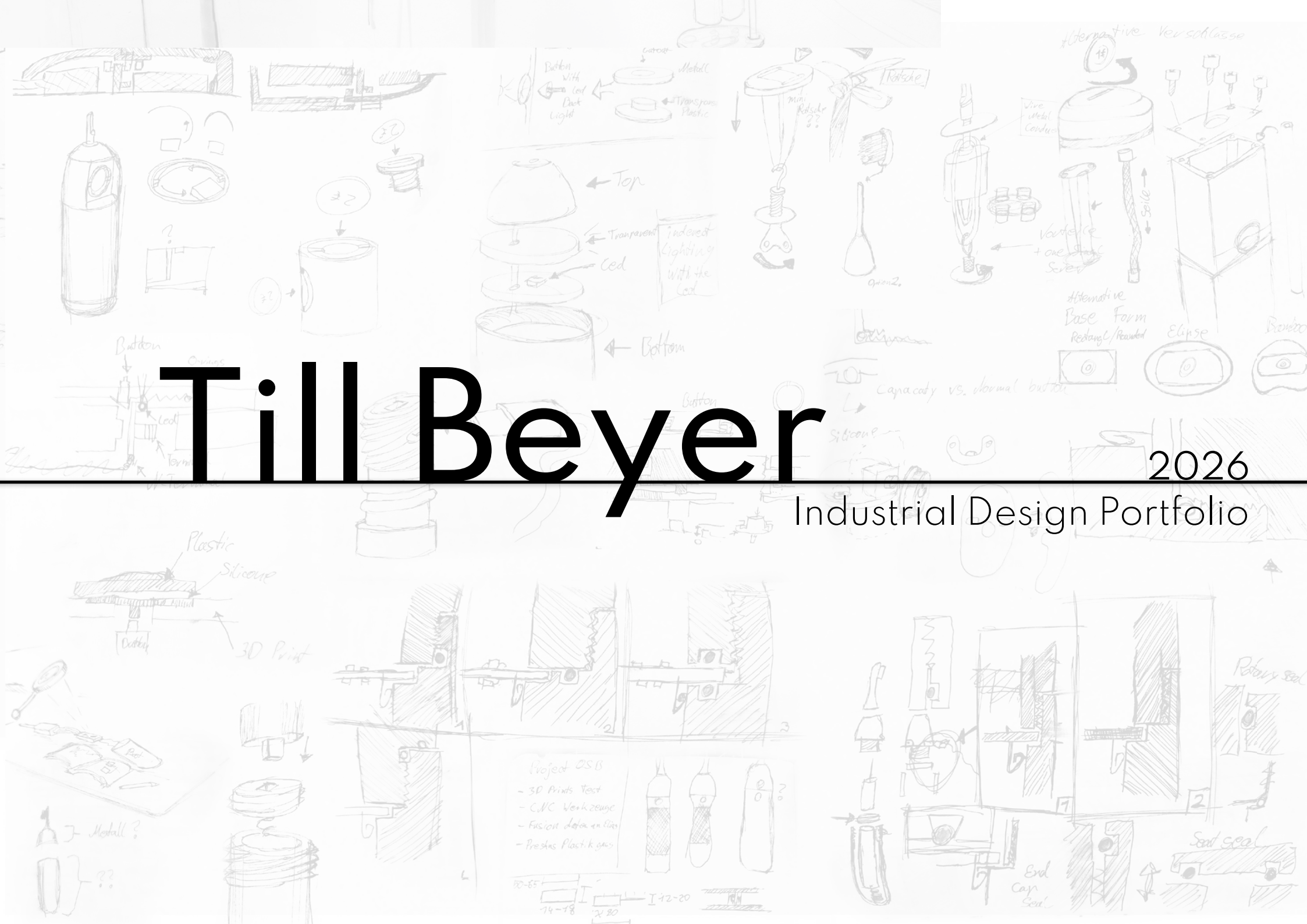
Till Beyer

2026

Industrial Design Portfolio



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Modül
Appliances for Life

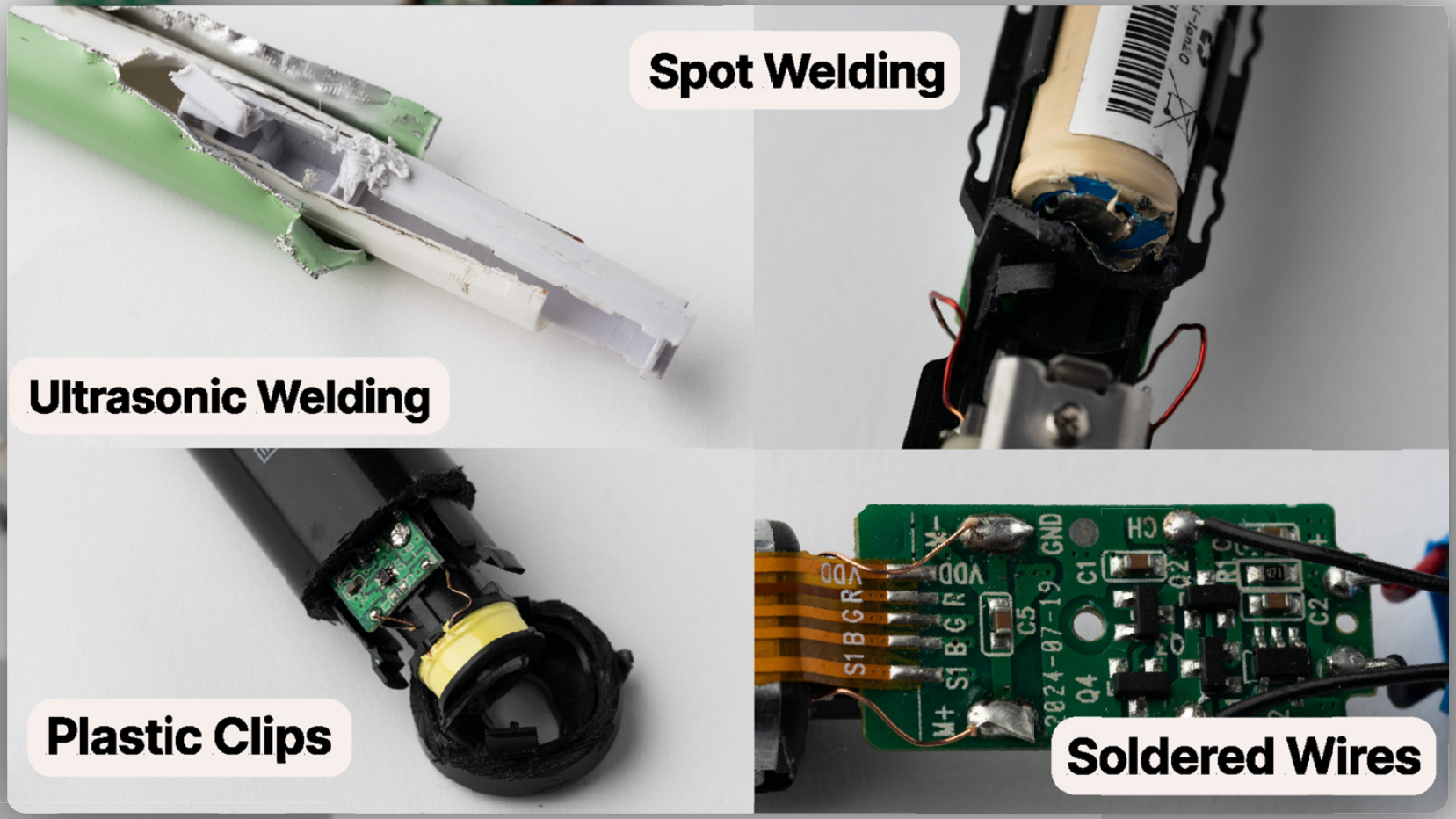
The first electronic toothbrush designed to last a livetime

