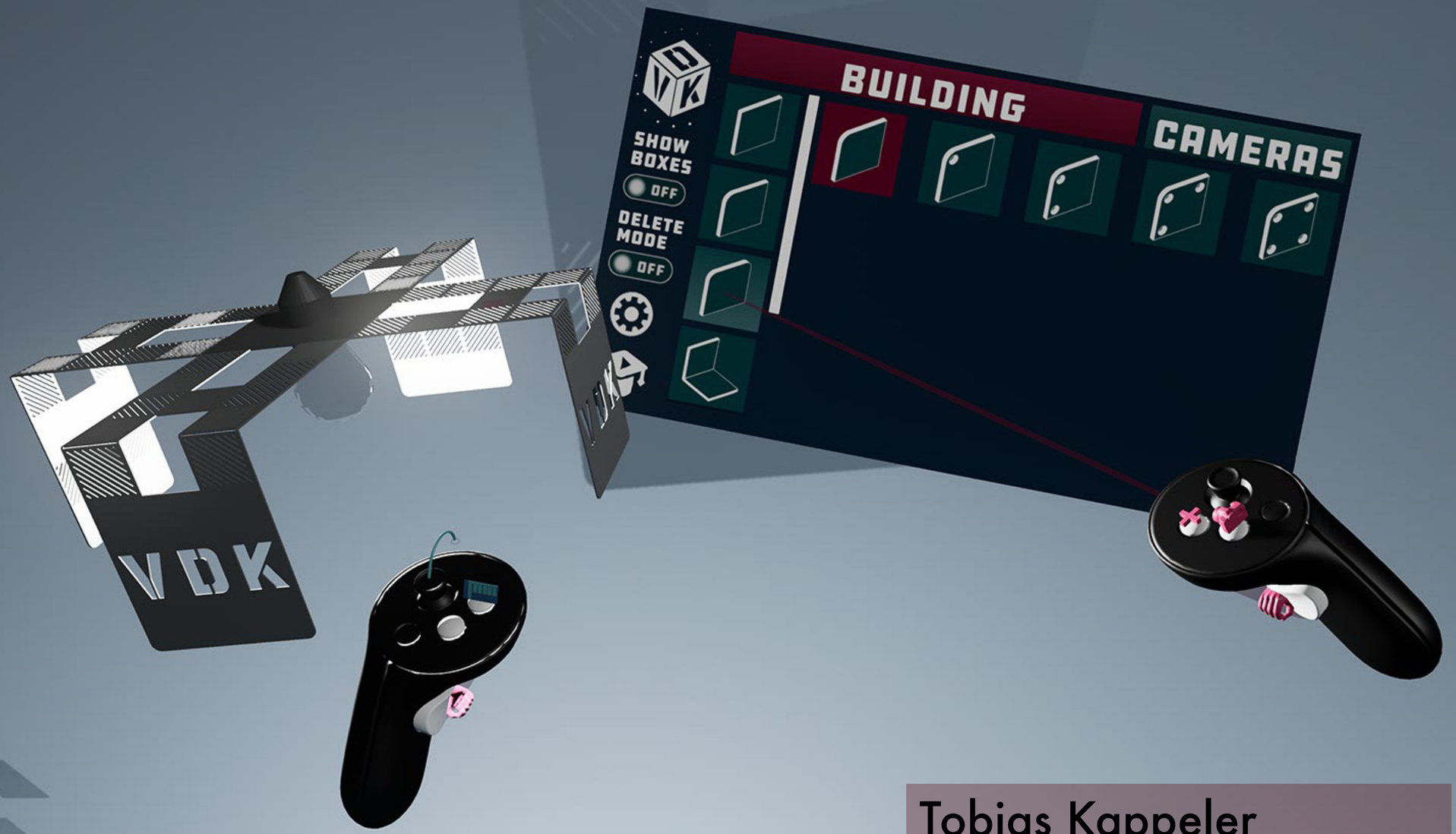


Tobias Kappeler

Interaction & experience designer
Portfolio

00

Index

I selected 5 projects that highlight my design and technical skills with a focus on prototyping and making in the analogue and digital realms.
I've added an ongoing personal project showing my passion for electronic music production and sound design which I use as a creative outlet.

Please view portfolio in full screen, thank you.

VDK

VIRTUAL DESIGN KIT

VIRTUAL DESIGN KIT

Designing sheet metal constructions in Virtual Reality

Virtual Design Kit, better known as VDK, is a design software that allows users to create sheet metal constructions in virtual reality. Your own idea can be brought to life by snapping pieces together to create your own designs. VDK simultaneously generates the flat projection of your design, which serves as the stencil for laser cutting.

As a first use case I decided to focus on the design of lamps, with the light and the according shadow being simulated in the virtual environment.

Video

Time: September 2018 – June 2019 (Bachelor project)

Field

VR Software development
UI & UX Design
Furniture Design
Metal work

Developed by

Tobias Kappeler
Christoph Schneider
Nicolas Dubied
Sebastien Fraginiere

Industrial partners

Meyer Blechtechnik
Laser cutting
Regent Lighting
Light components
Blaser Metallbau
Sponsoring

Academic partners

Institute Human Tech
Programming
Virtual Valley
Research society for Draft Design
Design strategy

Software

Unreal Engine
VR software development
Blender
3D modelling
Adobe Illustrator
Graphic design

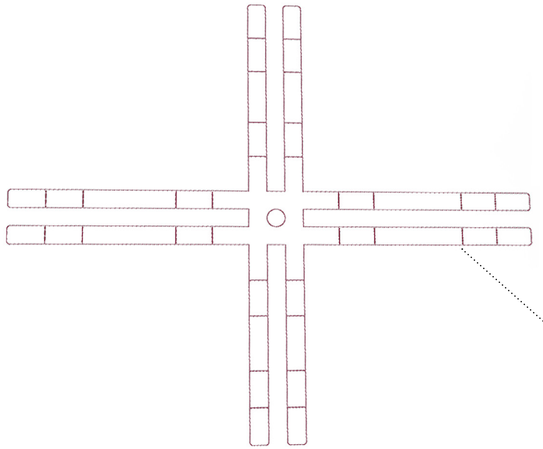
01

Flat projection

While designing, VDK generates the flat projection of the construction and gives an alert, when the design cannot be unfolded to its flat state due to overlapping pieces. This allows users to focus on the creative process and ensures that the design can be laser cut and folded together.

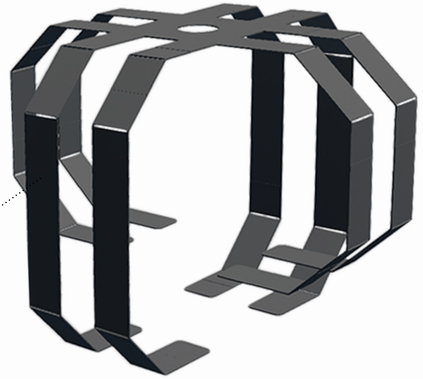
This method of designing can be applied to different production methods, e.g. tubular bending.

2D

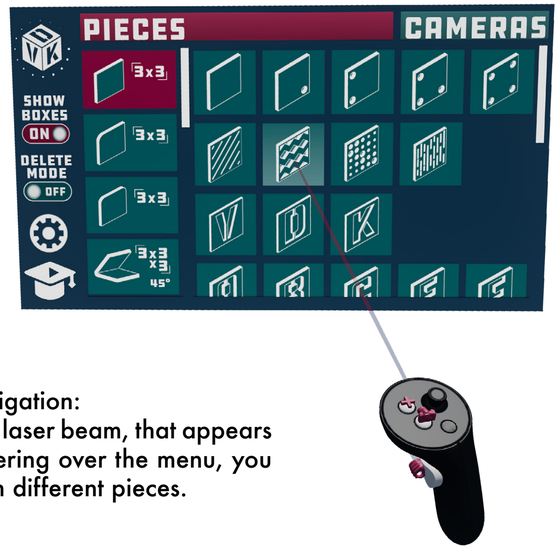


Perforated bending edges.

3D

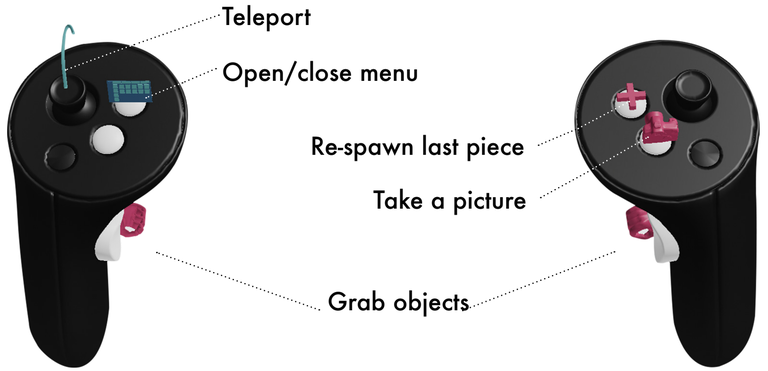


Menu

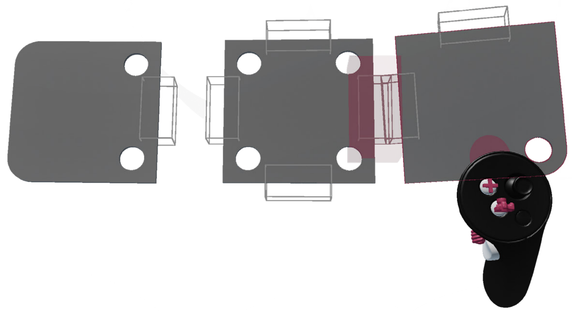


Menu navigation:
Through a laser beam, that appears when hovering over the menu, you can spawn different pieces.

Controller



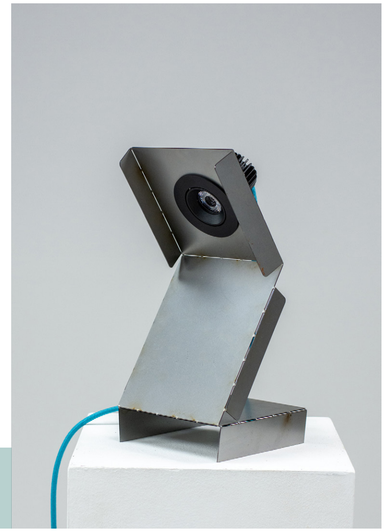
Snapping pieces



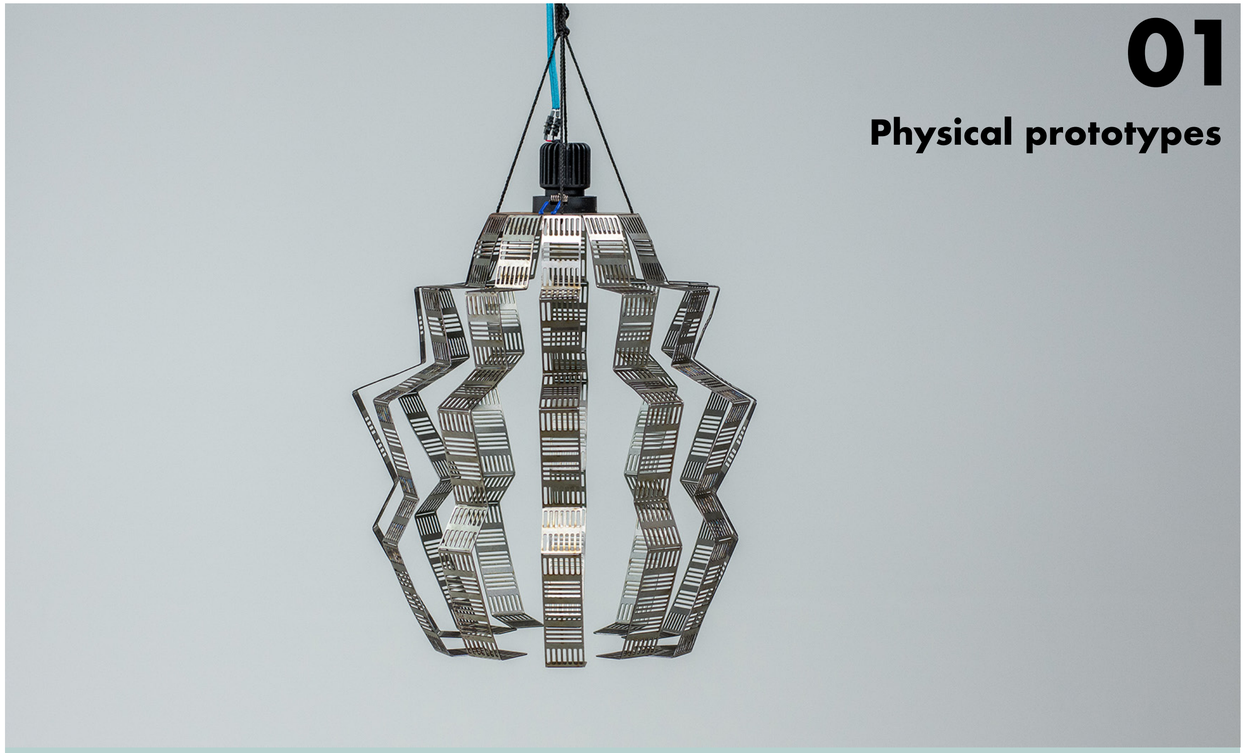
Snap pieces together:
Overlap the grey boxes until the red cube appears and let go of the piece.

