MOVUS

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Physical Computing
Interaction Design
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Mentored by
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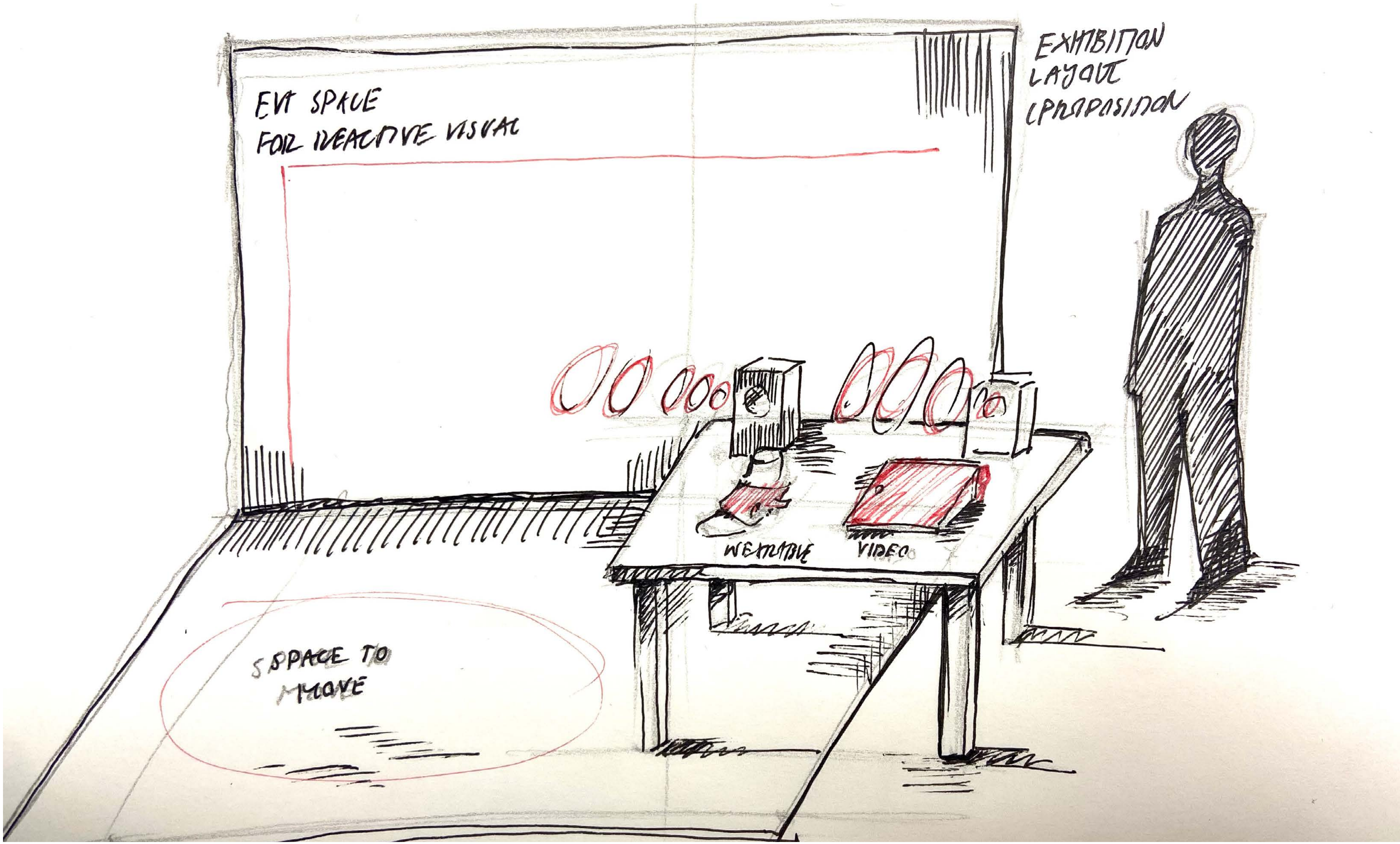
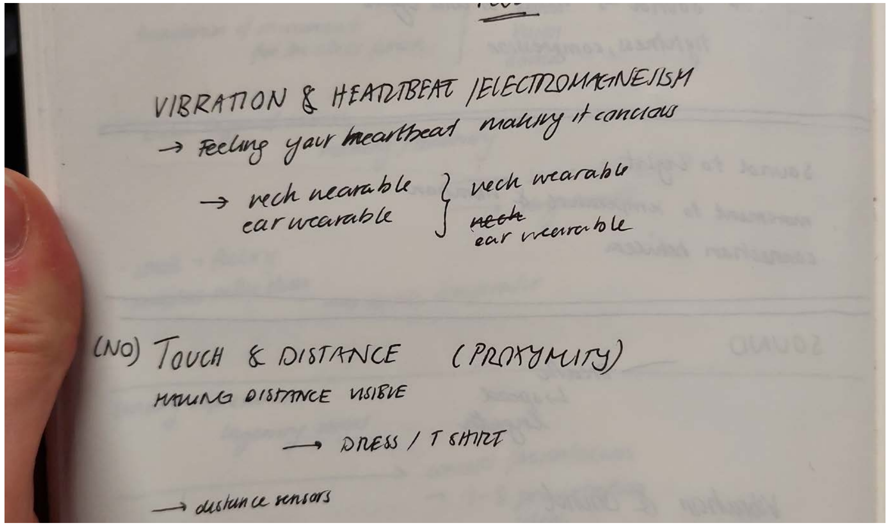
CONTENT