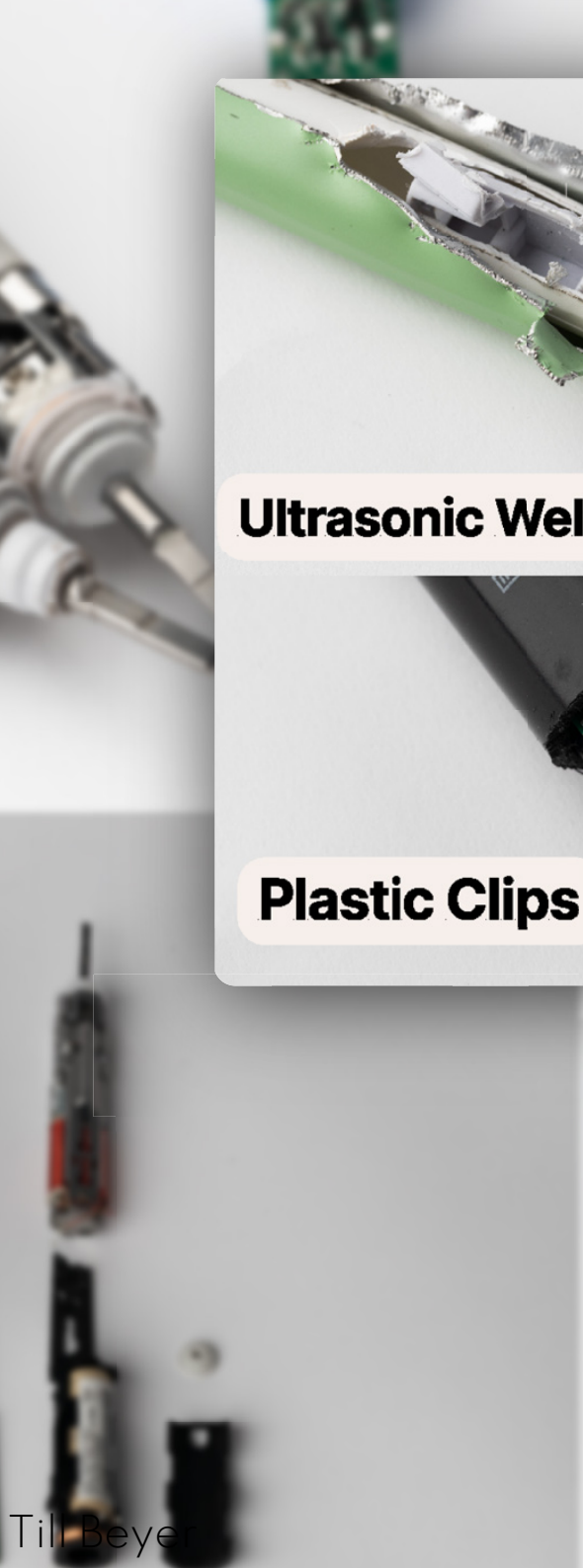
For my master's thesis, my goal was to redesign an electronic appliance that was prone to break down prematurely in a way that would encourage users to keep it.

Time frame
12 Month

Individual project supported by:
Gateway th-köln, SEDA Awards, Enactus köln

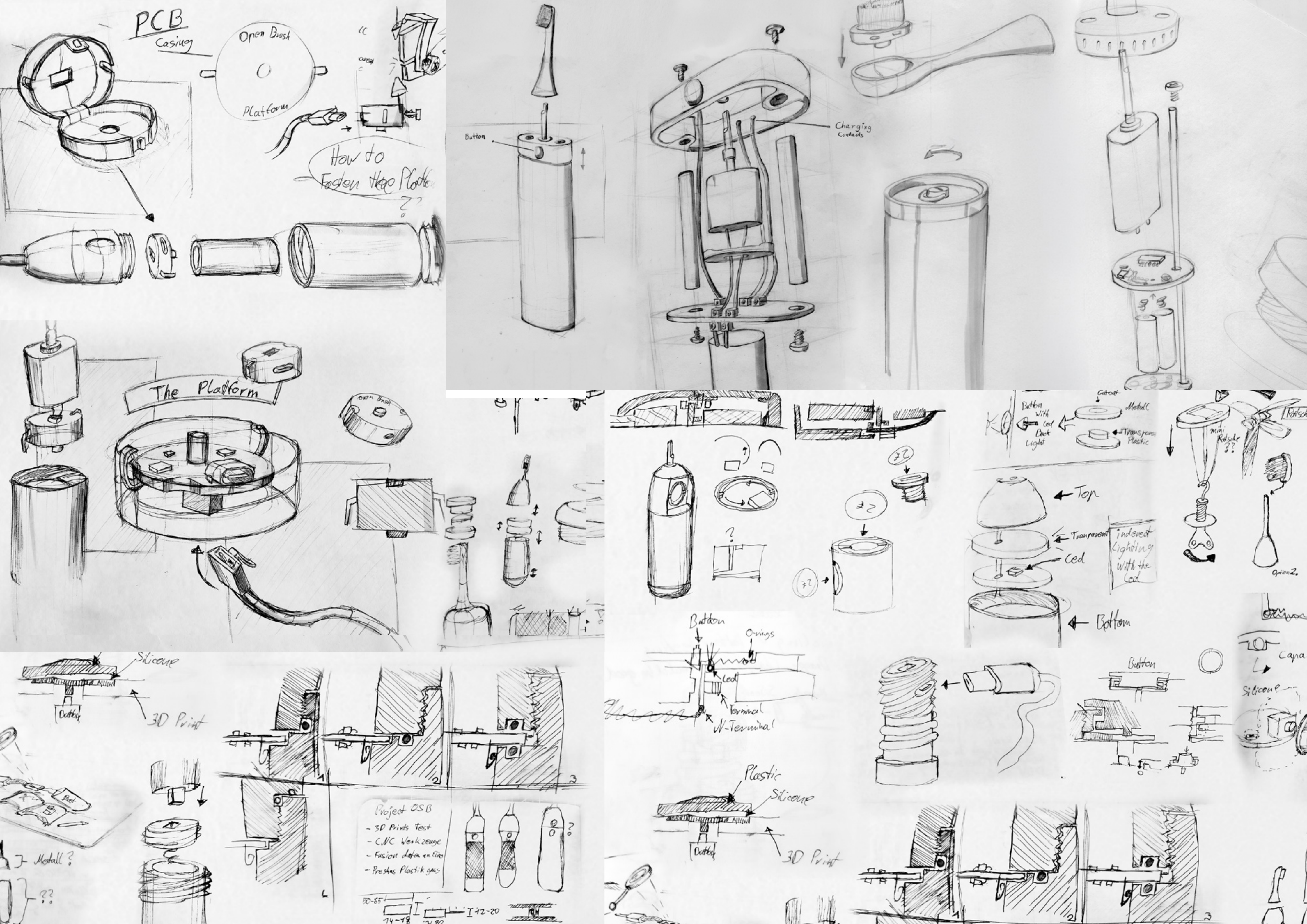
Electric toothbrushes are the most effective tool for oral hygiene. In Germany, 40% of people already use one, but they also produce a lot of waste. **The batteries and silicone seals wear out within a few years and, because they are permanently built in, a broken toothbrush usually just gets thrown away and replaced.**





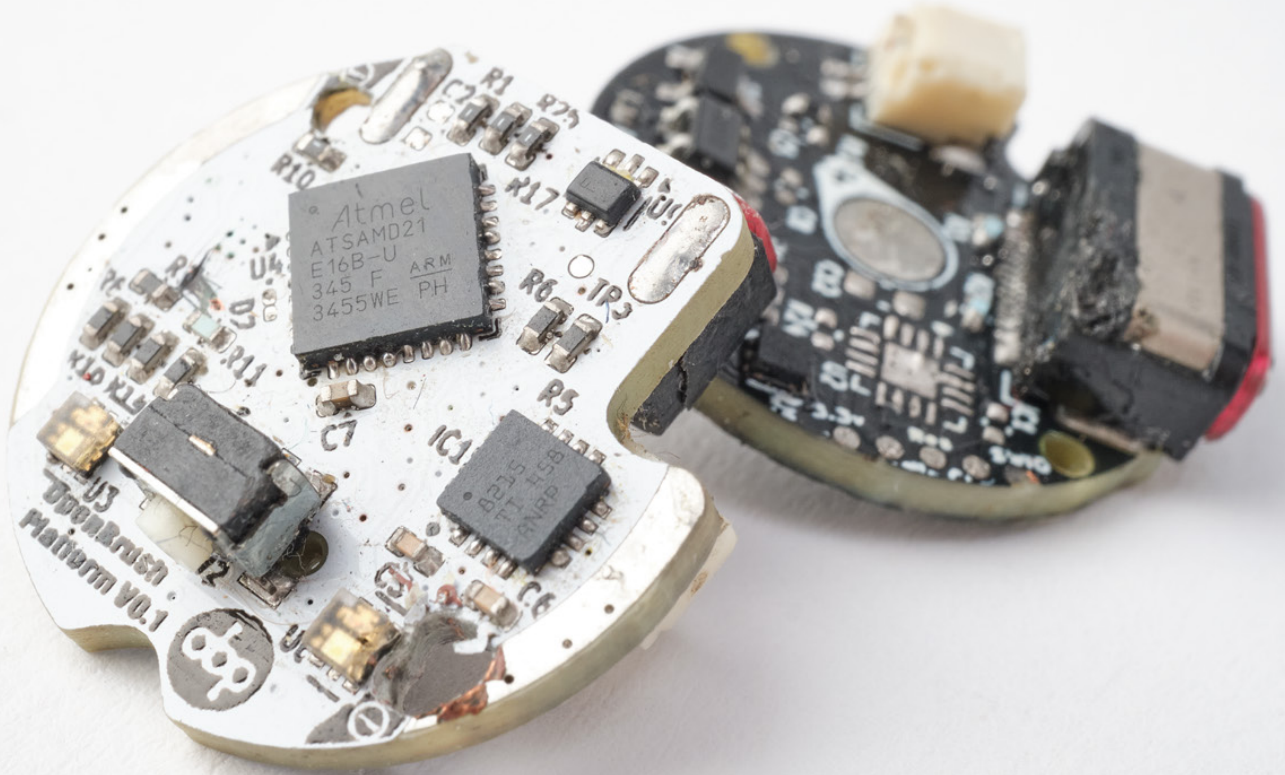
The EU's upcoming 2027 Battery Regulation aims to address this issue by introducing a requirement for user-replaceable batteries in electronic devices. However, devices used in wet environments, including electric toothbrushes, are exempt from this requirement.