01

Physical prototypes

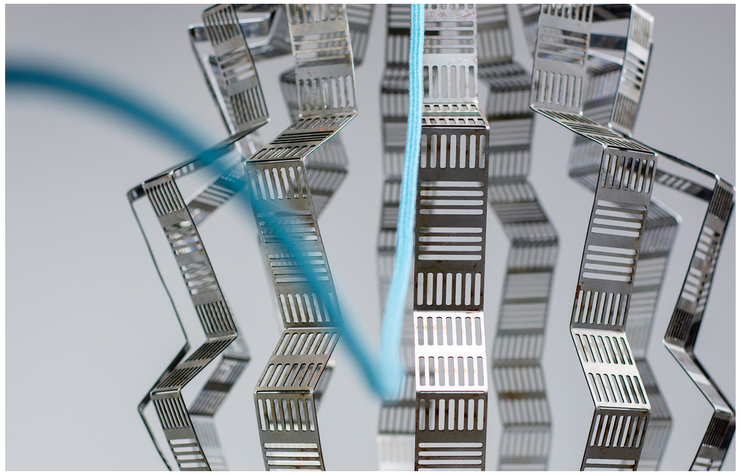


Lasercut table lamp made from 1.5mm sheet metal with a light component and cable.



Dodecagon sheet metal lamp folded together.
Created with six different pieces.

Square sheet metal lamp folded together.
Created with ten different pieces.



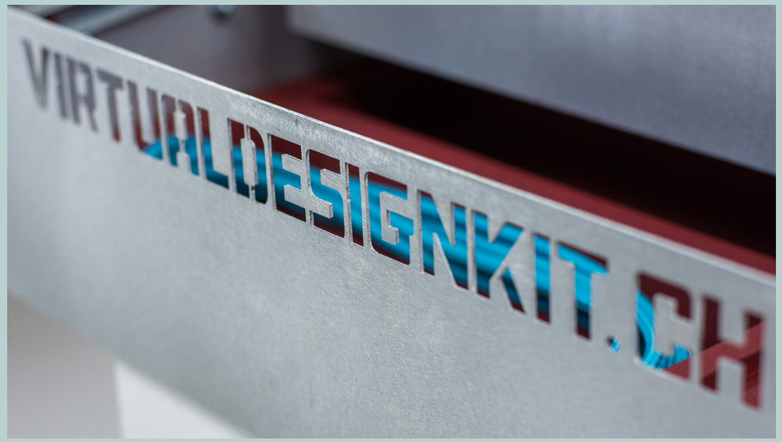
01

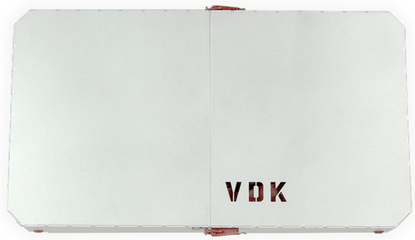
Communication

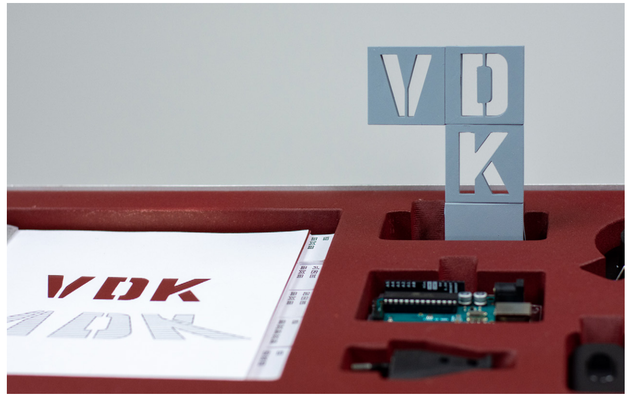
To communicate the intention and design method of VDK, I built a physical kit that represents the software. All components from the software are inside the physical kit. The different pieces are explained inside the booklet and the physical pieces can be snapped together magnetically.

The physical kit allows for better communication of the project and to reach people who are not as familiar with virtual reality.

The kit was made using perforated bending edges and then folded and screwed together like other VDK products.







02

Dinkum

Immersive spatial audio group conversations

02

Dinkum

Dinkum is a spatial audio communication tool that allows users to immerse themselves in customisable audio environments with a high sense of presence and intimacy. By leveraging spatial audio technology, conversations become more fluent and feel more natural. Conversations are audio-only, as this is more effective at conveying emotions to others compared to audio-visual remote conversations. Users can select from three room sizes (intimate, casual, adventurous) and different Ambisonic (full-sphere surround sound format) background sounds that match the type of conversation they are having and the people they are speaking to.

Video

Time: Jan 2021 – June 2021 (remote)

Field
Audio Experience Design
UI/UX
Communication Design

Developed by
Tobias Kappeler

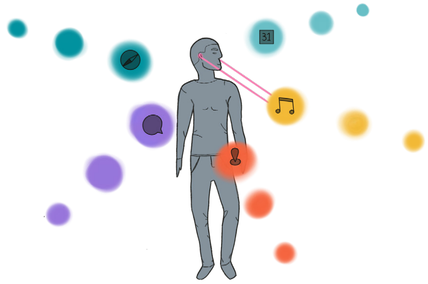
Software
Ableton Live
Digital audio workstation
3D Tune-In Toolkit
Real-time binaural spatialisation
Unity
Prototyping
Figma
User interface design
Touch OSC
User interface prototyping
Adobe Ps, Ai, Id
Graphic design

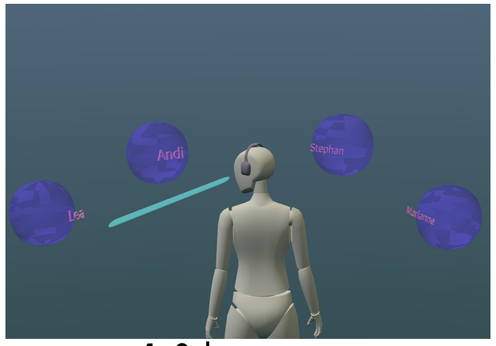
02

Early Ideation & concepts

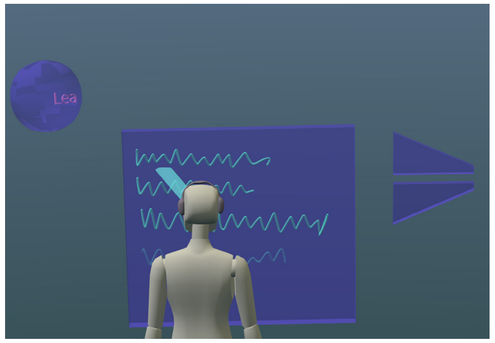
I've explored different applications and user experiences with spatial audio such as indoor navigation and using spatial audio cues as an interface for screen and hands-free interactions.

Spatial audio interface

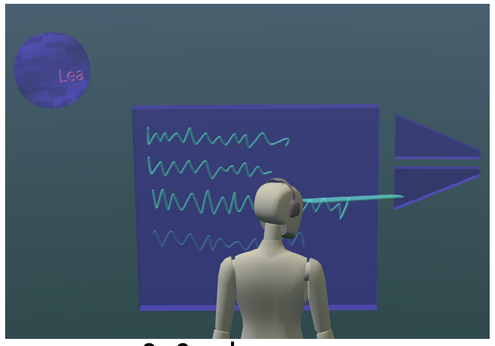




1. Select contact

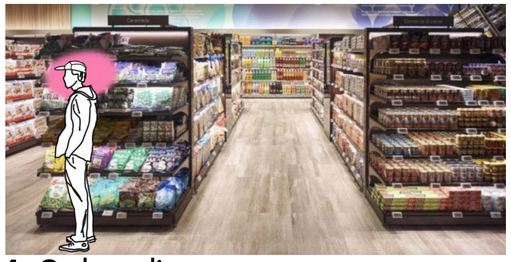


2. Dictate message



3. Send message

Spatial audio navigation



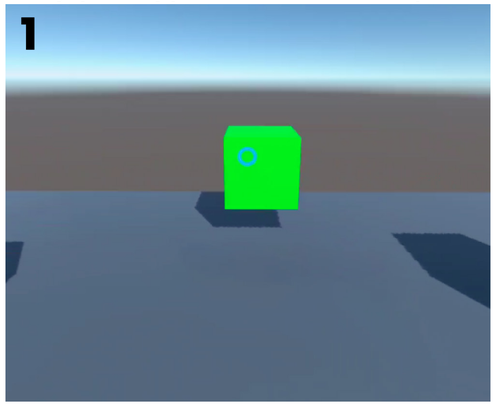
1. On-boarding

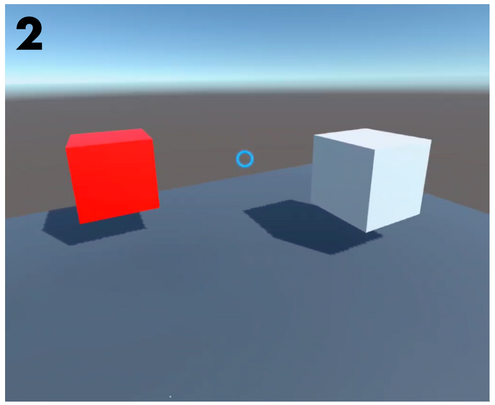
2. Navigation

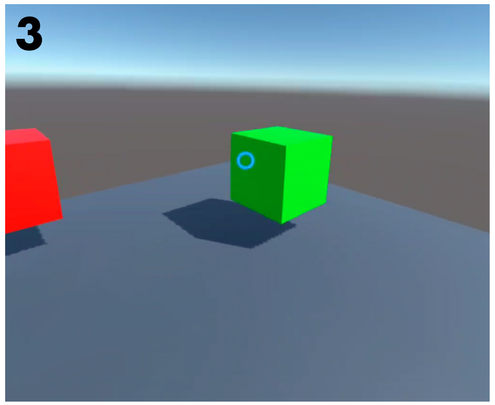
3. Pickup

Spatial audio navigation can be used at shopping centres, airports, train stations and architectural complexes for seamless navigation.