01 OUTCOME

Movus is an interactive wearable that allows people to explore their own movement in space in an unusual way. The product consists of a wearable made out of reused neopren and two small devices that need to be attached to different feet. Each movement produces a different sound, creating a unique sense of motion. By wearing the wearable on the feet rather than the hands, Movus highlights a part of the body that is often forgotten when it comes to interaction or creation. It also gives the people a new sense of balance, as normally one foot has to stay still while the other moves to avoid falling.


EXHIBITION
LAYOUT
(PROPOSITION)
SPACE
FOR REACTIVE VISUAL
WEARABLE
VIDEO
SPACE TO
MOVE

02 PROCESS



Layering Senses

Movement and Vibration | Movement triggers vibration

Connection btw people

Heartbeat and Movement | movement makes heartbeat visible

connection between people | seperating the wearable from the wearer

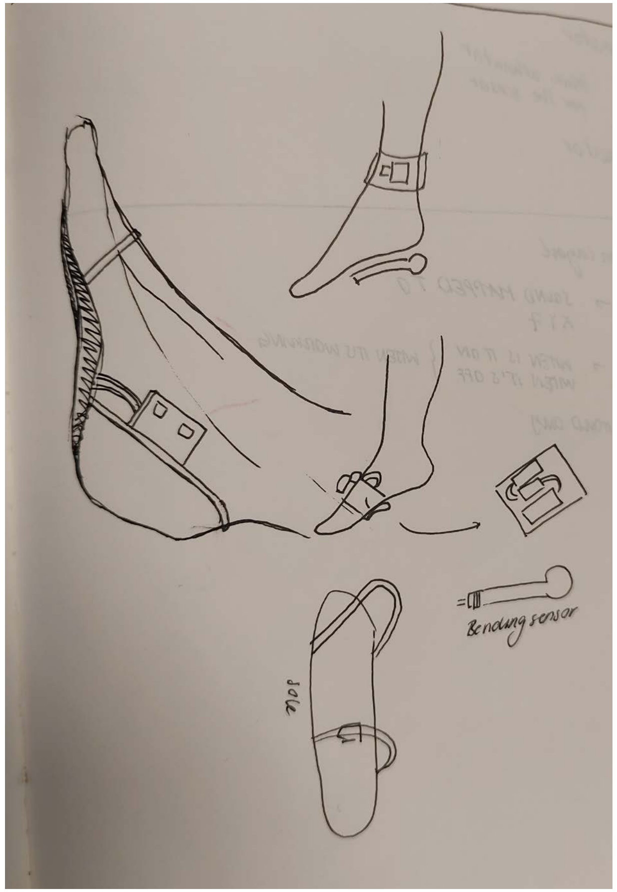
Connection btw people

Touch and Sound | Enhancing the expirience of sound through tough

Substituting Senses

Sound to Light | Taking sound. Giving Light

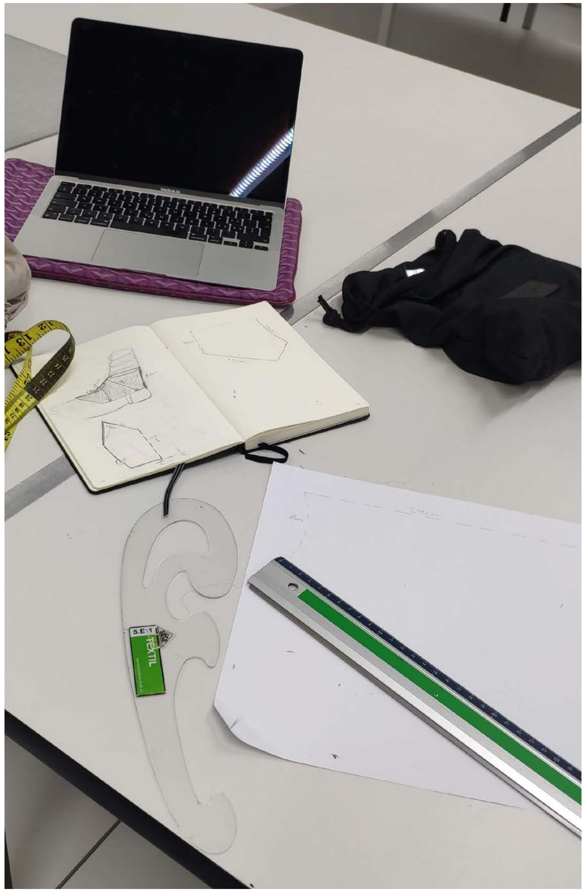
We did some clustering and played around by adding senses together and removing some. The idea we liked the most was taking the movement of hands or feet and converting this into an audio output. Luckily, the feedback on the concept presentation was also in favor of the movement-to-sound-transfer, so we decided to go with that.



We started by testing the sensors with a long cable by simply attaching the electronics to our socks. We built a quick prototype by taking a sole from a shoe. The idea was that we could build a silicone sole that could be attached to people's shoes. The problems we encountered were that it would have been difficult to incorporate electronics into the sole, as it could have broken from the weight of people standing on it. It was also difficult to make the sole suitable for all shoe sizes. So we started developing a wearable that could be worn on top of the foot.