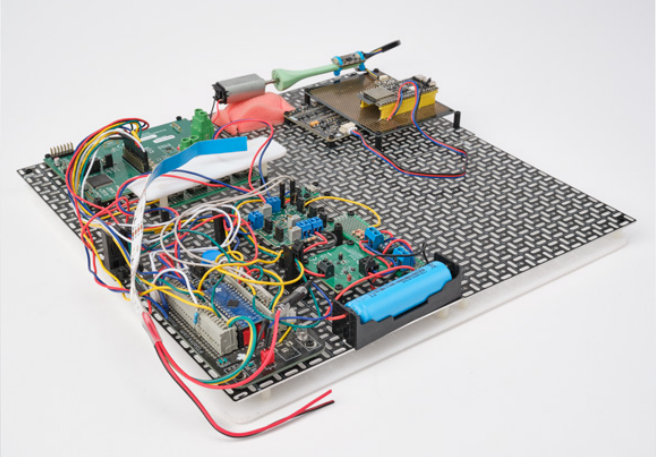
Currently, anyone who wants a toothbrush that's both effective and genuinely repairable has no option.

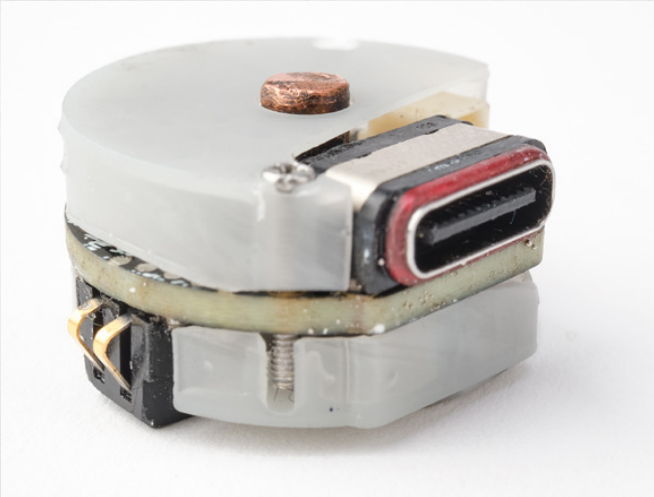

PCB
Casing
Open Brush
Platform
How to Fasten the Platform ??
Button
Charging Contacts
The Platform
Open Brush
Silicone
3D Print
Button
Metall ?
??
Project OSB
- 3D Prints Test
- CNC Werkzeuge
- Fusion daten an Elias
Button with Led Back Light
Cutout
Metall
Transparent Plastic
Top
Transparent
Led
indirect Lighting with the Led
Bottom
Button
O-rings
Led
Terminal
N-Terminal
Plastic
Silicone
3D Print
Button
Button
Silicone
Option 2

Electronics

The prototyping process ran on two parallel tracks: the electronics inside the toothbrush and the physical experience of using and repairing it. For the electronics, after investigating other toothbrushes, **I prototyped a breadboard model with development boards containing the necessary chips to make the toothbrush work. The breadboard schematics were then laid out on a compact circuit board in KiCad to fit inside the flashlight-style housing.** Firmware was developed and debugged through PlatformIO.



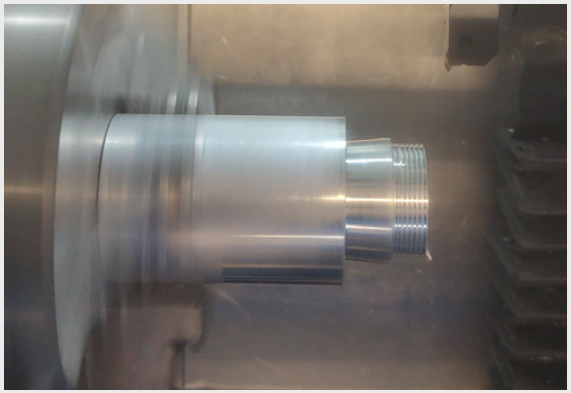


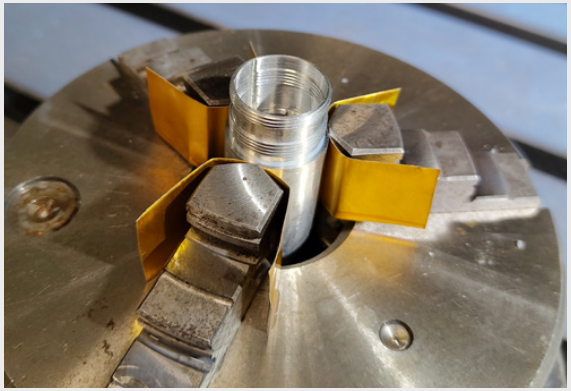


Prototyping

On the physical side, prototyping covered the full product experience: haptic feedback, packaging, the user guide and how the toothbrush feels when it is built and repaired by hand.
The fastening system underwent several iterations before settling on a coin-turned ring instead of an internal screw.

The aluminium housing was first iterated on using SLA printing, and was later tested for CNC manufacturability by generating the G-code and using a lathe to turn the required profiles.

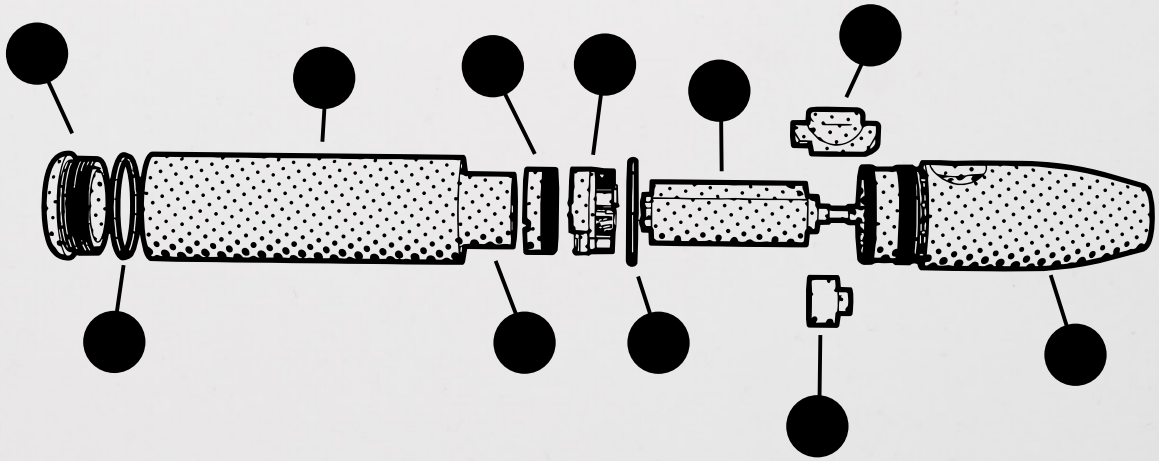




Construction

The design of Modul is inspired by waterproof flashlights. Its aluminium housing can be unscrewed to provide direct access to the battery and motor, with no tools, soldering or technical know-how required.

A vertical PCB layout keeps the electronics compact, and spring-loaded contacts ensure the internal connections are made automatically when the components are stacked into place, making replacing a worn part as simple as putting the pieces back together in the right order. The larger built-in battery, made from reclaimed e-scooter cells, only needs to be charged via USB-C around three times a year, and the modular design allows for future customisation and upgrades.



- Transparent O-ring
- Toothbrush Top
- Motor seal
- Motor
- Silicone Button
- Thinking Module
- Mounting Ring
- Handle
- Black O-ring
- Toothbrush Bottom
- Battery
- Brush head

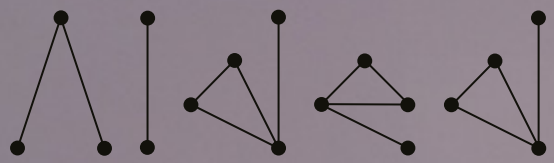
Packaging

The final prototype is a fully modular toothbrush that is shipped unassembled. Building it is therefore the user's first interaction with the product. **In the assamby process, the user learns how to replace components and forms a connection to the product.** In workshop testing, every participant completed that build. None had a technical background. They used nothing but the printed guide. The whole brush opens and closes with just a coin.

The brush can also be upgraded after purchase by plugging it into a computer via USB-C to add new vibration patterns or support for future motor modules.
With a manufacturing cost of around 70€ for a small batch and a feasible retail price of 250€, **Modül sits alongside other premium electric toothbrushes. However, it is built to outlast all of them, replacing a cycle of disposable purchases with a single product designed to be kept, repaired, and upgraded for years.**


Feel free to touch
Modül
Appliances for Life


Modül
Appliances for Life
Sponsors and Partners
Gateway
TH Köln
enactus
The first electronic toothbrush
designed to last a livetime



In the Aided project, **we created a multimedia installation focusing on depth-to-image generation for interior design.** We used live projection mapping and 3D scanning in combination with an analogue input device to enable users to create vastly different interiors at the push of a button.

Besides the controller **we also designed a small interior model in which participants can move differently shaped white cubes around to create and modify their own interior space.** Users do not require any technical knowledge for any of the interactions, a program running in the background automatically creates validated prompts based on the user's input.