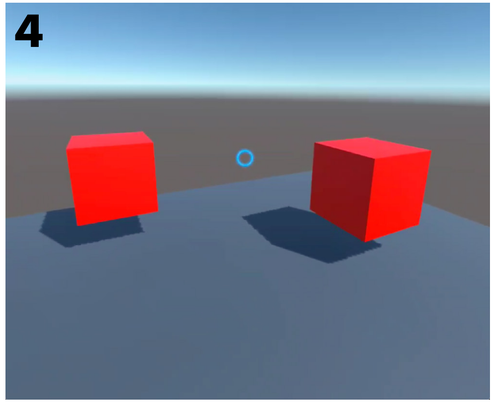
Unity prototype to interact with spatial sound cues

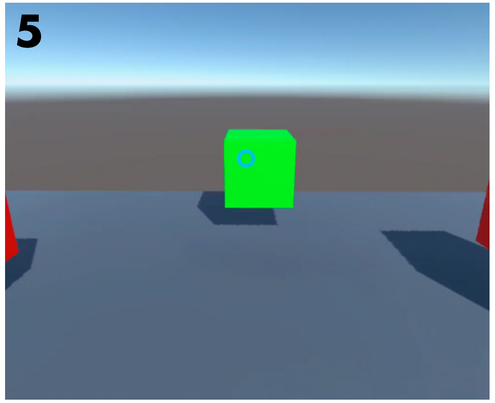


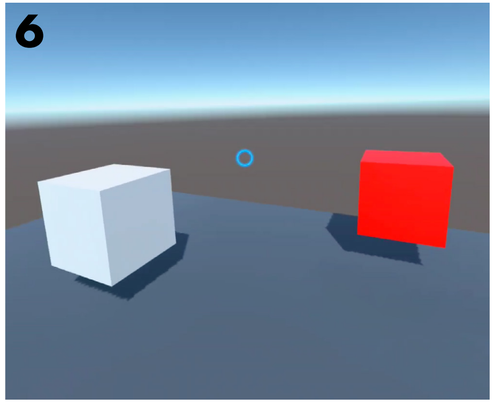




The cubes represent audio cues.
White=not interacted
Green=currently interacting
Red= interacted with







02

Experimentation

After deciding on using spatial audio for remote communication, I experimented with various spatialisation software. For advanced and faster experiments, I built a binaural microphone to test natural conversations with multiple people.
I explored different interactions and visual styles of the application.

Remote call with binaural microphone

Testing with users from different ages group to understand individual preferences.

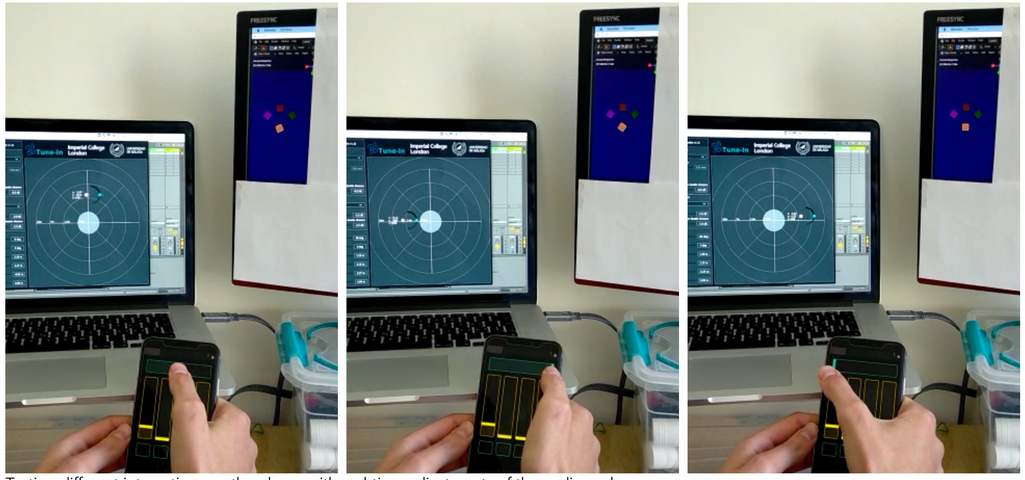
A-B Testing in Ableton Live to switch between spatial and mono signal as our hearing adapts very quickly.

Group conversation recorded and spatialised in real-time

Group conversation with binaural microphone testing different experieneces while interacting with the dummy head.

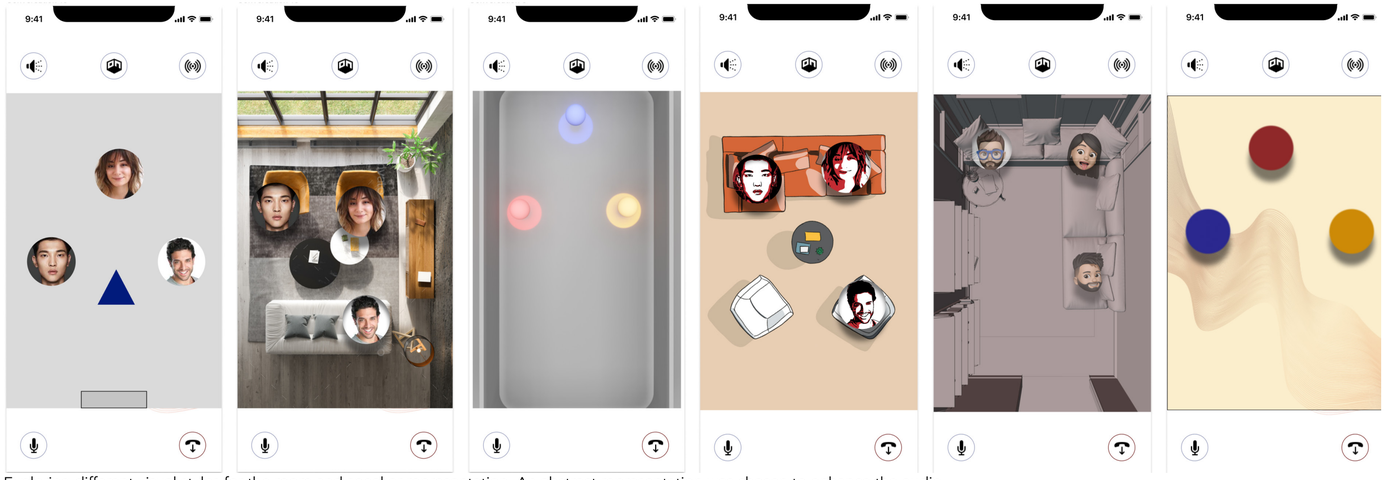
Listener experiences spatial group conversation.

Testing interactions



Testing different interactions on the phone with real-time adjustments of the audio and visual interface through OSC (Open Sound Control) Protocol.

Visual style development



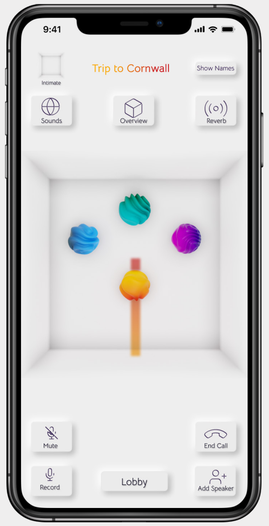
Exploring different visual styles for the room and speaker representation. An abstract representation was chosen to enhance the audio experience and not overload the phone screen.

02

Final UI & functions

Throughout the conversation, people can change their distance from others to make remote conversations feel more natural. Dinkum facilitates conversations for up to eight people. The position of speakers is updated automatically depending on the number of people on the call. Having Ambisonic background sound increases the immersion and shared experience while being remote.

CHANGE DISTANCE



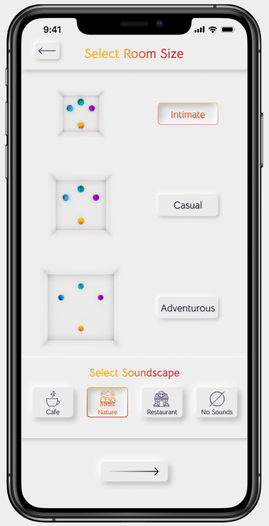
Move closer to:
- Increase intimacy
- Increase importance
- Show excitement

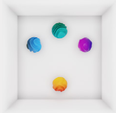
Move further away to:
- Indicate you're just listening
- Indicate negative feelings

ADJUST AUDIO ENVIRONMENT

Users can adjust the audio experience to their liking through the volume of the Ambisonic background sounds or the reverberation.

ROOM SIZE & BACKGROUND SOUNDS





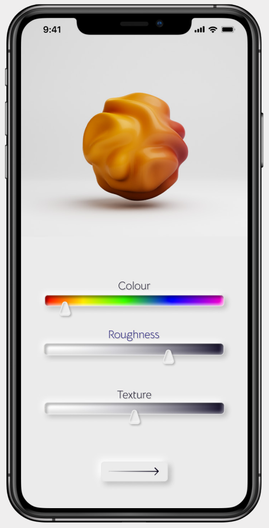
Intimate room:
- Intimate conversations
- High speech intelligibility

Casual room:
- Everyday conversations

Adventurous room:
- Long reverb
- Encourages abstract thinking
- High experience factor

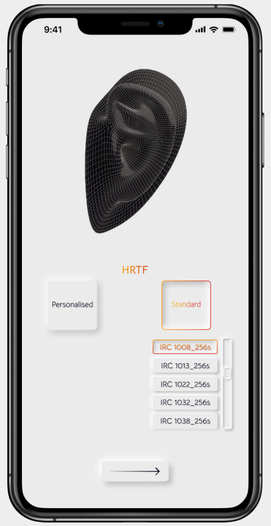
Users can choose a room-size that matches the type of conversation and the people they are with.

CHARACTER CUSTOMISATION



Users can customise their character to their personal preference. An abstract representation was chosen to emphasise the audio experience.

HEAD-RELATED TRANSFER FUNCTION



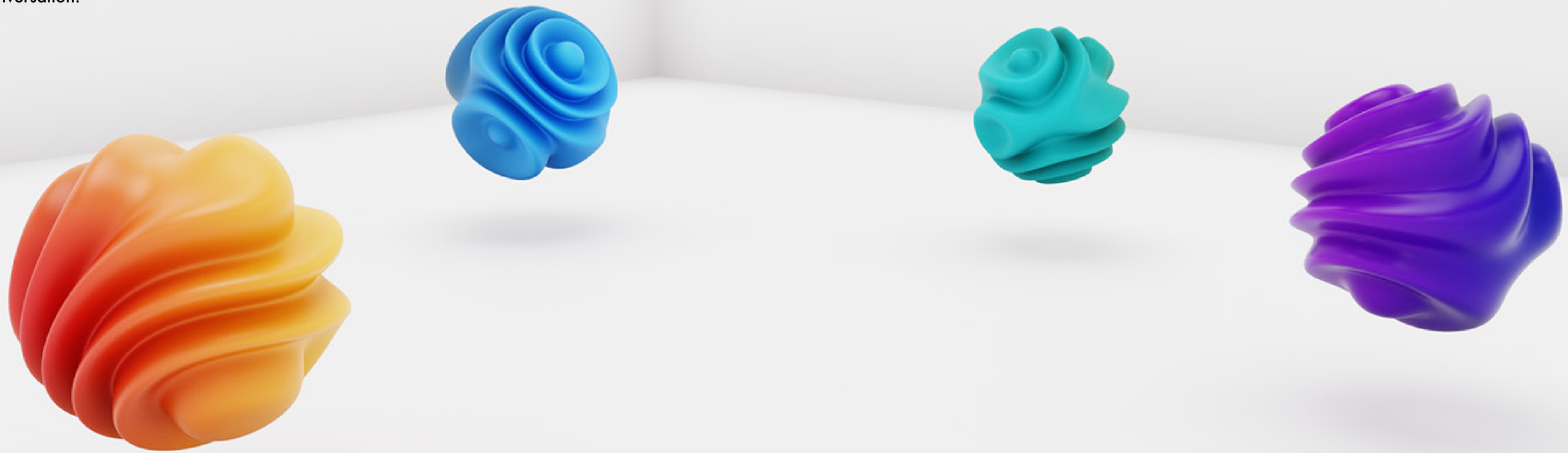
As each person hears differently and has an individual head-related transfer function, Dinkum comes with a set of predefined HRTF's and can incorporate personalised HRTF's in the future.

02

Dinkum

Dinkum targets people who already know each other such as friends and families and works alongside real-time collaboration tools such as G-Suite, Miro or Figma.

Dinkum is a new form of immersive communication and has the potential to revolutionize remote conversation.