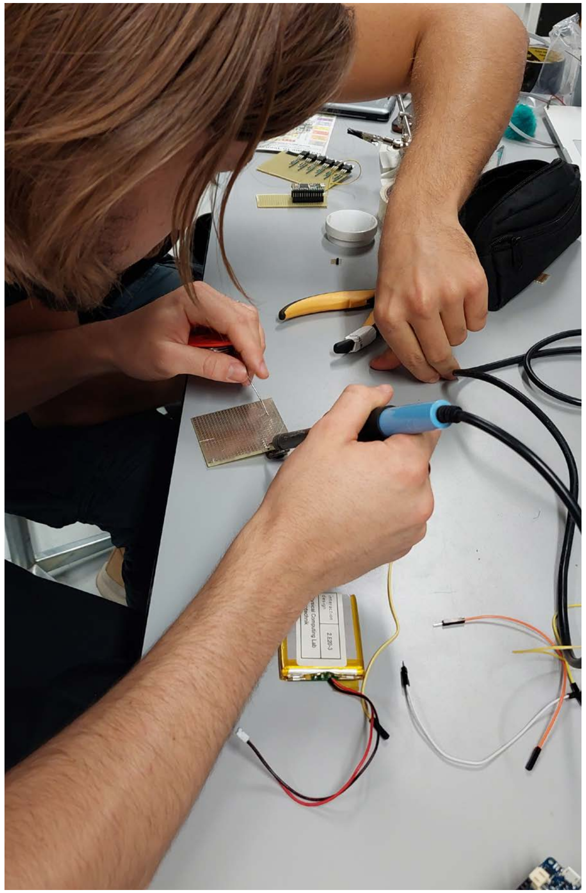
We made a few prototypes with leftover fabrics from an elastane-polyester blend. After testing them, we realized that we wanted something thick, durable and dimensionally stable. For our purpose, we thought neoprene would be best. We didn't want to buy new fabric and were looking for a way to reuse old fabric. At the end of the day, we were lucky enough to get two suits from a diving store in Winterthur called SCUBA VIVA. The store wanted to get rid of the suits, so they were happy that we could reuse them.

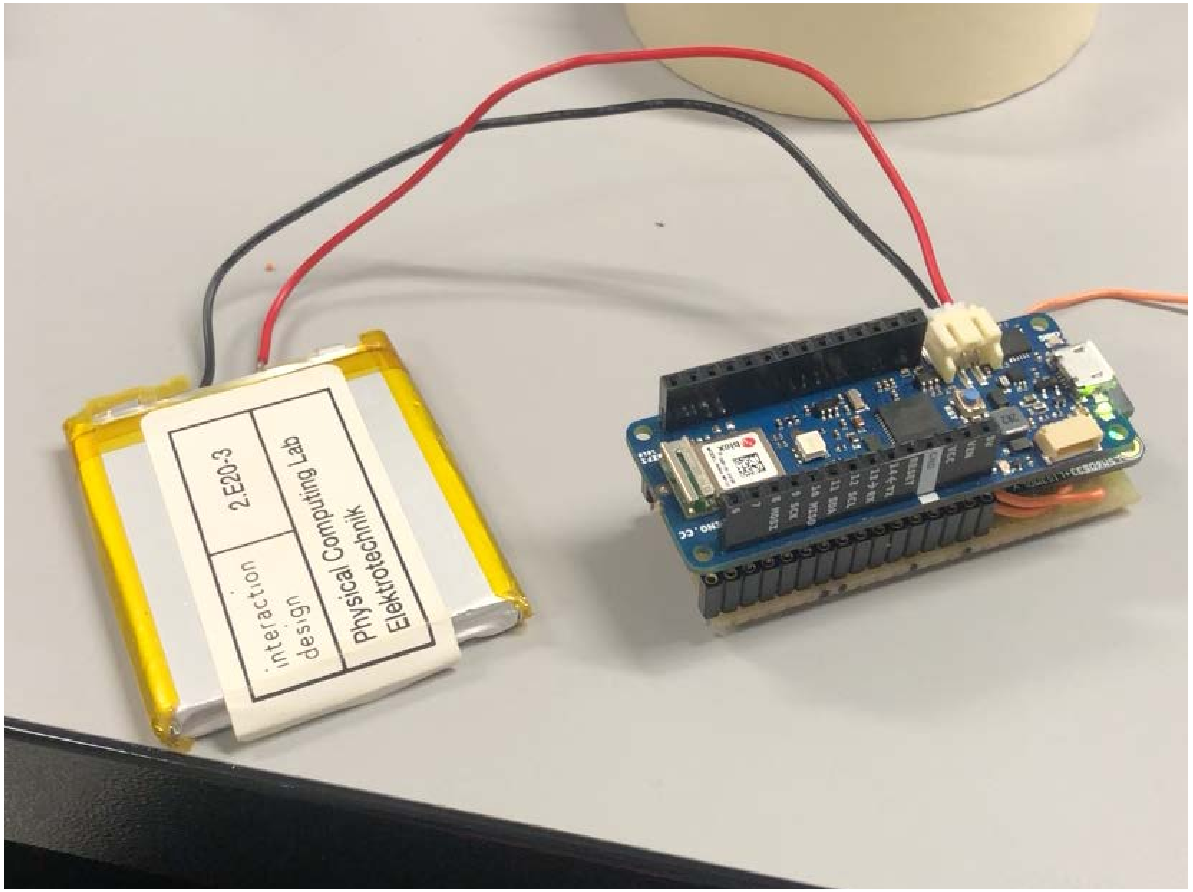
Sonja was responsible for designing the patterns and sewing the footwear. Once we decided to turn the idea of the sole into a wearable that would be worn over the foot, we started idealizing and trying out the best solution. We wanted to make something that could be worn over any shoe, regardless of its shape or size. Testing different shapes, we finally arrived at a solution that could be closed and adjusted with an elastic band and a Velcro strap. We drew the patterns and made some prototypes. After we received our final fabrics, we made a few more variations and added a pocket for the electronics to the design.