Time frame

6 Month

My Role

Project management, Programming, Circuitry

Group project with

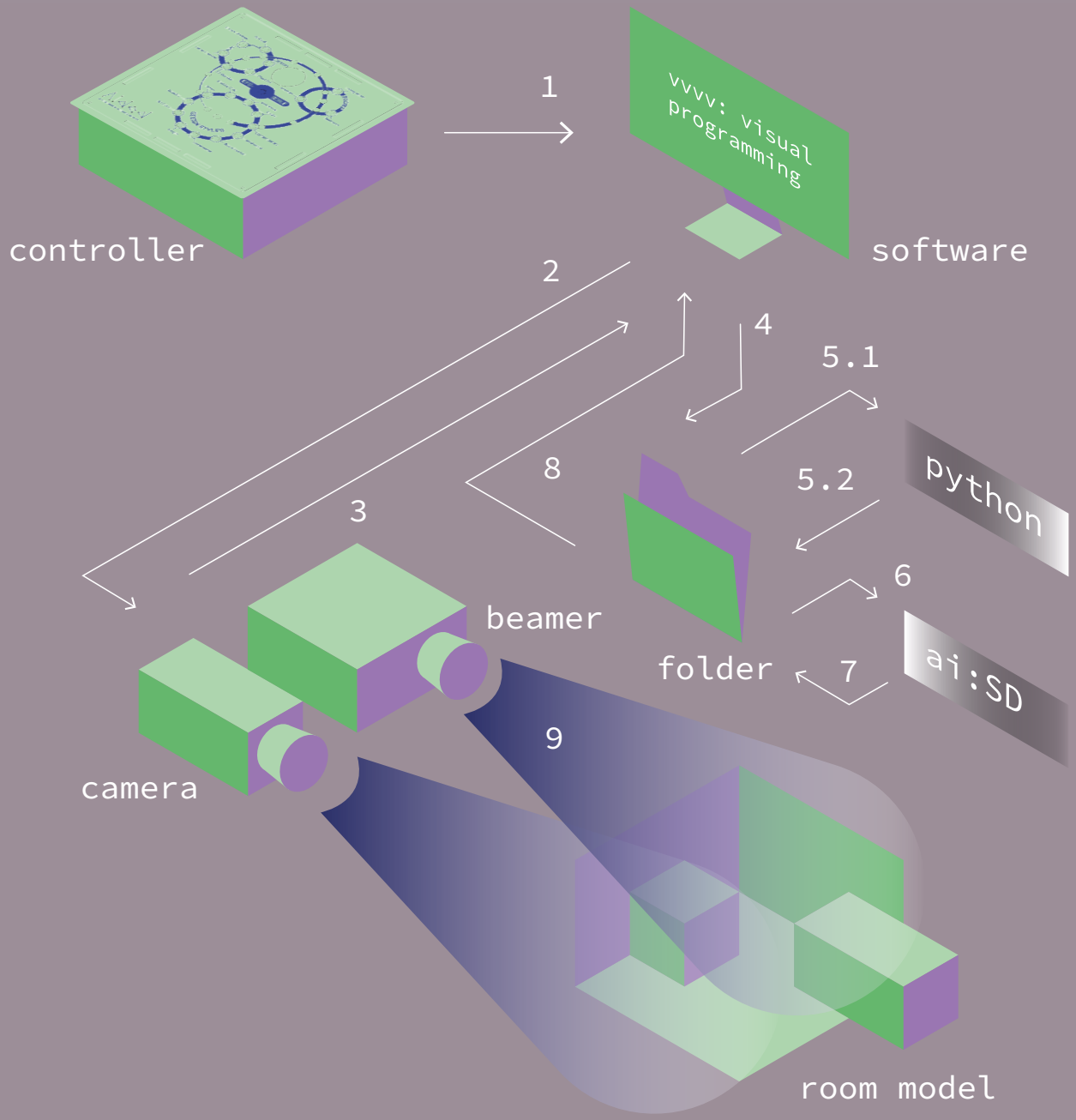
Elias Philips, Tim Klünker, Lukas Darius Loibl, Sophia Katharina Stelter

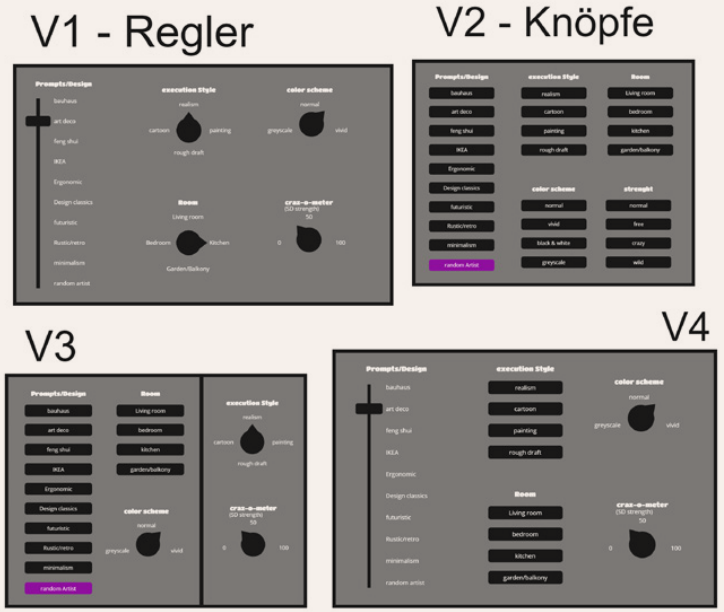
Our main goal in this project was to explore the potential of AI image generators as assistants for businesses, designers and artists.

We ended up with an interface design where you could choose three different prompts at the same time (interior styles/ art styles/rooms) and also choose the guidance scale, in other words how “creative” the AI is.

Video of the Instalation
https://vimeo.com/1189690939?fl=pl&fe=sh

Till Beyer





The housing for the installation uses an ESP32 with some multiplexers for the inputs. The electronic components are held in place by a laser-cut and engraved casing. VVVV was then used to translate the inputs into prompts, which were handed over to Python. Python accessed the locally running A1111 via an API. The resulting image was loaded into VVVV and projected onto the cubes using projection mapping.

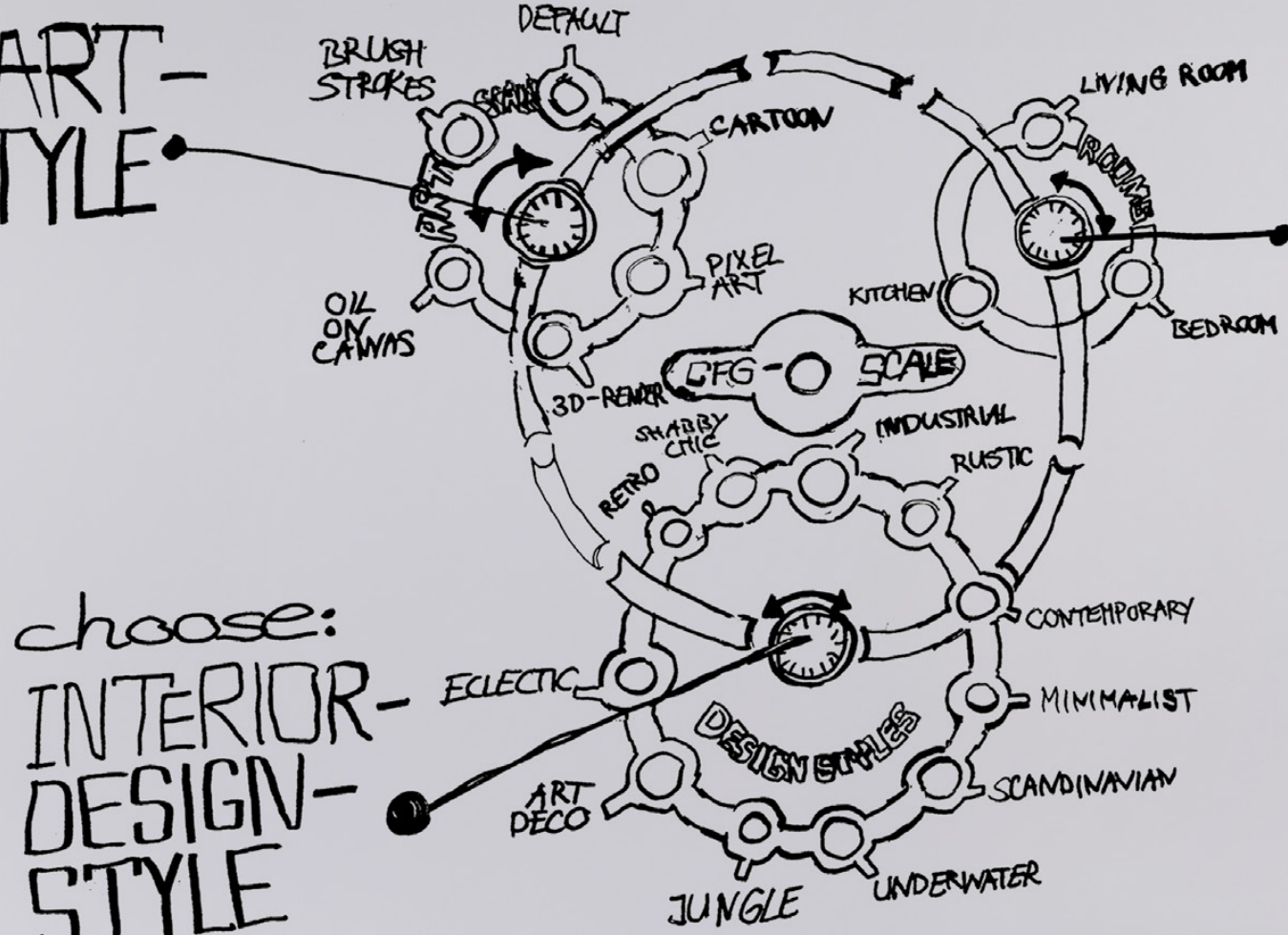
I proposed this self-initiated project to my peers, suggesting that we use AI to support designers in their work. One of the more challenging aspects of the project was managing the workload and maintaining everyone's involvement throughout the project.