Haragana

Lounge chair

03

Haragana chair

We live in a fast-paced world where everything happens instantly and thus, we often forget to take a break, lean back and just observe our surroundings. I aimed to create a chair in which you remain seated, to observe and take a break. The design invites you to observe the chair, as what you see, is not what you see. Perceived is an armchair due to the emphasized outline however, there are no armrests. When sitting, it invites you to observe your surroundings due to the low, spacious and comfortable sitting point.

The chair is made from 19mm steel tubes for the outline and 16mm steel tubes on the inside. The seating is made from natural cork with a high density.

Time: February 2020

Field
Furniture design
Craftsmanship

Developed by
Tobias Kappeler

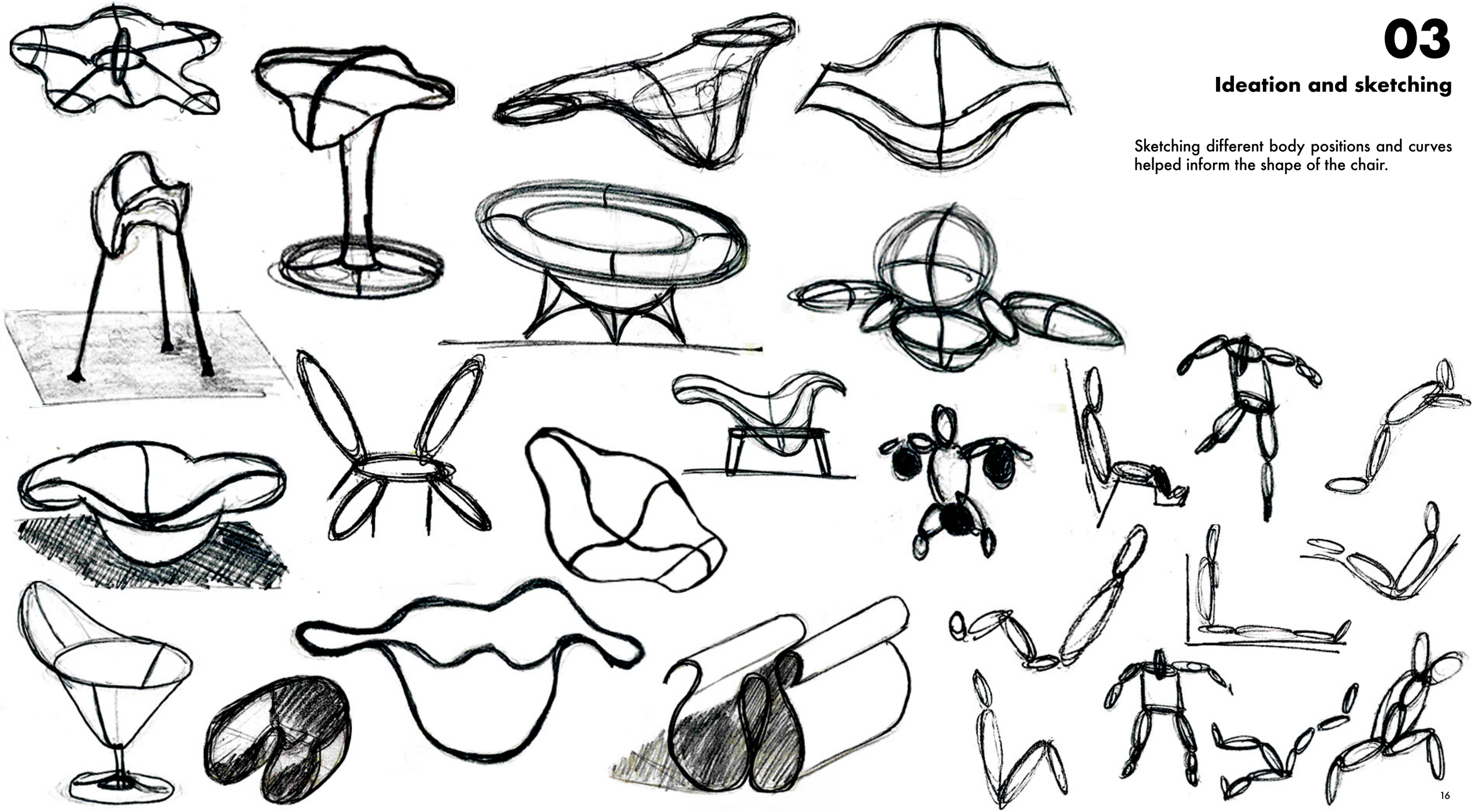
Materials
Bended steel tubes welded together
cork disks, sanded

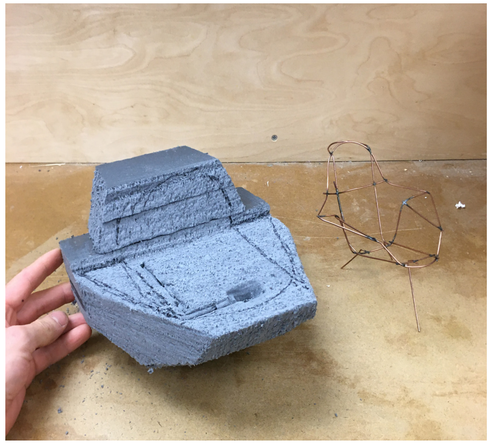
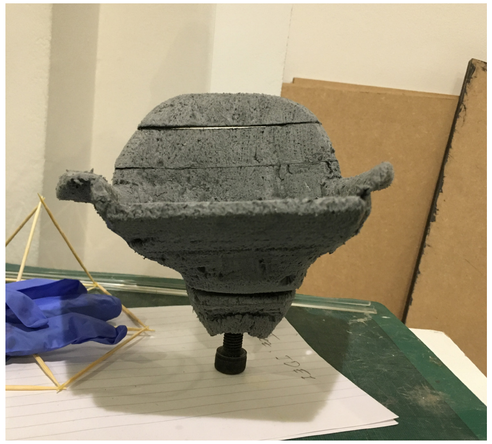
Software
Fusion 360
Form development

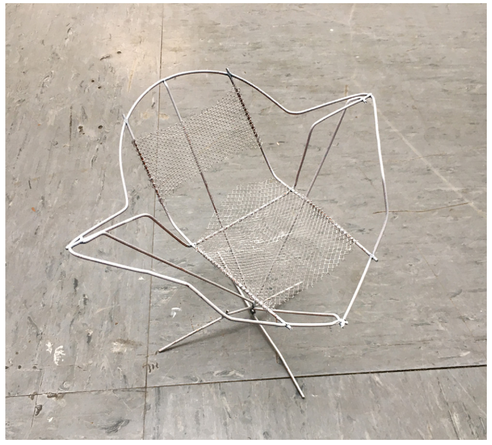
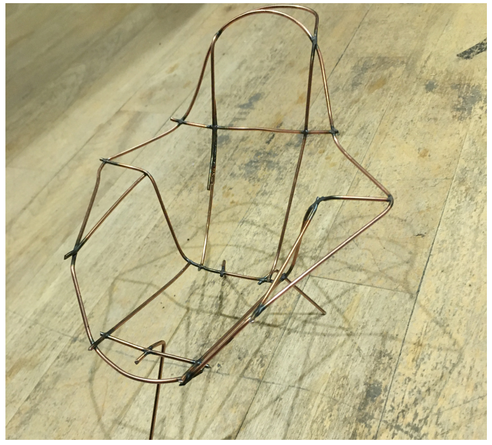
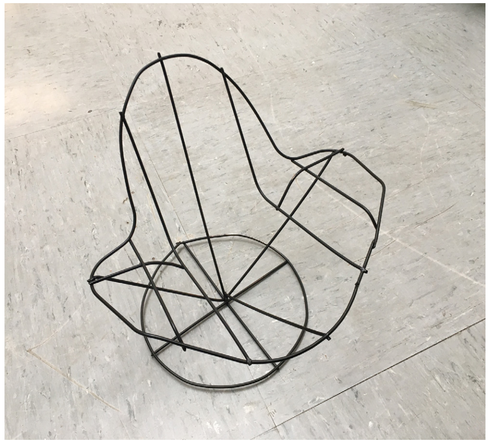
03

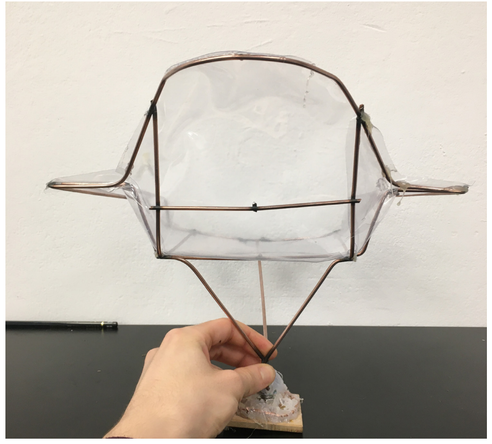
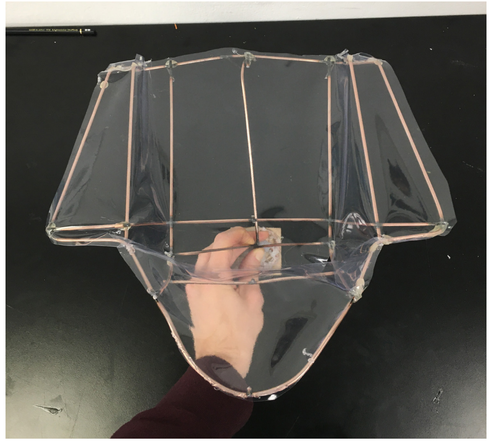
Ideation and sketching

Sketching different body positions and curves helped inform the shape of the chair.



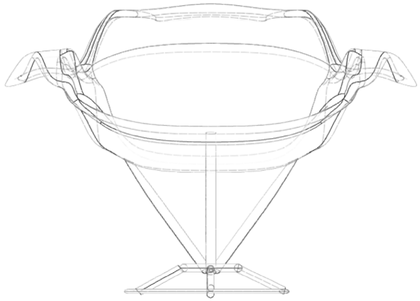




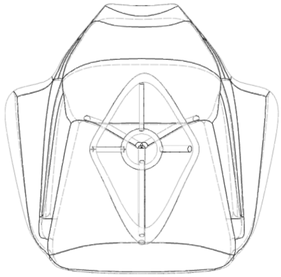
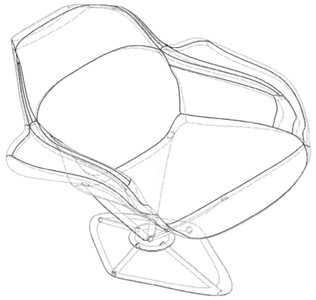



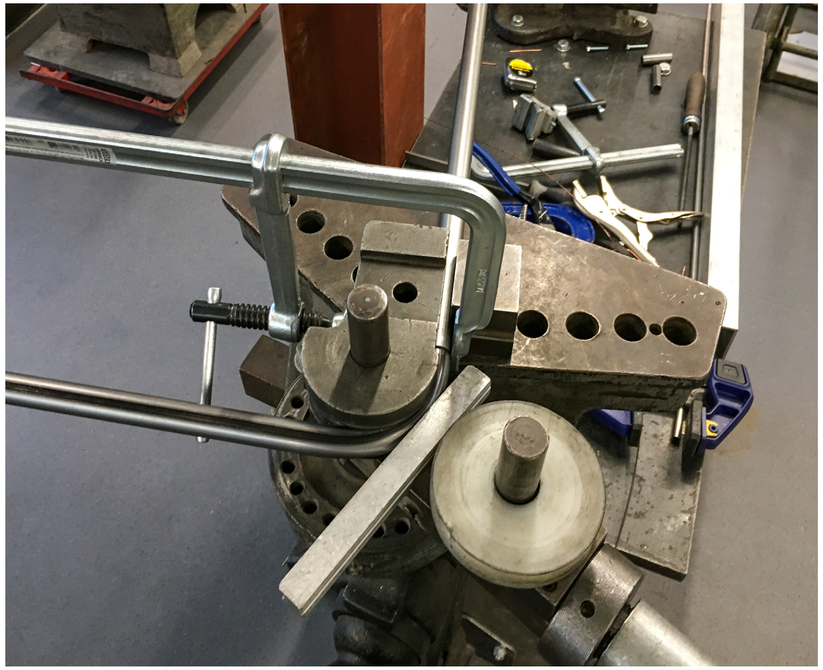
03

Prototypes and CAD models

Foam models and wireframe prototypes made with 1.5mm and 3mm steel wire, bent and spot-welded together at a scale of 1:10 and 1:3.
CAD models helped inform different radius, proportions and scale.



