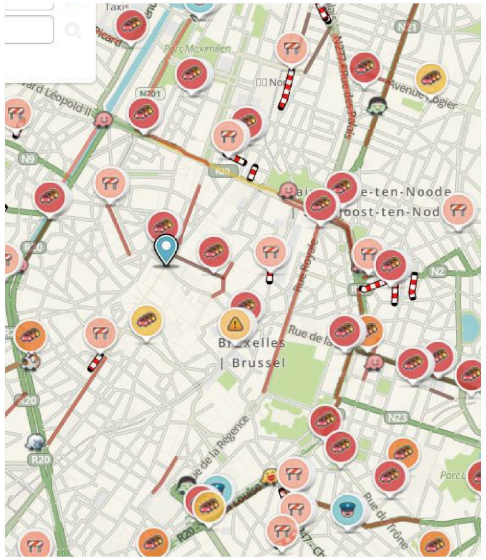
Waze, launched in the U.S. in 2009 and acquired by Google in 2013, emerged as a pioneering live Participatory Sensing Network (PSN) map in the current market. It offers continuously updated maps, traffic alerts, and route suggestions, enabling drivers to report incidents, police presence, weather issues, fuel discounts, and more. Emphasizing community participation, Waze's model goes beyond providing turn-by-turn navigation to become a road data sharing platform, attracting a diverse user base including commuters and government agencies.

Waze's reliance on user-generated content can be a distraction, especially for drivers and cyclists who interact with their devices while on the move.Therefore, while Waze's community-driven approach and collaboration with governments are commendable, its design primarily suits drivers, suggesting the need for alternative, bike-friendly PSN applications for safer, distraction-free cycling experiences.

Beeline, a London-based startup founded in 2015, focuses on enhancing urban cycling navigation. Their product, the Beeline Velo 2 GPS Cycling Computer, simplifies navigation by minimizing interface distractions. This device, resembling a compass, shows the direction and distance to the destination, encouraging a more intuitive riding experience.

Beeline Road Ratings allows cyclists to provide route feedback during their rides. This is done through green and red buttons on the device, with green indicating a positive route experience and red the opposite. This feedback helps Beeline improve its routing algorithm, prioritizing routes with higher ratings and avoiding less favorable ones. However, the design, which requires cyclists to remove a hand from the handlebar to use these buttons, can be risky.

RideP! is designed based on the evaluation of existing products, identifying potential improvements, and assessing the pain points of the cycling community to deliver a better Participatory Sensing Network (PSN) annotation experience.It enables users to capture self-reported emotional responses and points of interest during rides. It seamlessly connects the physical product with mobile devices via Bluetooth, utilizing the phone's integrated GPS to track user locations and record various emotional interest points based on user input



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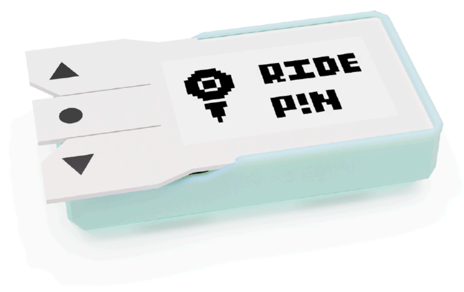
02 Live Traffic Conditions on Waze Showing Congestion and Alerts in Brussels, Belgium.

03 Beeline Velo 2 road rating



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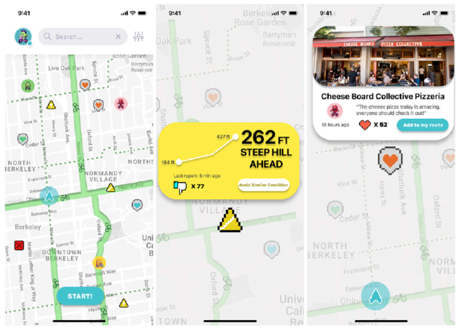

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04 Button module rendering

05 RideP!n Mobile app home page with live map;two annoation screen for different conditions

06 Final Prototype on bike handle bars

The accessory features a versatile button module that attaches to bike handlebars with an adjustable elastic band, tailored to the cyclist's hand placement. Alongside the buttons, a small screen allows for easy interaction, enabling cyclists to mark points of interest without needing to use their phone during a ride. The accessory is cost-effective and compact, equipped with a custom PCB , ESP32 computing chip, OLED screen tactile switches, and a 5000mA battery.

The product includes three customizable buttons: one for 'LIKE' annotations to positively mark locations, another for 'DISLIKE' to highlight areas needing attention, and a third button assignable for various functions, such as operating an external camera or tracking performance metrics.

User annotations and messages are uploaded to the accompanying mobile app with user consent and shared within the community. This collaborative feature creates a live map of local bike network conditions and popular spots, enriching the overall cycling experience by allowing cyclists to contribute to and benefit from collective route knowledge and preferences.