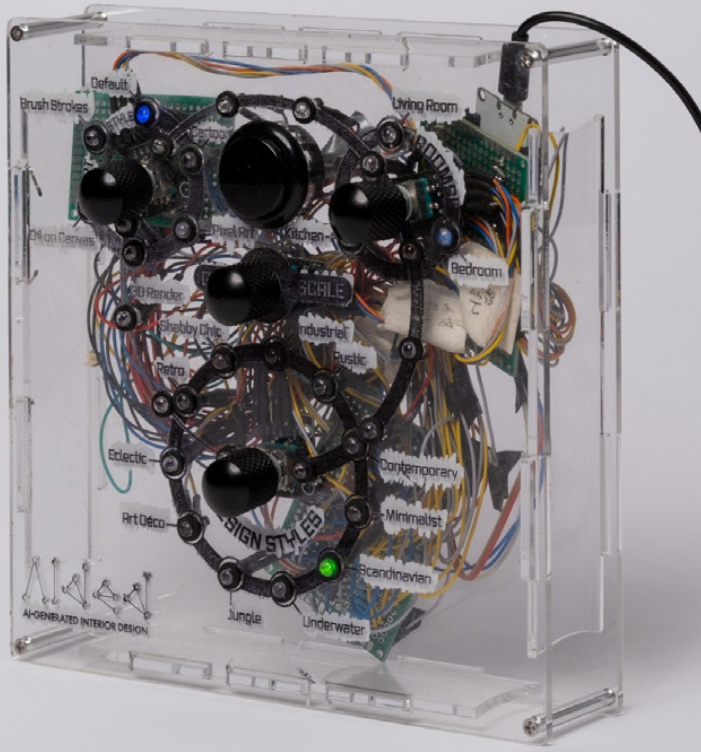
CONTROLLER

choose:
ART-STYLE

choose:
ROOM

choose:
INTERIOR-DESIGN-STYLE





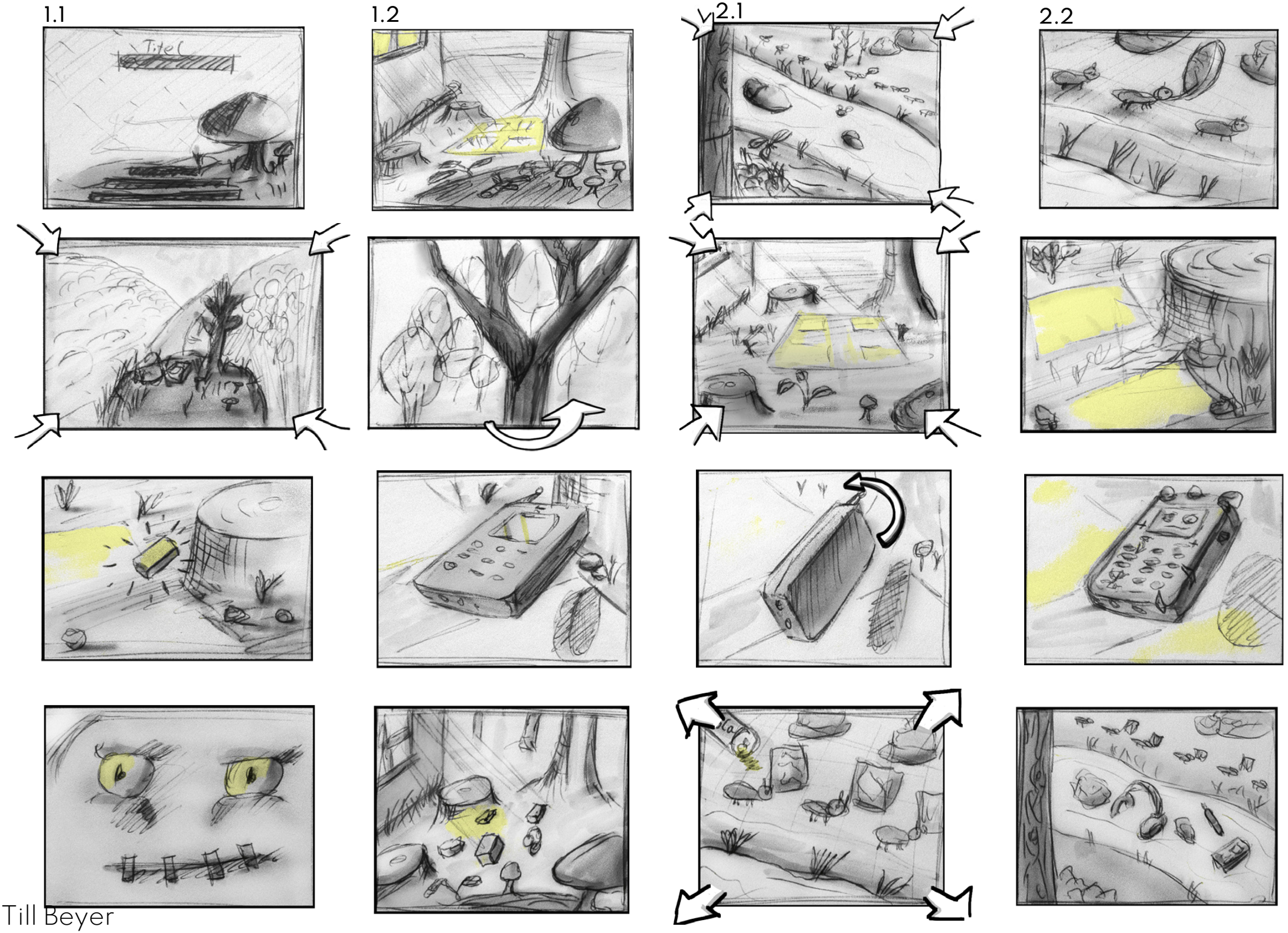
Monsterus Hybrids

This **three-minute short film** that was developed during a course on storyboarding and visualisation at Konstfack. During the project, I learnt how to structure the production process of a short film using storyboards, as taught by the storyboard artist Martin Bergquist.

The resulting animation focused on the artistic exploration of **'monstrous hybrids', a term defined in the book Cradle to Cradle as products, components or materials that combine technical and organic nutrients** in a way that cannot easily be separated, meaning they cannot be recycled or reused by either system. To achieve this, **I used a variety of 3D techniques, including hard and soft surface polygon modelling, texturing, sculpting, rigging, keyframing, audio mixing and mastering, colour grading and editing.**

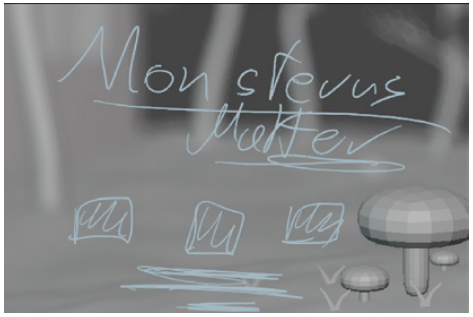
Time frame
2 Month

Individual project



Till Beyer

1.1



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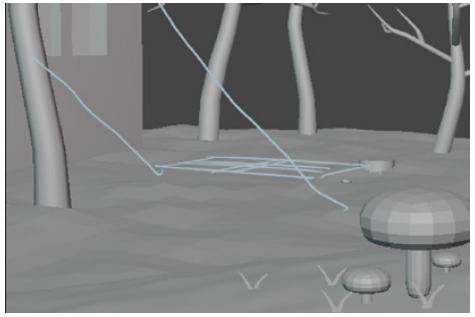

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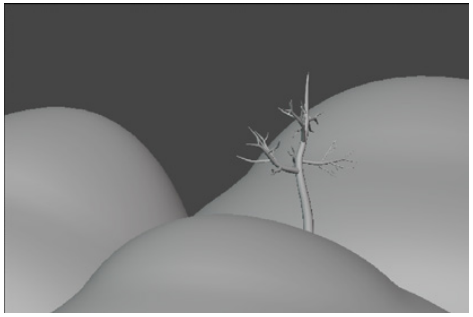
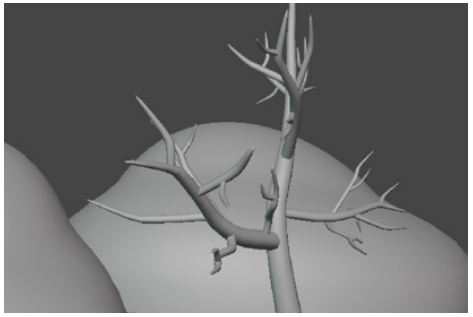
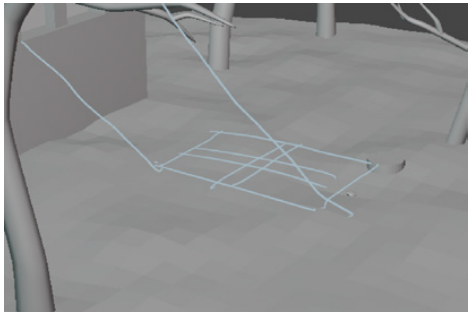
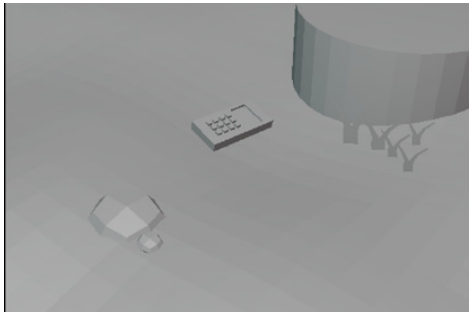
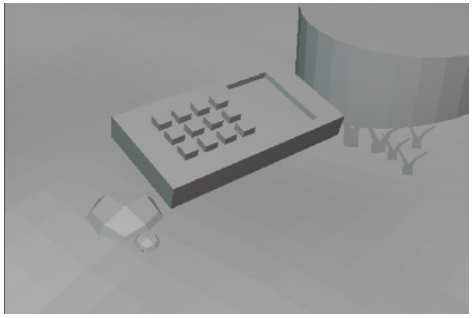
2.2