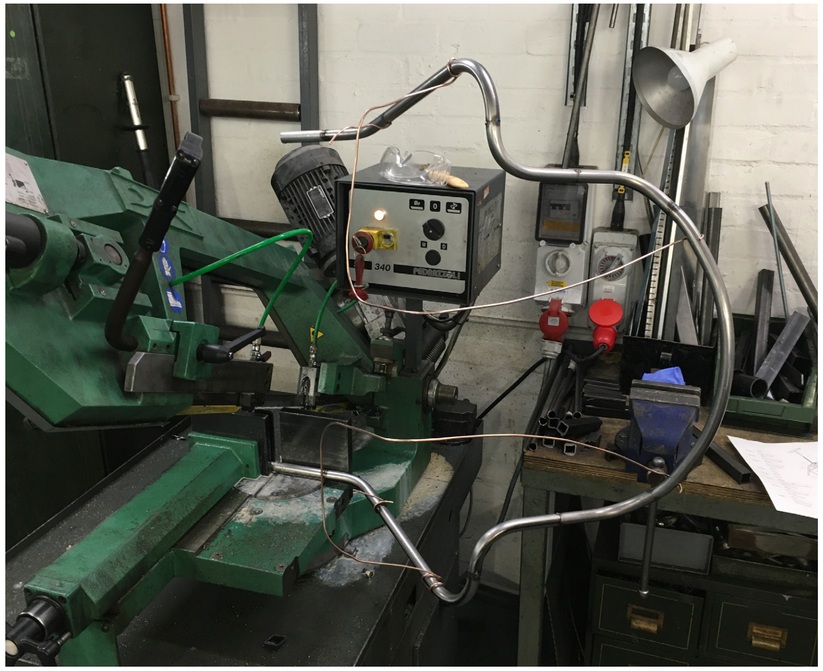



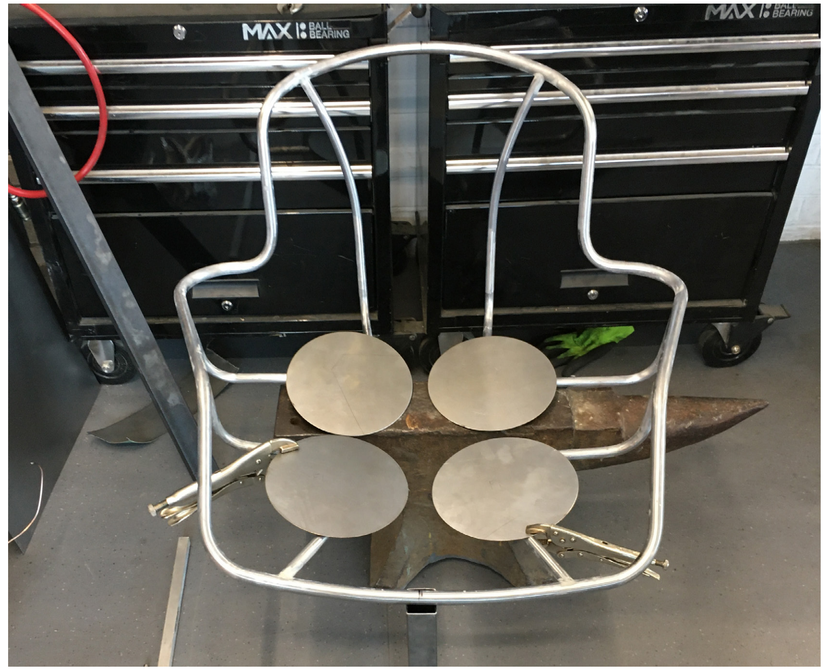


03

Prototypes and production

All tubes were bent by hand and then cut to the correct length. First, the outline was created and spot-welded together, then the inside tubing for the seating. Once the chair had its final form, I welded everything together, sanded the chair and added the legs and the seating.





03

Final chair

The chair was painted in a warm dark red with slight reflections to emphasise the curvature. The short backrest encourages a leaned-back seating position.
The open and airy minimalist design smoothly integrates into interior spaces without claiming too much space while allowing for a more complex shape to be present.

04

Claro

Indoor air quality for cognitive performance

04

Claro

Claro is a CO2 capture system that ensures indoor air quality for cognition performance.
For generations, buildings have been optimised for energy efficiency, making our living spaces more airtight than ever. CO2 concentration above 1500 ppm, emitted from human metabolism and often found in indoor environments, can reduce cognitive abilities by 50%. This reduction manifests itself in drowsiness, difficulty to focus, to think strategically, and to make use of information at work. Claro senses when concentrations are high and captures CO2, making sure you work at the best of your cognitive abilities.

Video

Time: Sept. 2020 - Dec 2020 (remote)

Field
Product Design

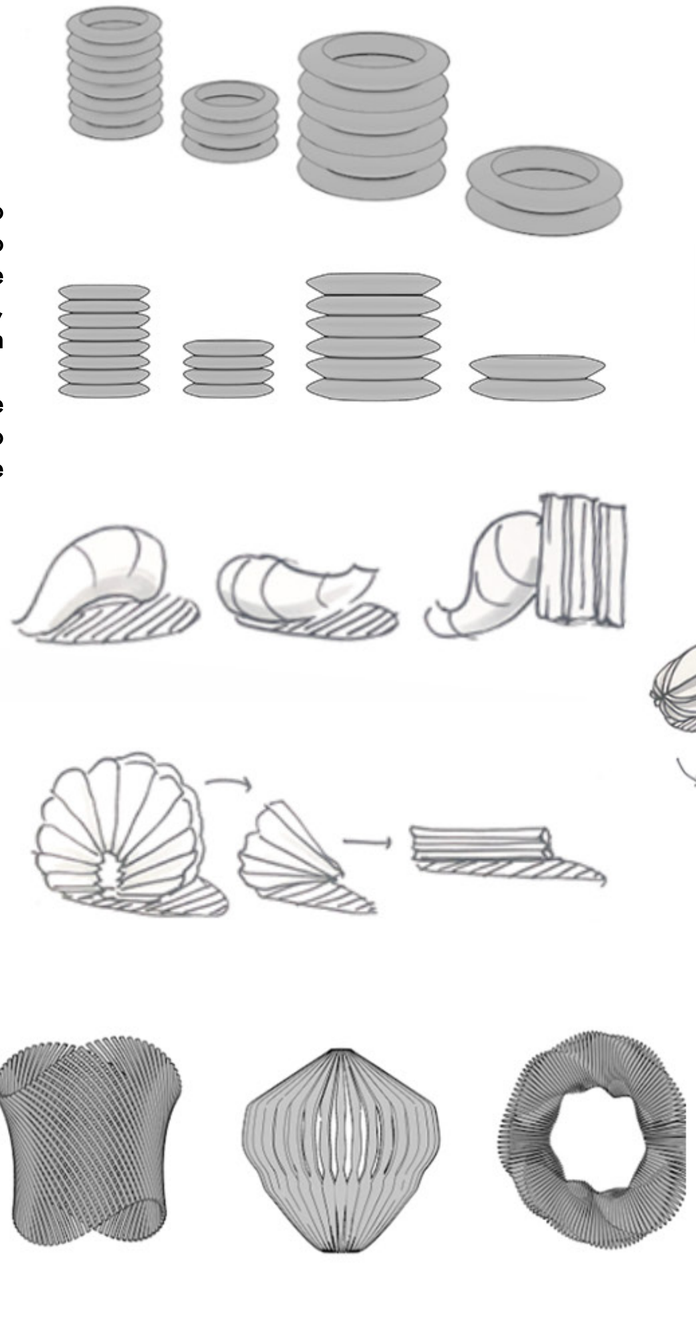
Developed by
Tobias Kappeler
Disharee Mathur
Leon Grillet
Nathalie Bar David Frenkel

Software
Blender
3D Modelling & Rendering
Gravity Sketch
Ideation & Product development
Photoshop
Image editing

04

Ideation & sketching

Claro uses moisture swing technology to absorb CO2 from ambient air, which is safe to use indoors. When concentrations are above 1500ppm, the critical limit for clear thinking, Claro starts unravelling to expose the adsorption surface to ensure safe concentrations indoors. Sketches and paper prototypes informed the ideation on different mechanisms on how to expose the moisture swing material over time to ensure clean air while working.

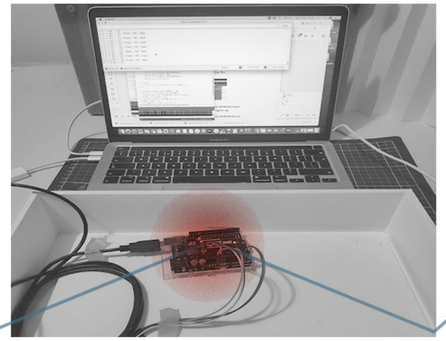


04

CO2 monitoring & network

Indoor air quality is often up to 5 times worse than outdoor air and is ever-evolving, with toxins added every few years due to human interventions. Parallelly, Carbon Dioxide, a product of human metabolism, is the most abundantly generated molecular contaminant indoors.
We monitored home offices in London and Paris to find CO2 levels up to 300 higher than healthy limits.