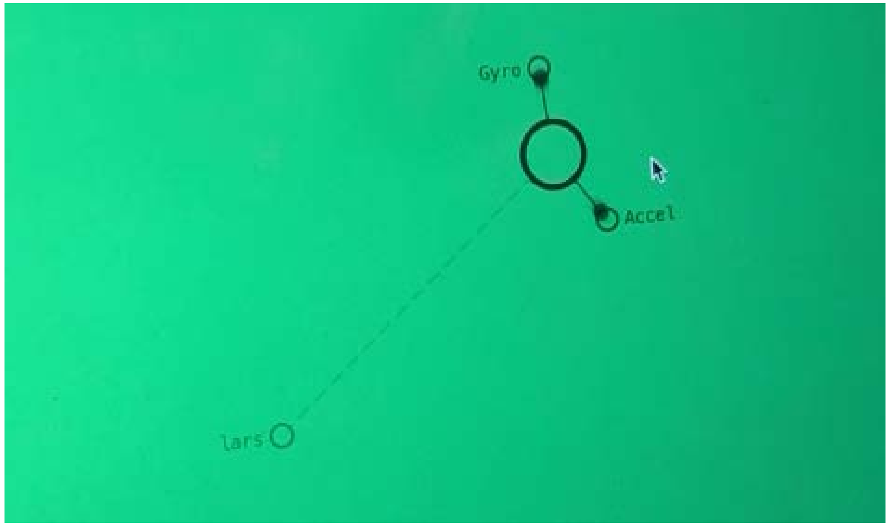


Since our hardware part had to be attached to the feet, our goal was to keep it as small as possible. We also expected people to run or even jump with our product, so stability was also an important factor. We worked with the Adafruit LSM6DS33 sensor to measure the movement of the feet, and later decided that it would be helpful to attach a small LED as well. It didn't make sense for us to work with the larger, standard Wi-Fi Arduino, as we wanted something smaller.

