Minjoo Cho

Creative Technologist

I'm a creative technologist specialized in the IoT proof-of-concept prototyping and interactive installation conceptualisation and development. My technical focus is in the seamless integration of physical experience into digital with web-based technical approaches.

I came from hardware engineering and industrial design background, but enjoy view products and services in a systemic scale.

Smart Trolley

Can we track food inventory without RFID tags?

AR for Food Innovation

How to estimate weight of the ingredient without any external sensors?

Digital Steam

Can we make the digital steamer more smarter and connected?

Brain Piano

Can we ever be able to listen to what our brain sings?

How will AI change you

Can we visualise our feeling towards the future with Artificial Intelligence ?

Selfie-metre

How can we make people more aware of their environmental impact?

Currently I can only share the installation projects disclosed to the public, but I can explain more exciting client project in person.

About Me

PROFESSIONAL EXPERIENCE

Creative Technologist, Indeed Innovation
Hamburg, Germany
May, 2017 - Present

Fast HW/SW Prototyping and POC implementation
- Liaison of developers and designer throughout the conceptual stage of the project and help implementing proof-of-concept prototype to validate the generated ideas.

Installation development / demonstration
- Full implementation of interactive installation from concept development to delivery
- Concept development, full technical implementation (SW, HW, System integration), demonstration guideline
- On-site/Remote demonstration support

Creative Strategist, Samsung Creative Lab
Suwon, South Korea
Jun 2013 — Oct 2014

Samsung Creative Lab is a Samsung's incubation program for Samsung employees to incubate creative ideas into real project. My role in the team included:

- Proposed the winning idea to gain entry in C-Lab
- Product Strategy and development: product features definition, fast-prototyping (Android SW), in charging of user research with the hearing-impaired community
- Regular progress report to the C-level representatives

Product Manager, Samsung Electronics HQ
Suwon, South Korea
Jan 2011 — Dec 2014

- Responsible for Samsung Galaxy Tablet Series, and Google Nexus 10
- Solving procedural issues during the entire product life cycle development stage to the end of the production
- Regular VP/C-level issue reports on the project status
- Responsible for the communication with the cross functional departments.
- Building a product strategy for the sustainable sales growth, defining USPs for the market communication