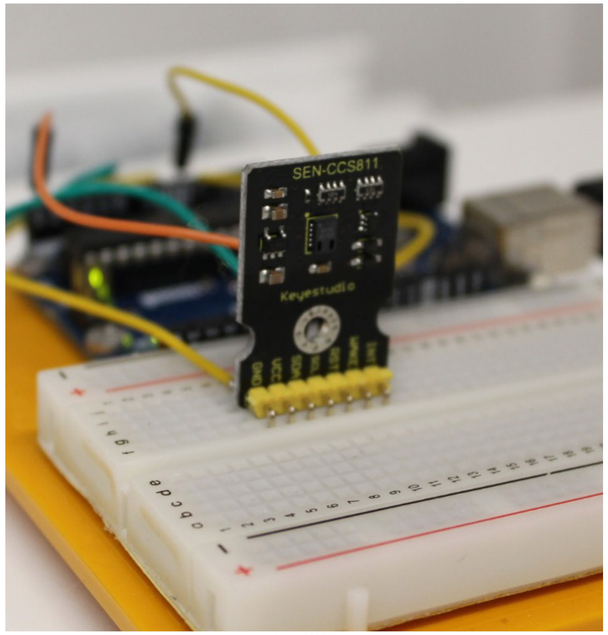
3820 ppm



4000 ppm

3160 ppm

4740 ppm

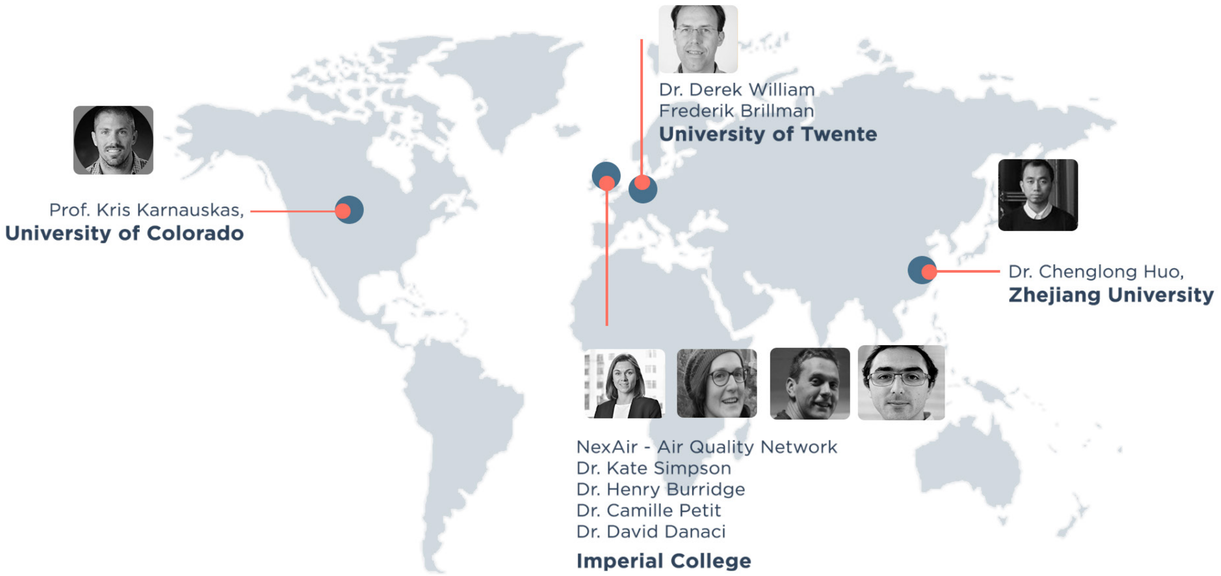


Indoor air quality sensor used to monitor CO2

ultrasonic-sensor-MAX

```
#define echoPin 11 // The number of the digital pin connected to the echo input
#define trigPin 12 // The number of the digital pin connected to the trigger output
#define LEDPin 13 // This enables the LED feedback for testing

int maximumRange = 30; // The max distance observed from the sensor
int minimumRange = 0;
long duration, distance; //duration used to calculate distance

void setup() {
  Serial.begin(9600); //starts the serial communication via USB
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(LEDPin, OUTPUT); //board LED for testing

}

void loop() {

  digitalWrite(trigPin, LOW);
  delayMicroseconds(2); // pulse off

  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10); // pulse for 10 microseconds

  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH); // echo pin listens / receives

  // from that data calculate distance in CentiMeters based on Speed of Sound
  distance = duration / 58.2;

// error handling
  if (distance >= maximumRange || distance <= minimumRange) {
    Serial.println("-1"); //if nothing observed ouput -1
    digitalWrite(LEDPin, HIGH); // LED will be on
  } else {
    Serial.println(distance); // prints the distance in CM
    digitalWrite(LEDPin, LOW); // LED will be off if object detected
  }
```

Arduino script to store the data with a time stamp to better understand how high CO2 concentrations occur while working.

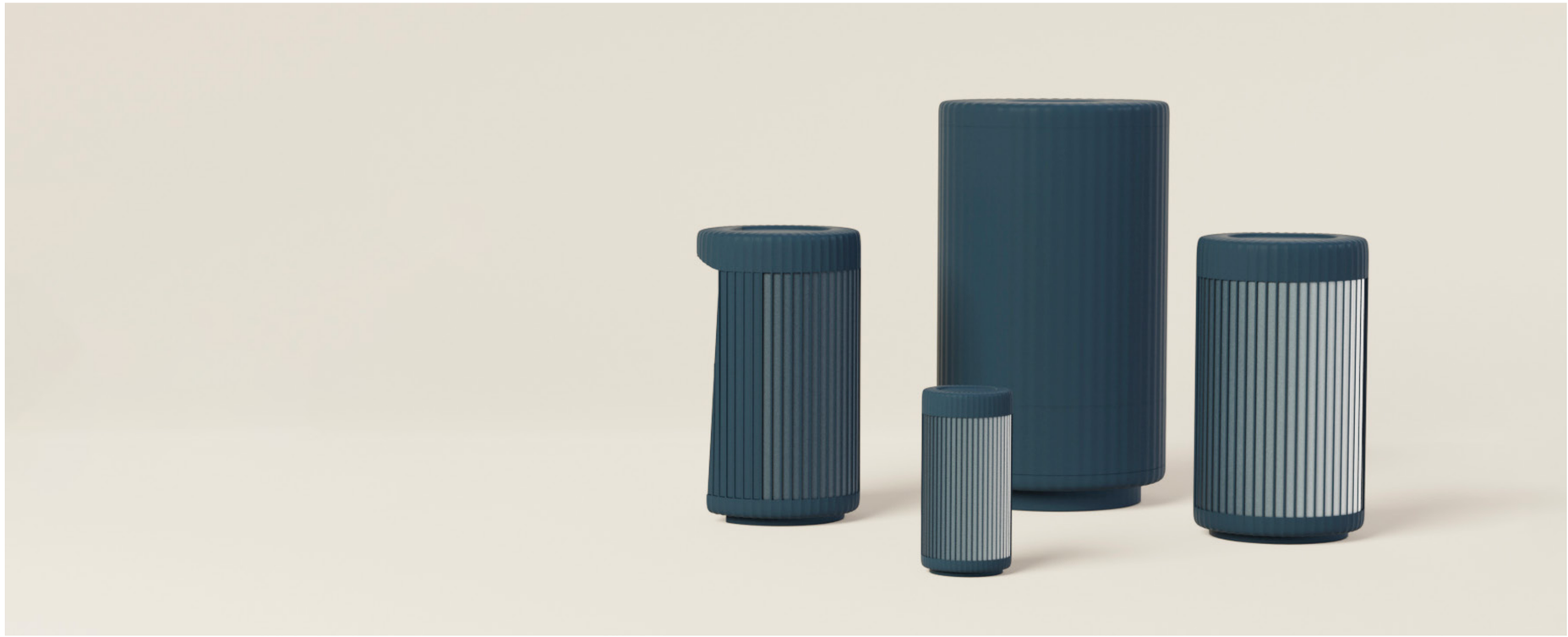


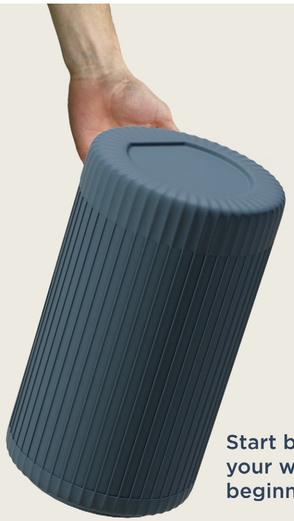
Claro's concept, technology and applications were developed and validated through a network of experts around the globe.

04

Claro

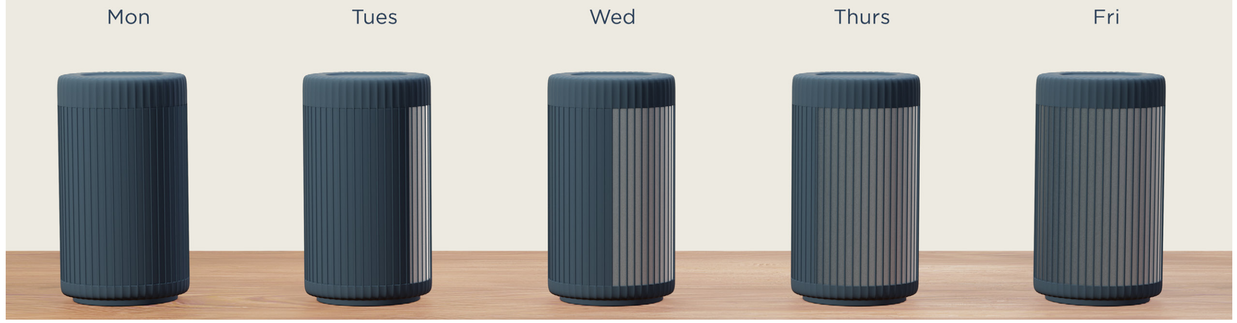
Claro is a two-part system that is safe for home and work environments and uses minimal energy. Claro captures CO2 through the course of a workweek and can be regenerated circularly, designed to align with modern domestic behaviours. Claro sits at the intersection of air purification, wellbeing and productivity, being the first of its kind to ensure indoor air for cognitive performance.



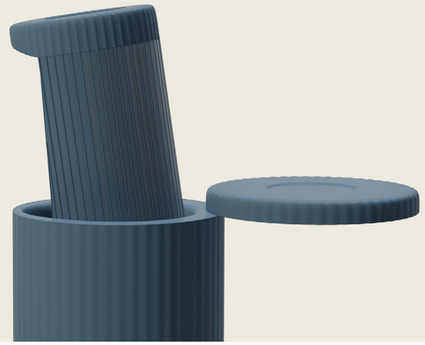


Start by placing Claro around your work desk at the beginning of your workweek.

Claro slowly unravels to capture CO_2 when concentrations are high. The amount of captured CO_2 is visually depicted through a gradient that darkens as more CO_2 is captured.

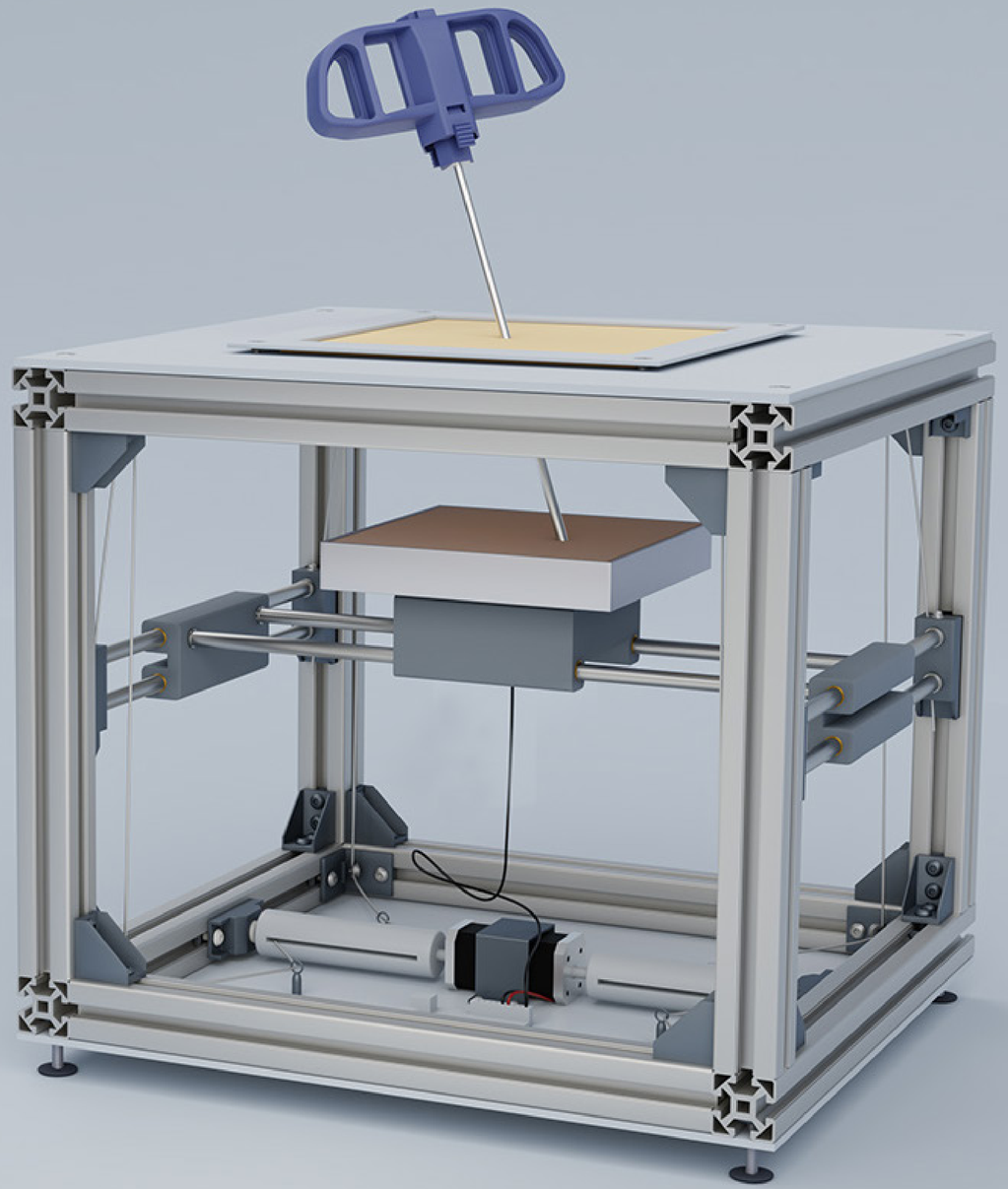


After the workweek, Claro can be regenerated by being placed in its counterpart. After two hours, it is ready to be used again.