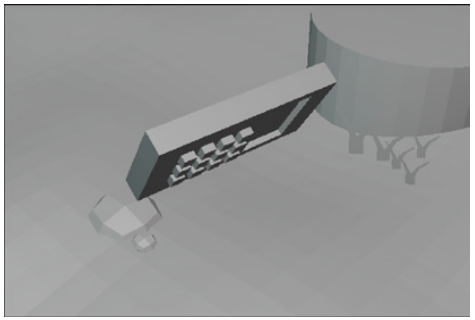


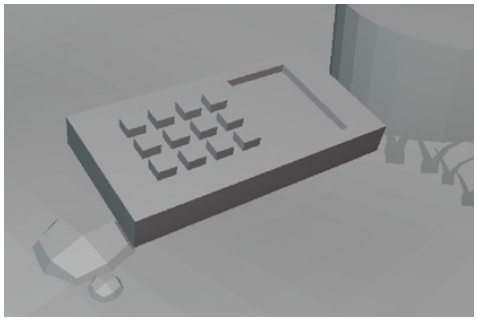


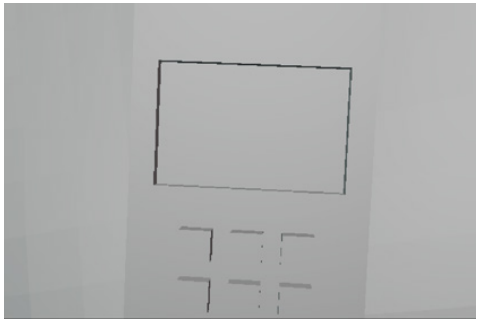


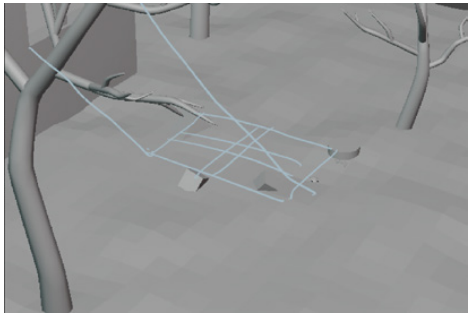












Till Beyer

Made without AI
Monstrous Hybrids by Till Beyer
https://vimeo.com/917645504

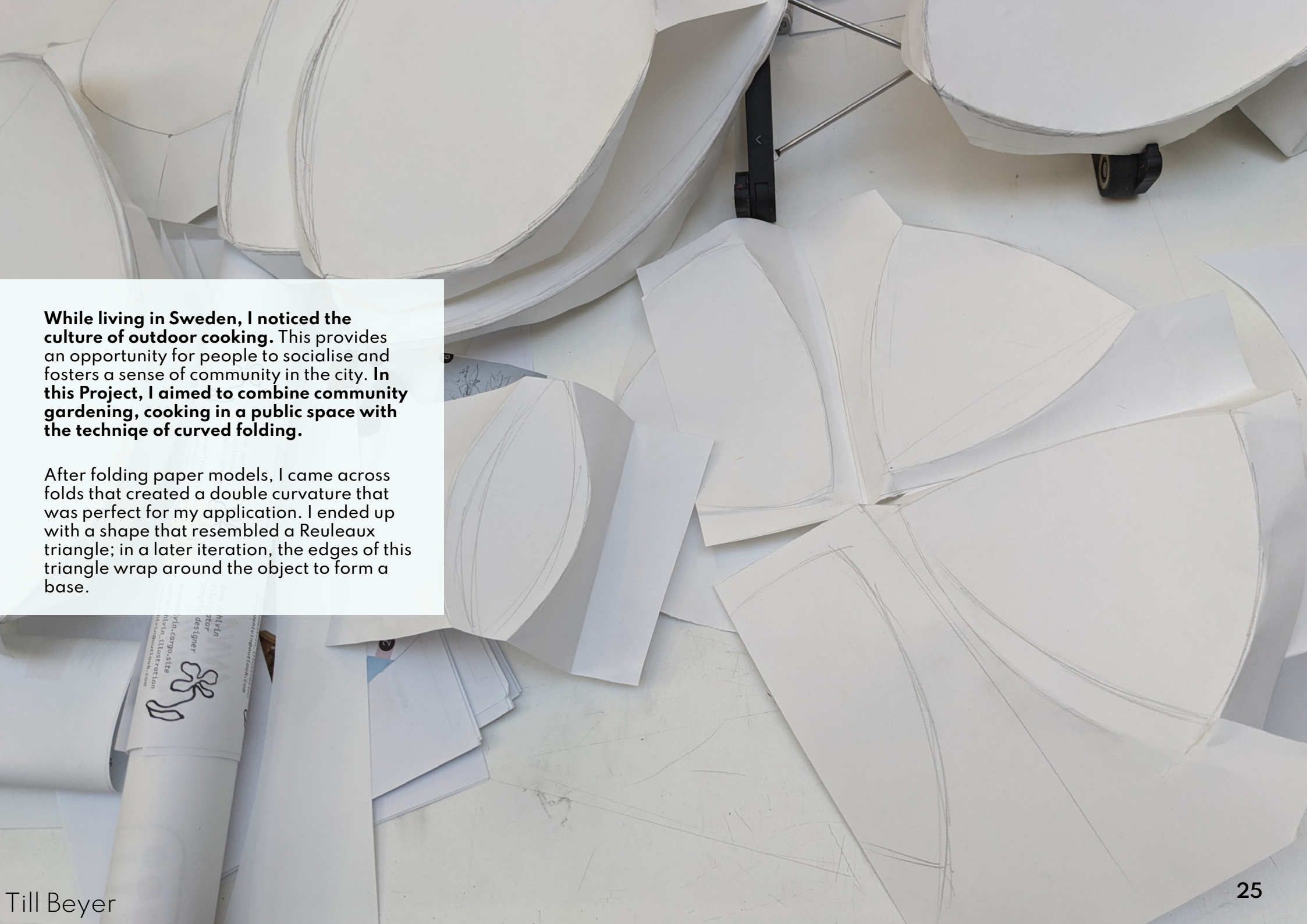
SolarFlowerCooker

This project was a collaboration with Stilfold, a start-up that focuses on the production technique of curved folding.

For this collaboration, I created a solar cooker for public spaces.

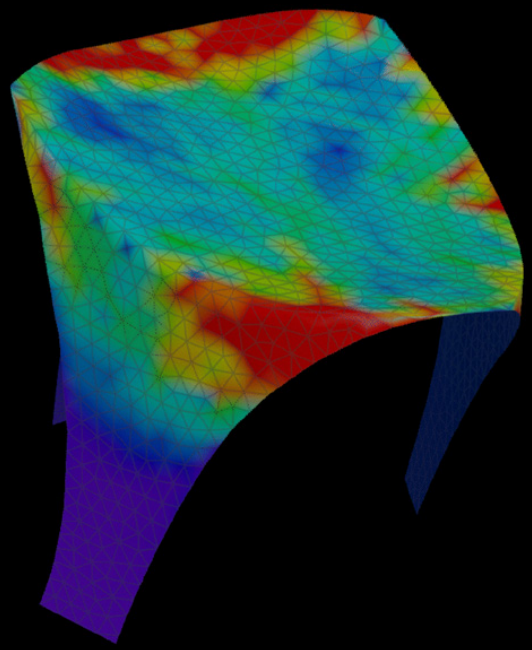
Time frame
2 Month

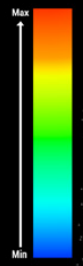
Individual project in collaboration with
STILRIDE / STILFOLD: Gunnar Wikbom