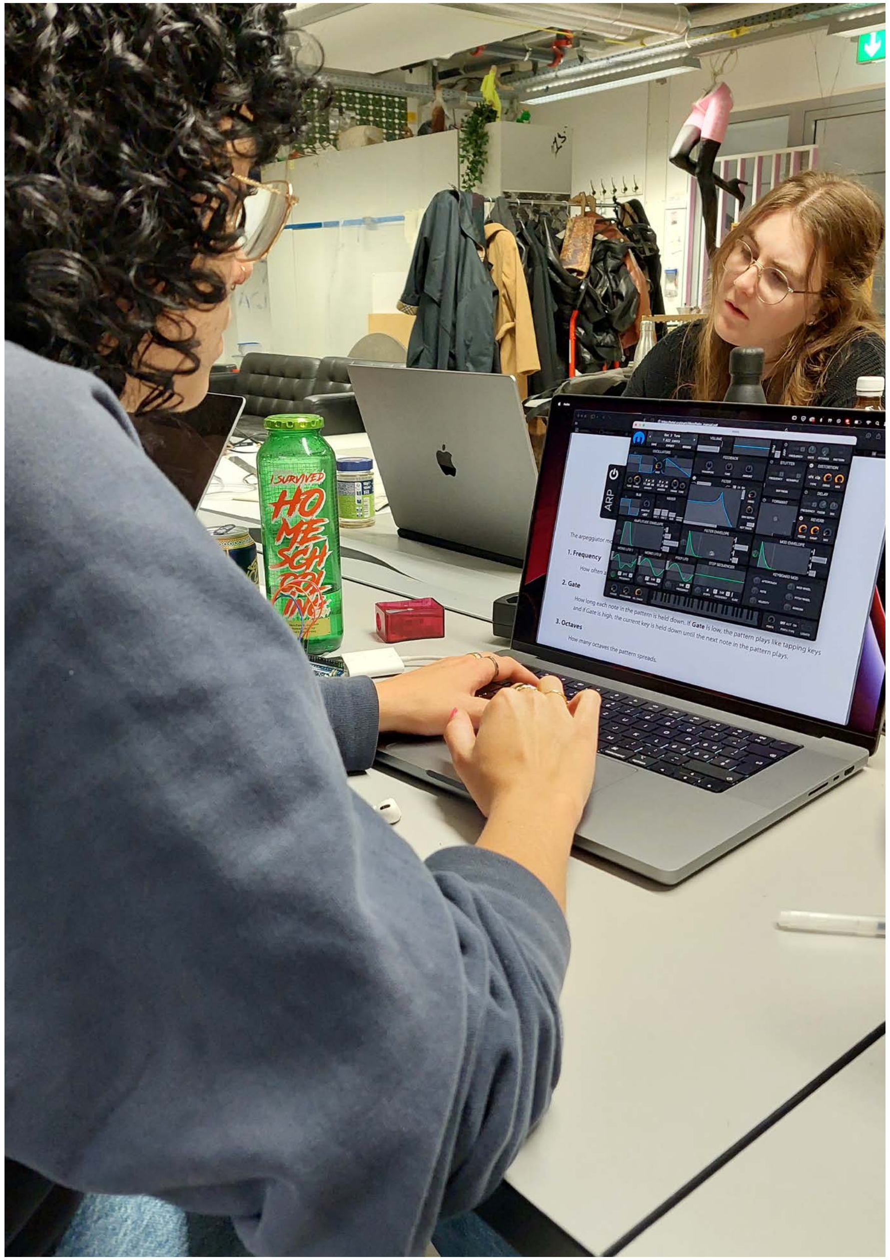
Unfortunately, this took a long time as we tried three different types of microcontrollers, none of which really worked, even with the great help of Luke and Paulina. In the end, we went with the Arduino MKR 1010 Wi-Fi, which worked fine. But it was really frustrating because Lars ended up "wasting" two days of work trying to get the other microcontrollers to work.
We soldered the Arduino to a stripboard, with the sensor underneath, so that the space was used most efficiently.