Neetly

Haptic feedback for augmented reality biobsy training



05

Neetly

Augmented Reality biopsy simulations allow training of different procedures with various complexities while seeing the insertion of the biopsy needle on a virtual CT scan in real-time. This informs trainees with a comprehensive overview of the situation, however, lacks the haptic and tactile feedback which is a crucial factor of the procedure and training, especially for high-risk insertions.
Neetly provides accurate haptic feedback that matches the resistance of different tissues during biopsy procedures. This helps students gain confidence and experience before entering the workforce.
The project was a remote collaboration between students from Imperial College London, the Technical University of Munich and Gravity Sketch.

Video

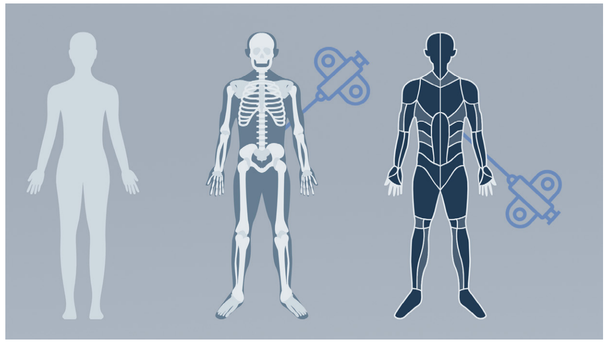
Time: Jan 2020 - March 2020 (remote)

Field
Product Design
UX

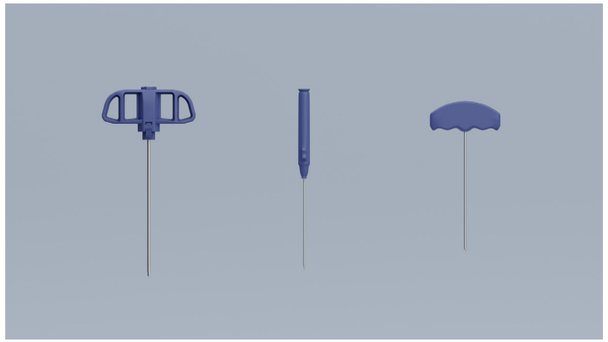
Developed by
Tobias Kappeler
Janis Milde
Yuan Ying

Software
Arduino IDE
Programming
Blender
3D modelling & Rendering
Gravity Sketch
Remote Collaboration, Ideation & product design

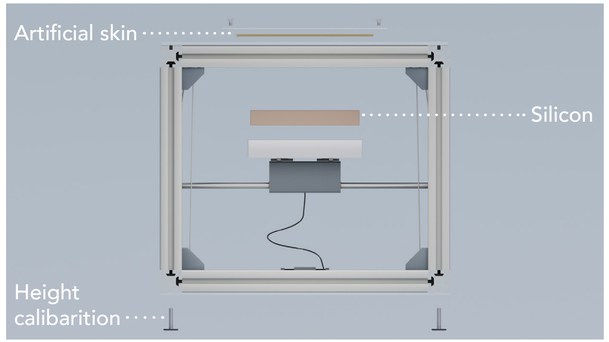
Biopsy training with Neetly



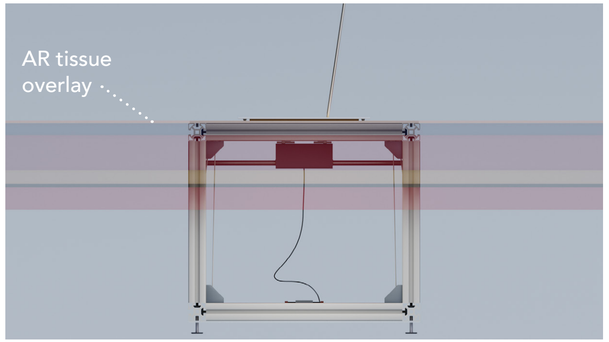
1. Select training simulation



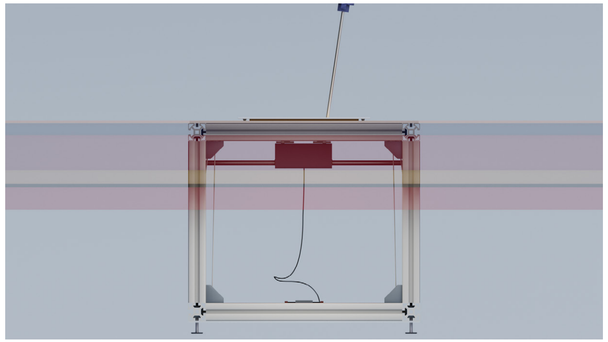
2. Select biopsy needle



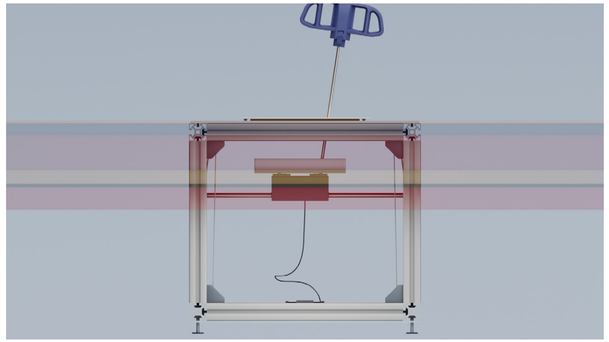
3. Set up



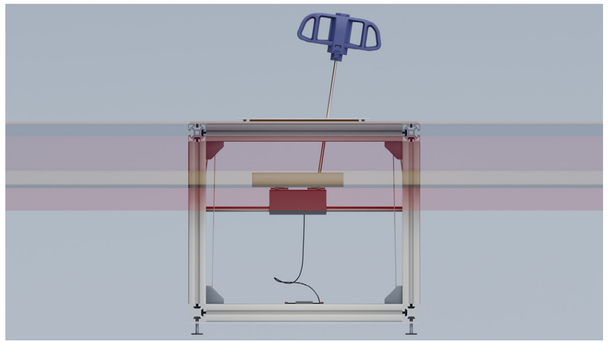
4. Insert needle



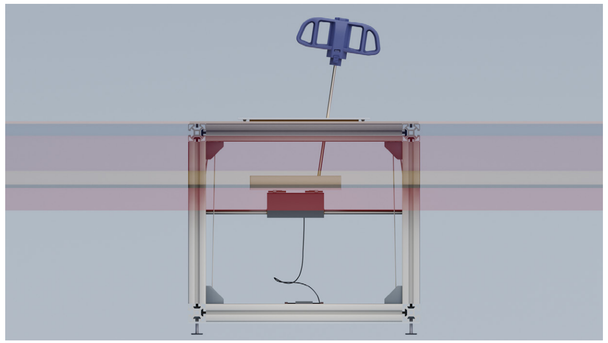
5. Fat layer



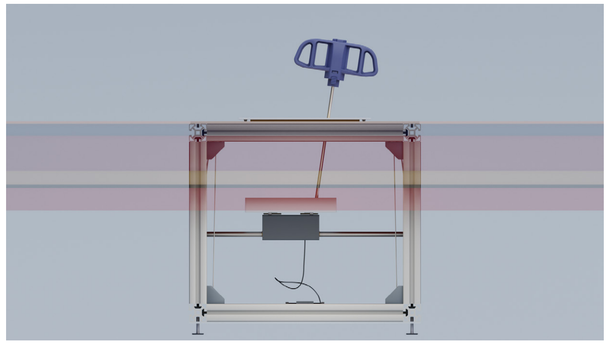
6. 1st tissue layer



7. 2nd tissue layer



8. Bone insertion



9. Bone marrow

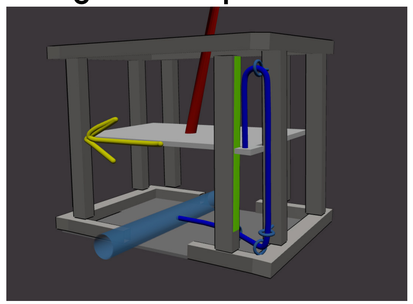
Neetly allows for different simulations of biopsy procedures. The artificial skin and silicon layer (step 3) allow holding the needle in place during the procedure making the experience more realistic.

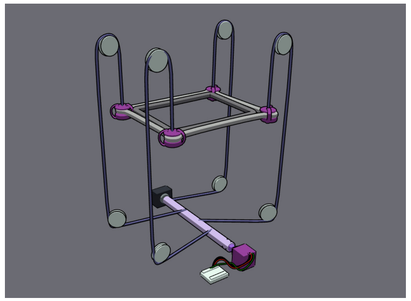
05

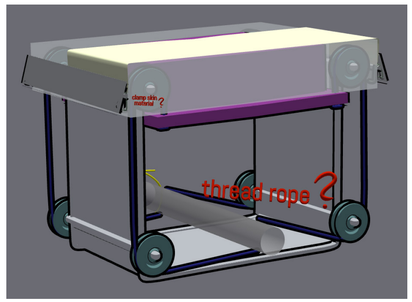
Ideation & design development

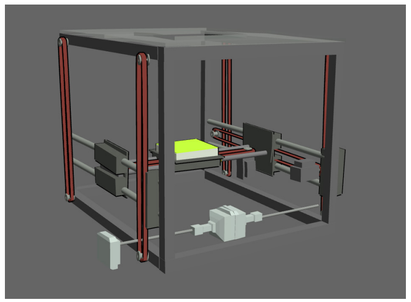
We used Gravity Sketch's virtual environment for collaborative ideation, concept development to resolve technical details while being remote. Physical prototyping informed the design decisions and guided the overall process.
We programmed the final prototype with the Arduino IDE and used load sensors to measure the pressure and activate the motor accordingly.

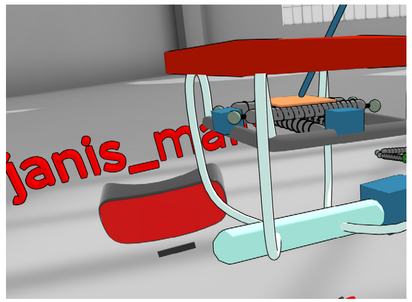
Design development





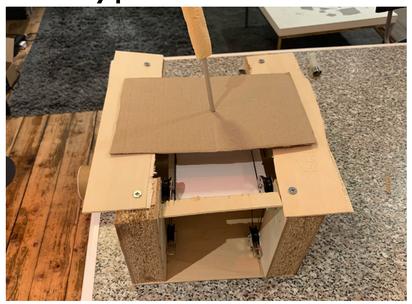


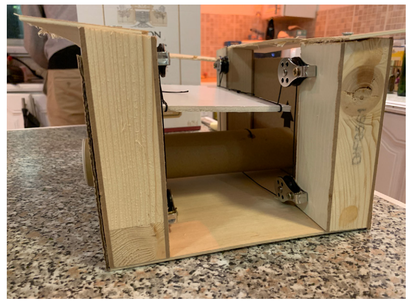




Ideation, collaborative visual thinking and product development in Gravity Sketch

Prototype





Arduino Code

Tangibility_electric_motor_force_sensor_controled_NEMA_23_21_06 §

```
HX711 scale;
// function to reset scale to start position
void reset_position (){
  Serial.println("reset position to start");
  Serial.println(a);

  // Set the spinning direction clockwise:
  digitalWrite(dirPin, LOW);
  reset = true;

  //check if platform is not in start position. Start position at a = 0
  for (int b = 0; a > b ; a--) {

    //call move function
    move_table ();
  }
  //reset bone variables
  bone_pinched = false;
  reset = false;
}

// function to moove the table up or down
void move_table (){
  // Set motor speed according to force applied by user
  if (reset == false){

      // the motor_speed_correction_factor is calibrated by an expert based on intuition
      motor_speed = motor_speed_correction_factor / (abs(scale_force) / req_force);

      Serial.println(motor_speed);

      //prevent to high motorspeed
      if (motor_speed > min_motor_speed){
        motor_speed = min_motor_speed;
      }
    else{
      if (motor_speed < max_motor_speed){
      motor_speed = max_motor_speed;
      }
    }
  }
```

Functions were programmed to be called throughout the loop such as resetting the position and moving the table at different speeds.