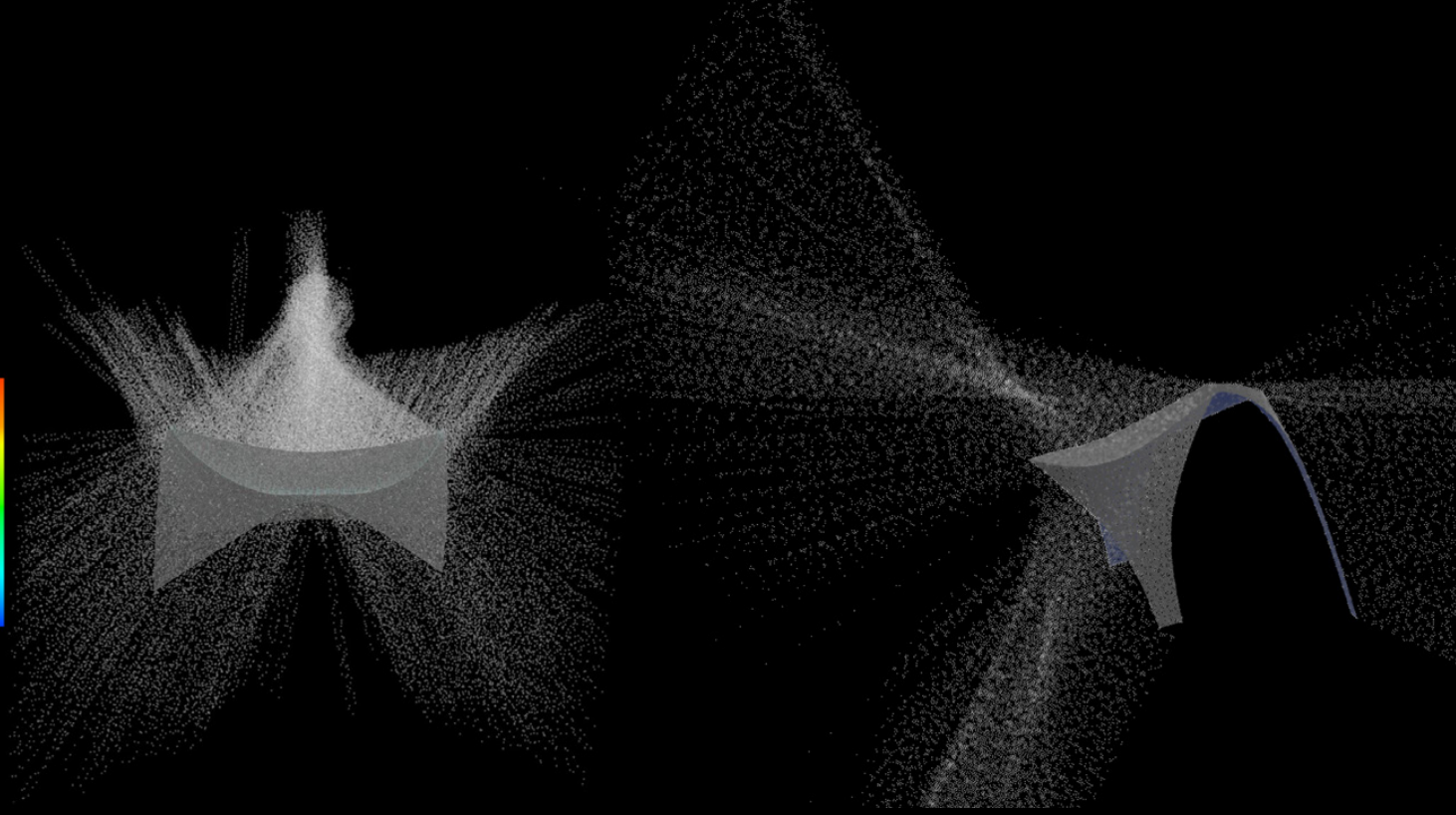


While living in Sweden, I noticed the culture of outdoor cooking. This provides an opportunity for people to socialise and fosters a sense of community in the city. **In this Project, I aimed to combine community gardening, cooking in a public space with the techniqe of curved folding.**

After folding paper models, I came across folds that created a double curvature that was perfect for my application. I ended up with a shape that resembled a Reuleaux triangle; in a later iteration, the edges of this triangle wrap around the object to form a base.



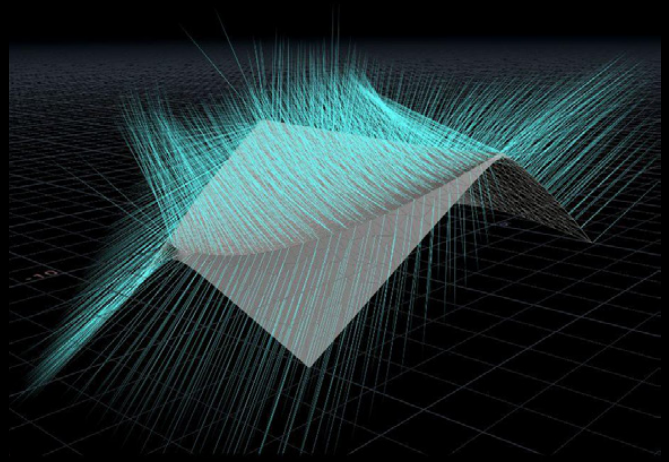




These shapes can be described as the leaves of the solar flower, which are designed to reflect sunlight towards the centre with their parabolic shape. **I used the simulation software Houdini to simulate the curved folding and also the rays of light reflected from the surface of the solar flower cooker.**

With these simulations I was able to iterate and tweak the curves so that most of the light was reflected towards the cooking pod.

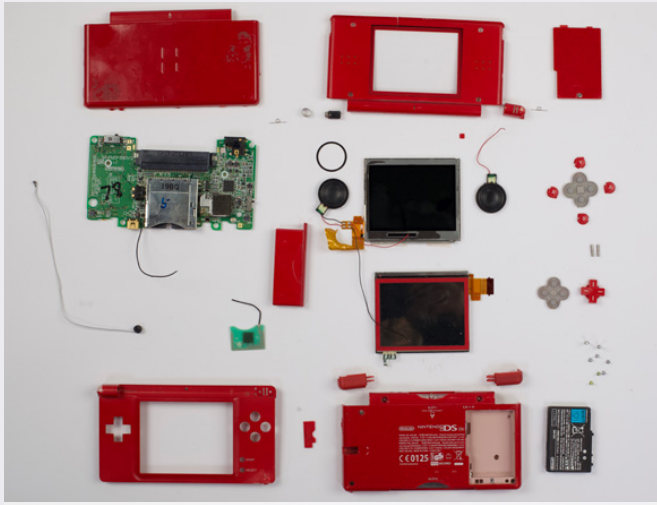
When the weather is not suitable for cooking, The leaves of the solar flower can be flipped and used as seating.

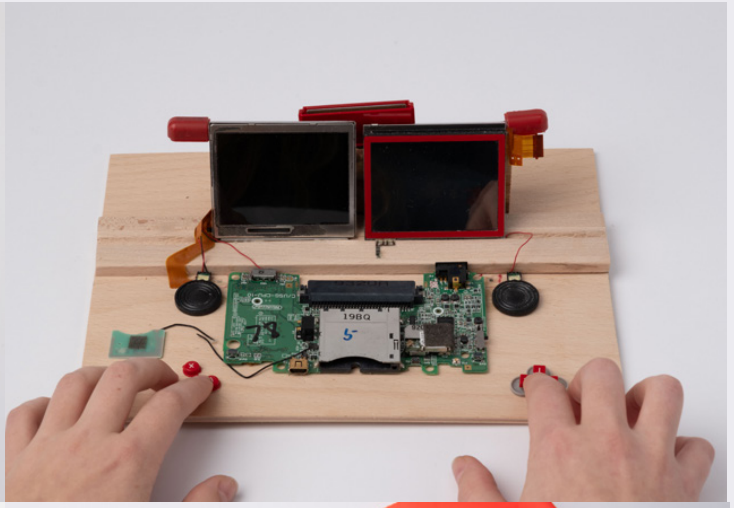


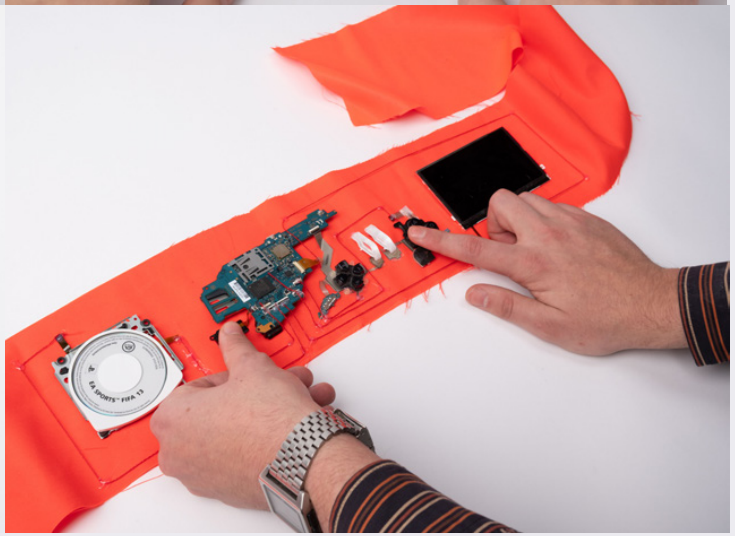
Design for Repair

The Design for Repair project was self-initiated and took four months to complete. The idea was to prototype different objects to make them more repairable. Maximilian Schmit and I organised this project together with a working group and explored this topic. **We disassembled a variety of products and mapped out the different pain points that we encountered during the process. These learnings were then translated into artefacts that were reassembled to solve some of these difficulties.**

Following the previous exercise, we split into groups and developed eight product prototypes focused on reparability.