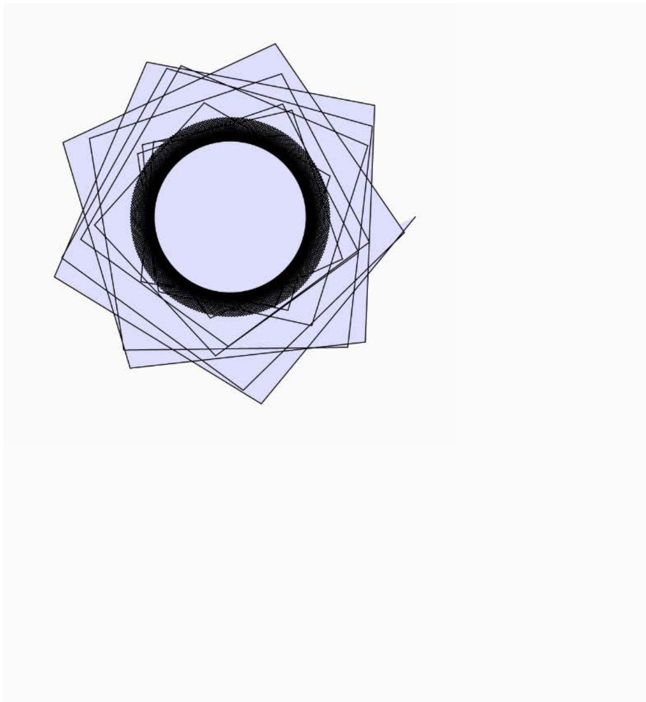
In order for people to have an experience with our product, it was necessary that they were not wired to a computer or something similar, because we thought that they would not be able to move freely. Therefore, it was obvious for us to work with a wireless technology for data transfer, and we chose Wi-Fi because many Arduinos already have this integrated and we already had an introduction to shiftr.io with Paulina. The idea was that the Arduinos on the feet would send the data to shiftr.io, which would then forward it to P5.js, where the sound would be generated. It wasn't very difficult to set up with shiftr.io, but we had some concerns with it as it wasn't as stable as we had hoped: The server would often go down for a few minutes and then come back. Luke suggested we work with Open Sound Control (OSC), a protocol that was actually meant for transmitting sound data. We didn't really manage to set it up, even with a lot of help from Paulina. We also realized that OSC was only possible if we used Processing, but we had already worked on the P5.js code and didn't want to do it all over again. So we decided to continue with shiftr.io. Apart from a small outtake during the presentation, it worked quite well.

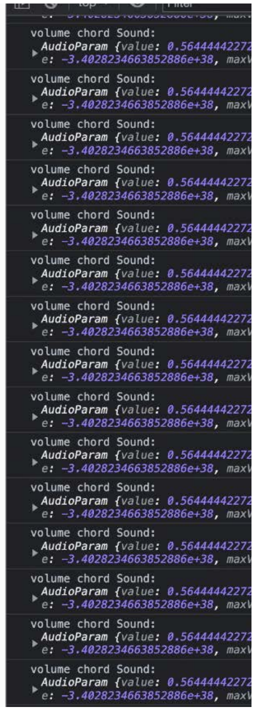


The Sound is constructed of a frequency that gets manipulated by the incoming data from the sensors. By getting the data through the shiftr.io the frequency changes its amplification.

In P5, by using the sound library, the frequency gets displayed and by using fitting variables, the data gets put into the frequency function. There were several challenges with the incoming data. For once, that the incoming data came as strings and had to be transformed into variables. Then the sound had to be mapped properly to the sound. Also was there a balance to be found, between the amount of incoming data. that was achieved by selecting the correct rate.

The sound is mapped to the z value, because in that data was the most variation. So when moving the foot up and down, the frequency changes the most.





We unfortunately had some technical hardware difficulties that even Luke and Paulina couldn't solve, which cost us a lot of time. Therefore, we unfortunately couldn't realize the second prototype during the time of the module and would have liked to invest more time in experimenting with the sound - which then had to be done after the module.
On the positive side, we really had great teamwork, as we were able to divide up the tasks well. Sonja was responsible for the material and sewing, Audrey took care of the sound coding and Lars did the hardware and soldering. Without this, it would not have been possible to get a result in such a short time.

We were also very pleased with how professional and robust the product looked in the end. It was great to see people interacting with it during the final presentation and even making jumps without damaging any material or technology. We think we did a good job with the material and hardware design.
Overall, we were very happy with the result and look forward to hopefully seeing it in the "bits and bolts" exhibition soon!