Tangibility_electric_motor_force_sensor_controled_NEMA_23_21_06 §

```
  scale.tare(); //Assuming there is no weight on the scale at start up, reset the scale to 0

  //declare interupt event if button is pressed to reset the platform to start position
  attachInterrupt(digitalPinToInterrupt(reset_button), reset_position, HIGH);
}
void loop() {
  //Stop if bottom is reached
  if (a >= 68) {
    reset_position ();
  }
  // Read force sensor load
  //Serial.print("Scale_force: ");
  scale_force = scale.get_units(),2; //scale.get_units() returns a float
  Serial.println(scale_force);
  //Serial.print(" lbs"); //
  //Serial.println();
  //call LED_indicator function#
  led_indicator();
  //if bone depth is reached reqired force is set to bone_force
  //wich is required to go throug bone, higher motorspeed simulates rel after pinching bone
  if (a > bone_depth && bone_pinched == false){
    req_force = bone_force;
    bone_reached = true;
  }
  else {
    req_force = tissue_force;
  }
  //Check if force is enought, despite if reading is positive or negative
  if (abs(scale_force) >= req_force) {
    Serial.println("moving down");
    // Set the spinning direction counter-clockwise:
    digitalWrite(dirPin, HIGH);
    a = a + 1;
    //check if layer is passed through
    pass_through_layer ();
    //call move function
    move_table ();
    //Check if bone was hit to set variable true, to reset the required force to tissue force
    if (req_force == bone_force && bone_reached == true){
      bone_pinched = true;
    }
```

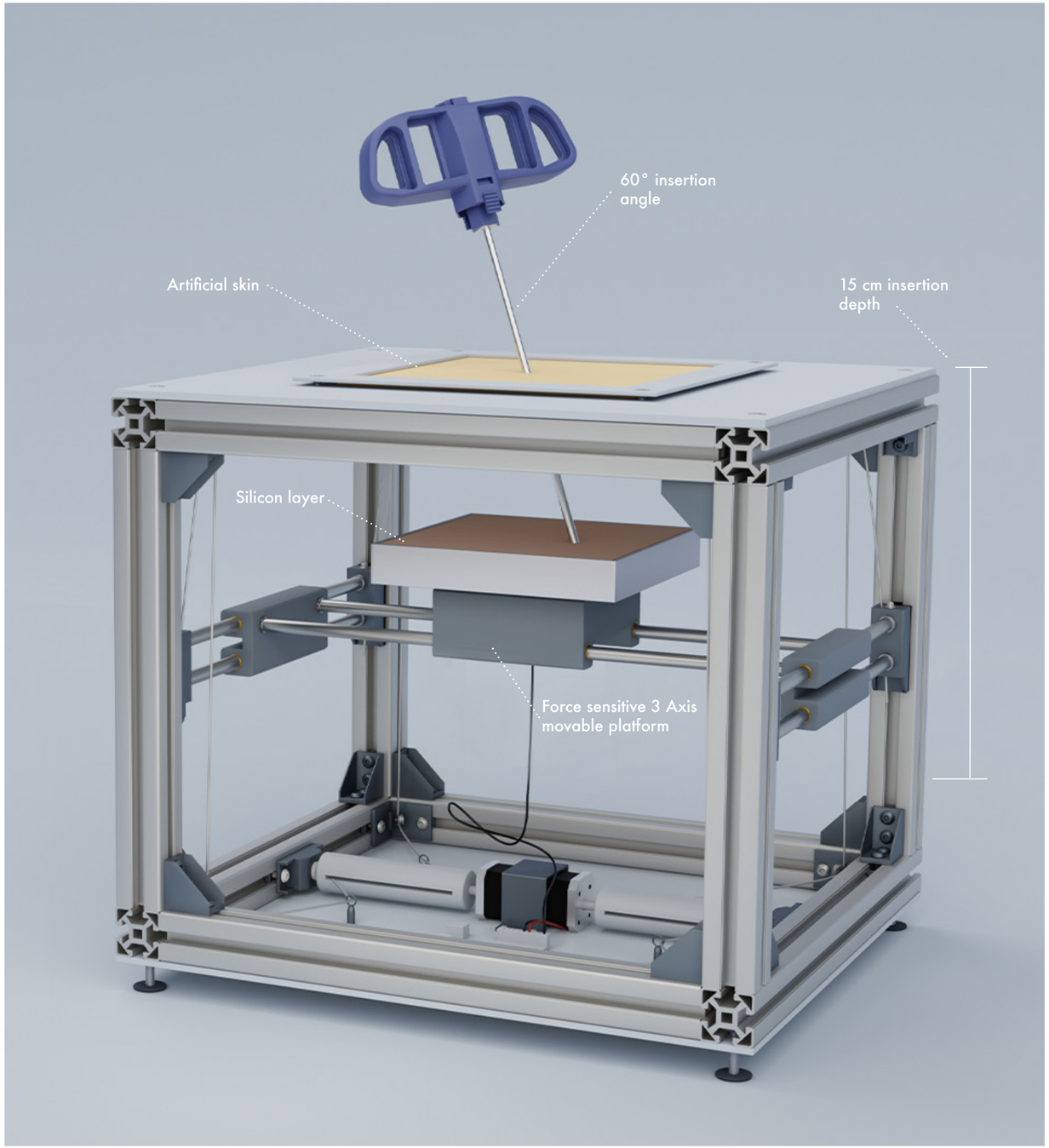
Depending on the pressure applied depending on the position of the needle the motor would be activated to moved the platform.

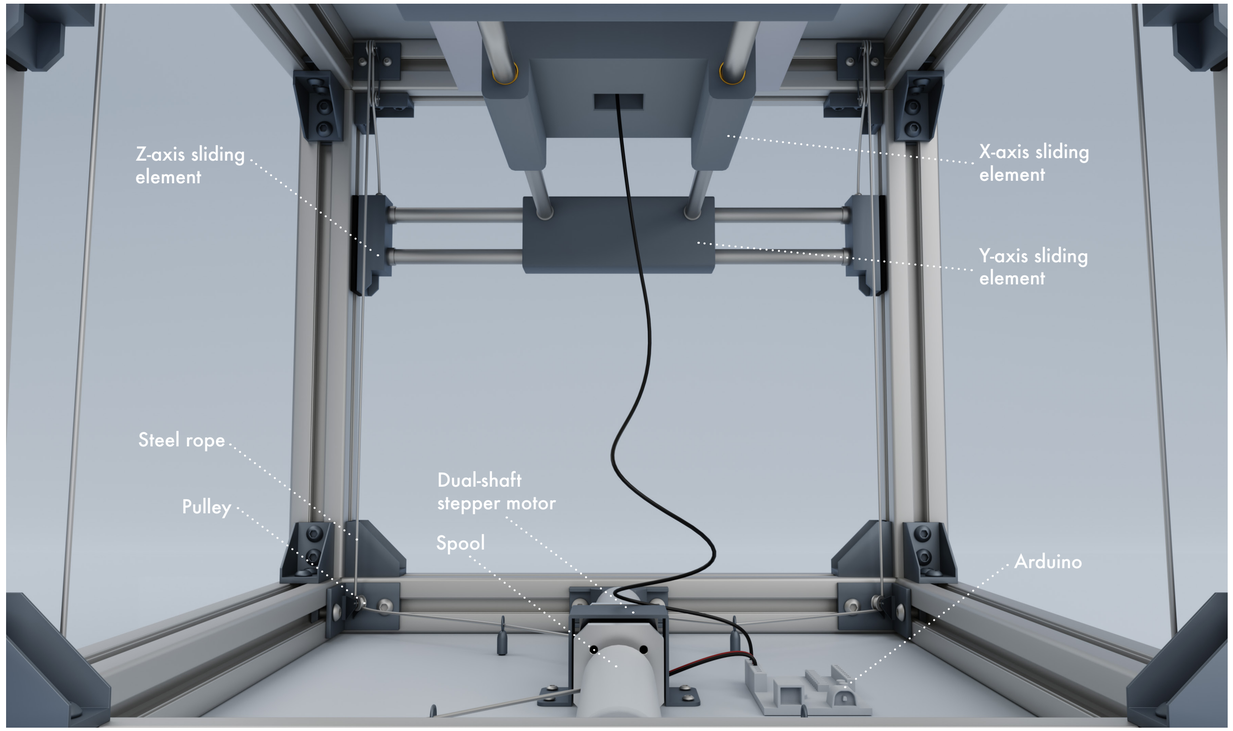
Final prototype

05

Final design

Neetly is targeted at university students to gain more realistic experiences before entering the work field. Neetly allows for an insertion depth of up to 15cm and due to its force-sensitive 3 axis movable platform, it can accommodate insertions of up to 60°.

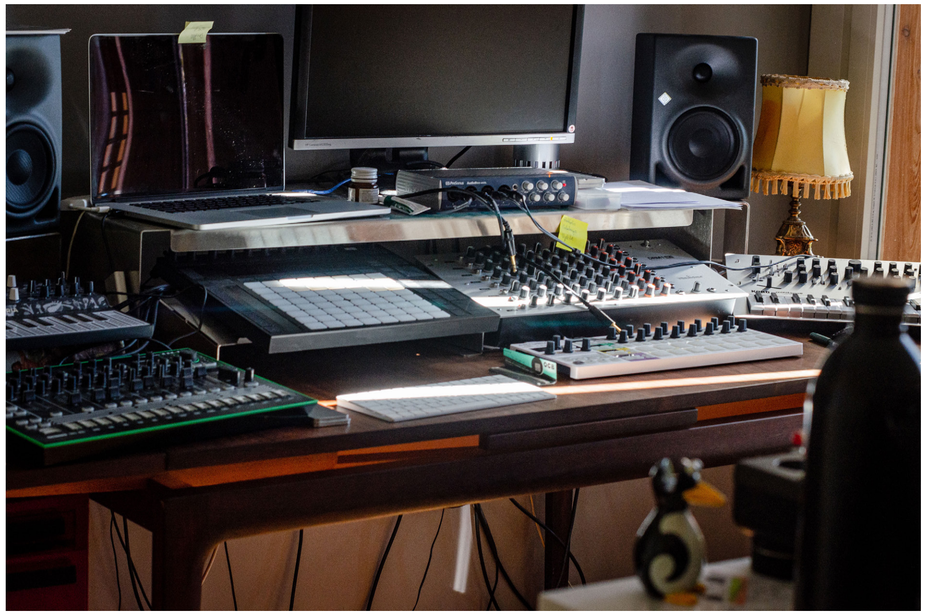




06

Electronic music production & DJ

Since 2016 I've been producing electronic music with hardware & software synthesizers and drum machines in search of the "golden loop". I'm fascinated by the emotional energy music can release and its ability to connect people.
Throughout this time, I've examined my workflow, how to reach a flow state when making music and what affects and stimulates my creativity. I understand the benefits of hardware and tactile feedback and the editability and flexibility of software and learned how to bridge the two.
In 2017, I switched from digital to analogue music mixing due to the experience of finding, collecting and mixing records.



Soundcloud

Time: 2016 - present

Field
Music Production
Interaction design
Creativity

Developed by
Tobias Kappeler

Software
Ableton Live
Digital Audio Workstation
3D Tune-In Toolkit
Binaural spatialisation
Envelop for Live
Immersive Audio

00

End

Thank you for viewing my portfolio.
You can find additional projects on my website.
I'm happy to explain my work in more detail or answer any questions you may have.

Thank you!
Tobias