Personal Memory: Live Map with most updated road condition and user annotations

RideP!n's ergonomic design allows for safe, uninterrupted annotation input during rides. Users initially set up the device to assign emotional values to buttons, expressing feelings through emojis on a map. Post-ride, a review session offers the opportunity to provide detailed feedback on specific locations, including adding notes and organizing them into lists.

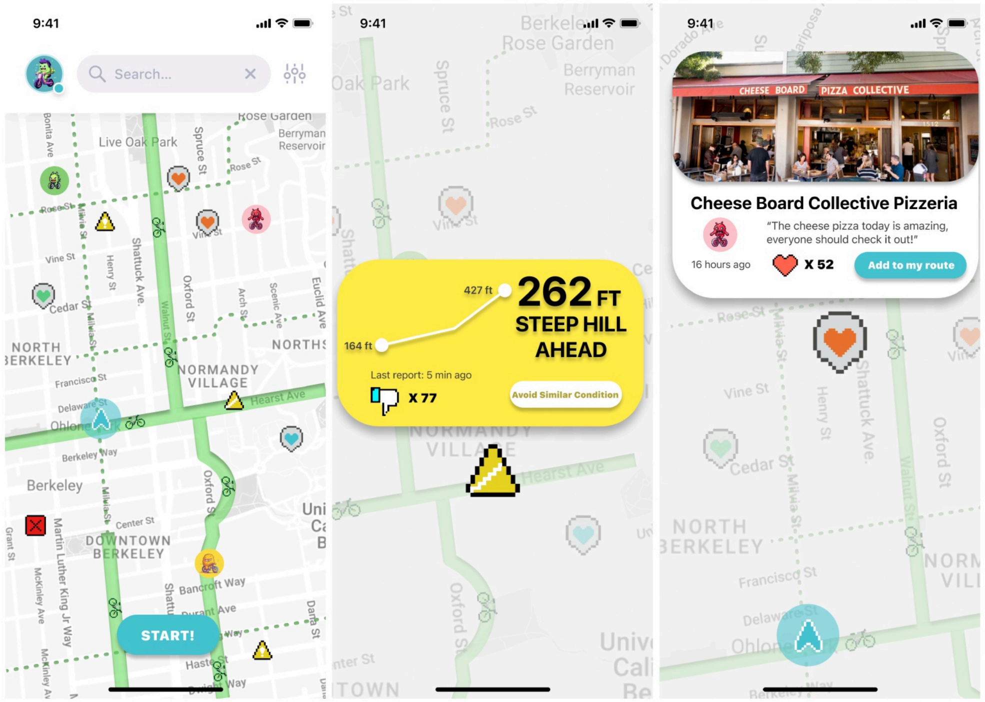
The app's algorithm uses this data to personalize future route recommendations, avoiding roads with reported issues like potholes and highlighting preferred paths. It also adapts to users' habits and preferences over time. Users can revisit favored spots, as the system records and utilizes these locations for future route planning. It interacts with users through the map feature, showing live road updates and user annotations. This map gives real-time insights into road conditions, including closures, as reported by users. Cyclists receive alerts for nearby annotations, especially those marked by friends or the community, as they approach specific locations.

The system also notifies users about areas with previously reported poor conditions, inviting them to confirm these observations. Participants are rewarded for contributing annotations and local information, encouraging active engagement.

Community Forming: Participatory Network User Data for better City Bike Constructions

RideP!n's growing collection of cyclist annotations in the city enhances its map, providing valuable insights into traffic patterns, popular locations, and biking conditions. This information, beyond the scope of traditional methods, aids city planners in understanding cyclists' needs and interactions with the urban infrastructure. The data helps to identify and develop safer, more efficient bike networks that cater to cyclists' preferences.

For example, if a bike route regularly receives negative feedback for poor conditions or unsafe traffic, RideP!n alerts planners



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for potential improvements. This user-driven data also highlights popular spots for cyclists, guiding the development of additional amenities and attractive routes.

A notable application is the creation of tourism biking lanes. Annotations near tourist attractions can lead to the establishment of dedicated lanes, enhancing the biking experience for tourists and encouraging more people to explore the city by bike. This approach exemplifies how RideP!n's participatory platform can influence city planning and promote cycling.

This project aimed to blend citizen science with consumer products, exploring how to add social value to navigation systems, making them more human-centered and informative beyond just speed and incline.

We employed a Participatory Sensory Network (PSN) approach, encouraging user contributions to refine the riding experience and infrastructure. Our tests revealed that cyclists exhibit a range of emotional responses, leading us to develop efficient ways to capture and process these experiences. The final prototype offered personalized insights into riding and local infrastructure, with the annotated Berkeley Map showcasing the product's accuracy in capturing diverse expressions and identifying areas for improvement.

This project provided valuable insights into cyclists' complex experiences, paving the way for future developments in personalized maps and navigation systems tailored to different user groups.