Time frame

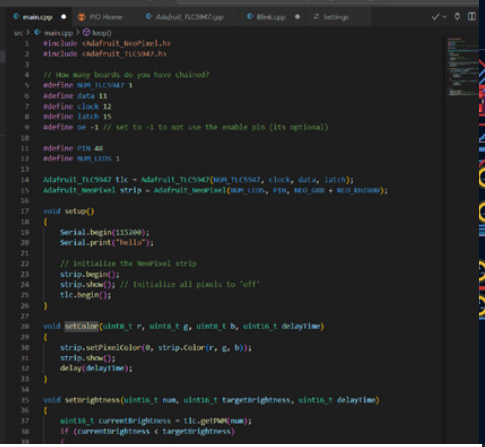
4 Month

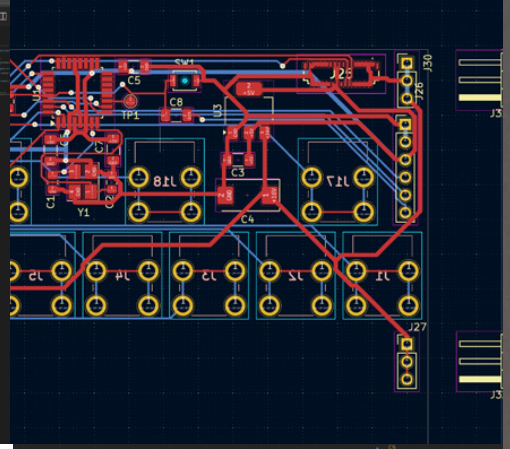
My Role

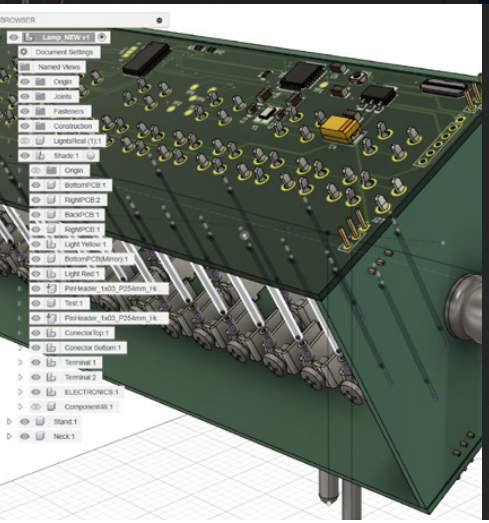
Project management,
Product design

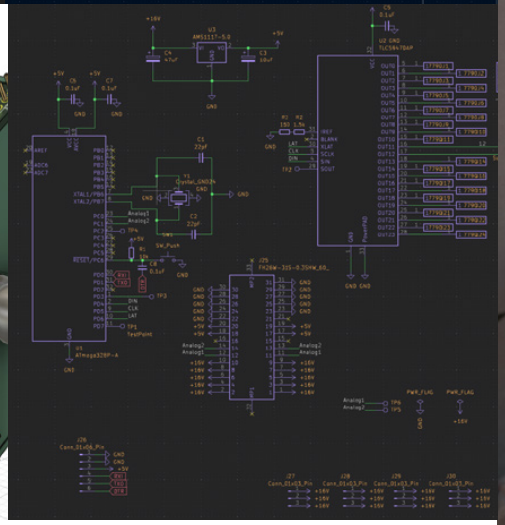
Group project with

Maximilian Schmidt
Till Beyer
Arina Schilling
Chris Hoffmann
Johannes Moritz Horster
Janko Günter Stein
Levon Javaheri Kopai
Riccardo Cossu
Zoe Lou Garba



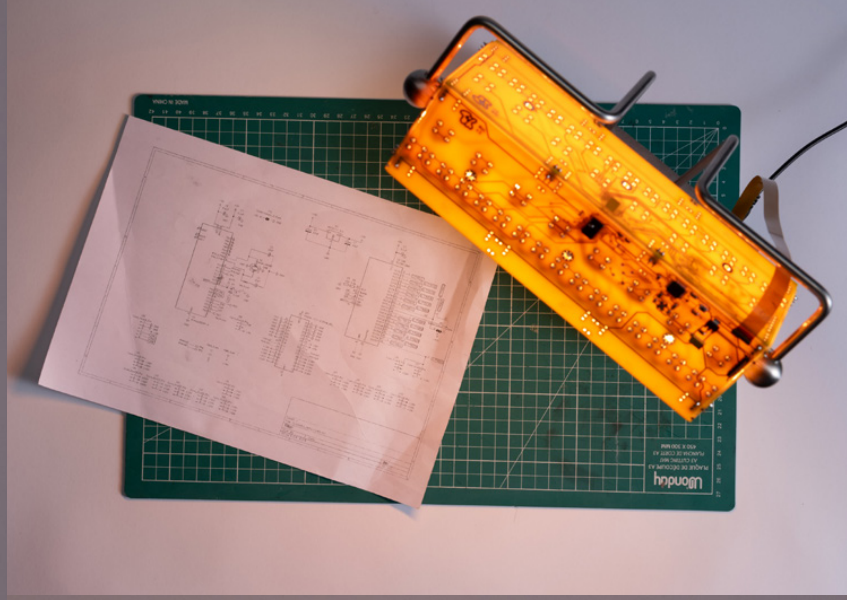






I designed the ModularLight where individual LED filaments could be replaced if they broke. The main goal was to create an open design that embraces the internal components that make the lamp work. The Lampshade thus showcases the lamp's circuitry.

The process of building the prototype involved creating a digital model of the lamp in Fusion, Kaicad and rendering it in Blender. After a few itterations, printed circuit boards (PCBs) were produced and populated, and the metal construction was bent and cut to size.



Till Beyer

Marbility

Marblebility is an educational game designed to make quantum computing accessible to those without a background in the field. It was developed through a semester-long collaboration between KISD, Parsons School of Design and the DLR (German Aerospace Center).

In the game, two players each control levers representing the state of a qubit, aiming to achieve a target probability. Turning the knobs sends marbles on different paths through the machine, demonstrating how qubit probability can be influenced by gates, with each marble counting as a measurement called a ‘shot’.

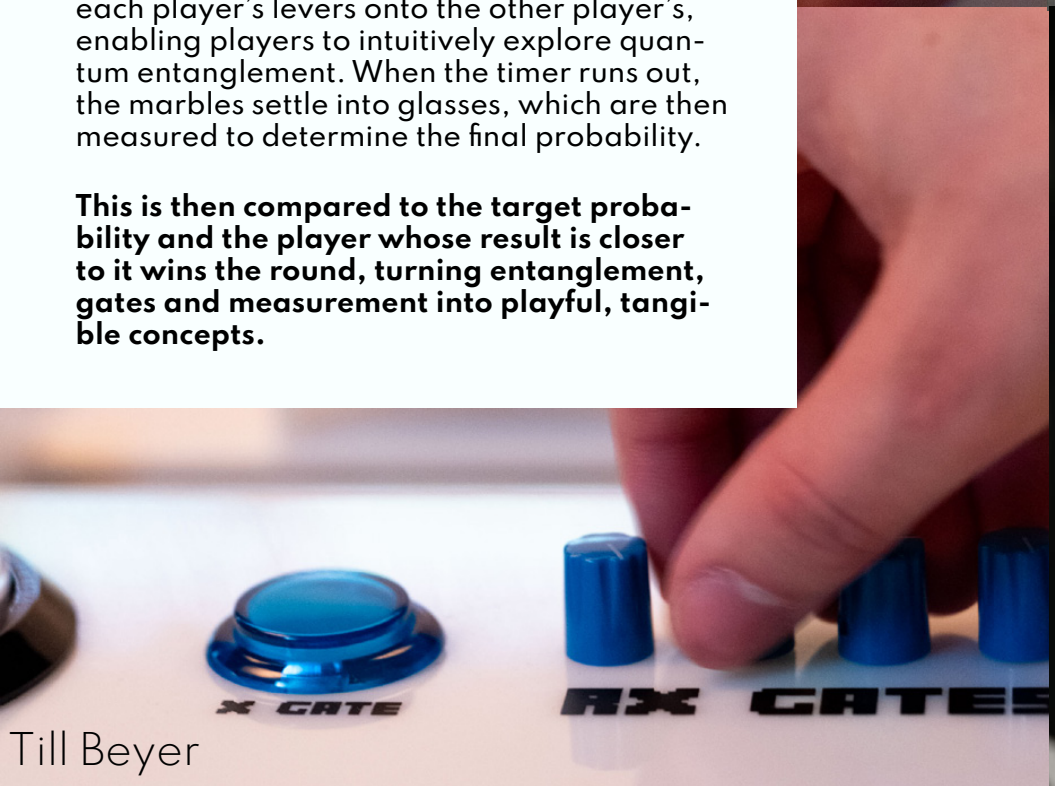
Time frame
6 Month

My Role
Project management, Programming, Circuitry

Group project with
Sofia Fellinger
Seth Lukin
Colby Lamson-Gordon
Ziye An
Rishikaa Modi

Pressing the ‘Entanglement’ button maps each player’s levers onto the other player’s, enabling players to intuitively explore quantum entanglement. When the timer runs out, the marbles settle into glasses, which are then measured to determine the final probability.

This is then compared to the target probability and the player whose result is closer to it wins the round, turning entanglement, gates and measurement into playful, tangible concepts.



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Thank you

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