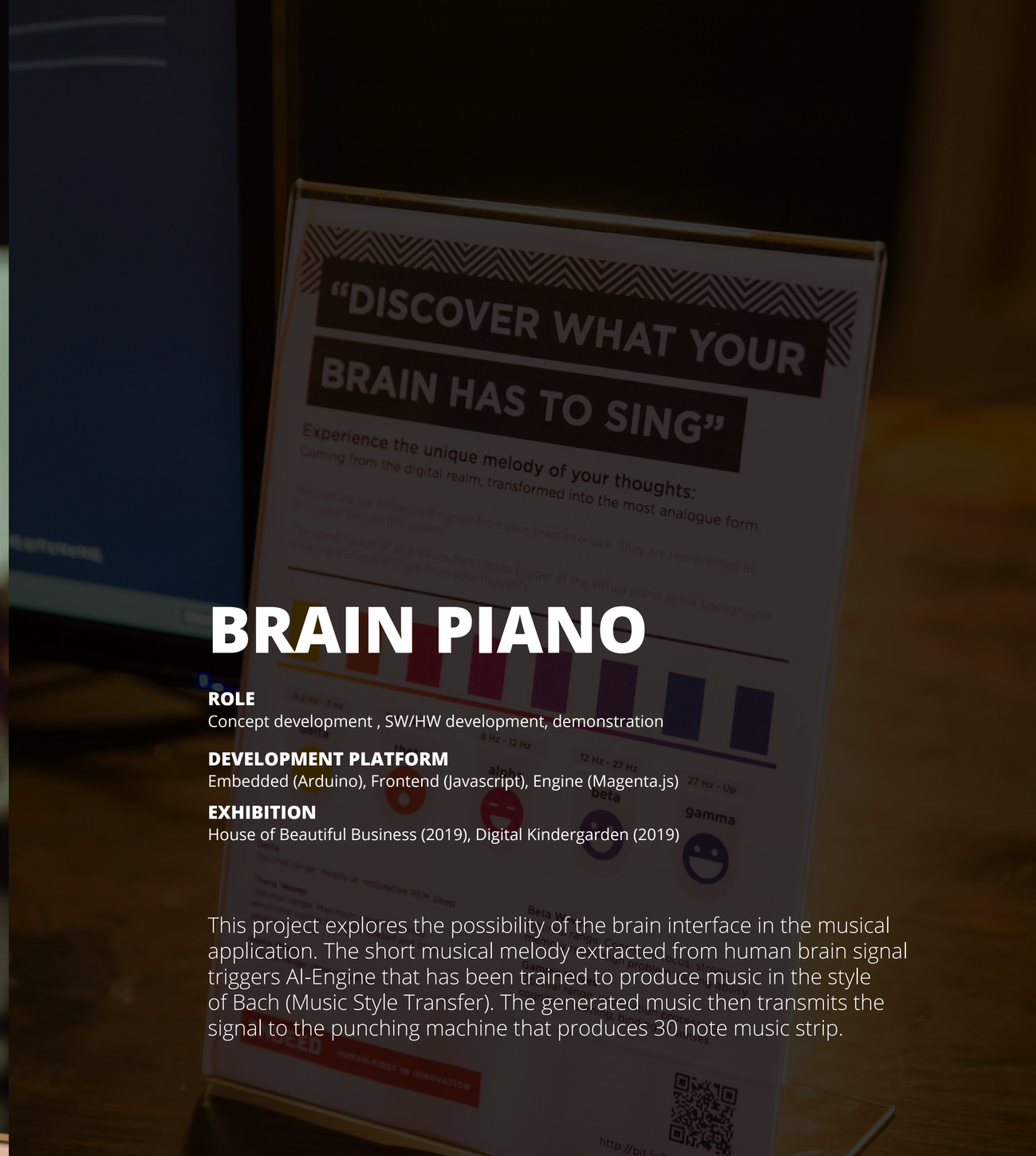
EDUCATION

M.S in Industrial Design, KAIST
Daejeon, South Korea
Mar 2015 — Feb 2017

- Mater's thesis: Calm Automaton, A DIY Toolkit for Ambient Displays
- A previous research member of myDesignLAB (Prof. Daniel Saakes)
- Full year scholarship : National Science and Technology Scholarship

B.S in Electrical Engineering, KAIST
Daejeon, South Korea
Mar 2006 — Feb 2011

- Major in Electrical Engineering and minor in Business Economics
- Full year scholarship: National Science and Technology Scholarship



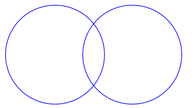
BRAIN PIANO

ROLE
Concept development , SW/HW development, demonstration

DEVELOPMENT PLATFORM
Embedded (Arduino), Frontend (Javascript), Engine (Magenta.js)

EXHIBITION
House of Beautiful Business (2019), Digital Kindergarden (2019)

This project explores the possibility of the brain interface in the musical application. The short musical melody extracted from human brain signal triggers AI-Engine that has been trained to produce music in the style of Bach (Music Style Transfer). The generated music then transmits the signal to the punching machine that produces 30 note music strip.



Digital **Physical**

MIDI music	Music Box
Artificial Intelligence	Brain Signal Processing

Concept

The Brain Piano project showcases the interplay of Artificial Intelligence with this human brain while resonating in between its physicality.
The brain signal, one of the representative analog signal from human body, is transformed into a digital music piece that is later printed in the 30 note music strip punched from a machine inspired by antique typewriting machine.

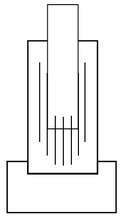
Interaction Flow

We have built an experience that harnesses the power of thought, using algorithms to create music from the streams of thought, making it tangible and audible.

Step 1.

Read Brain Signal

As you concentrate, we measure the electrical activity of your cerebral cortex. Each electro-chemical discharge, each signal of your nerve cells produces an individual vibration profile of beta, alpha, theta and delta.



Step 2.

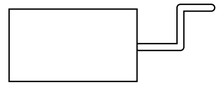
Music Generation

Based on your vibrational profile, our creative code creates a unique piece of music: Inspired by Bach's works - but unique as you are - your melody immediately becomes part of our digital music library.

Step 3.

Punch Music Nodes

The puncher makes your music audible and tangible outside of the digital. Thanks to the 3D printer, ingenuity and engineering, the puncher is virtually a polaroid of your mental vibration profile.



Step 4.

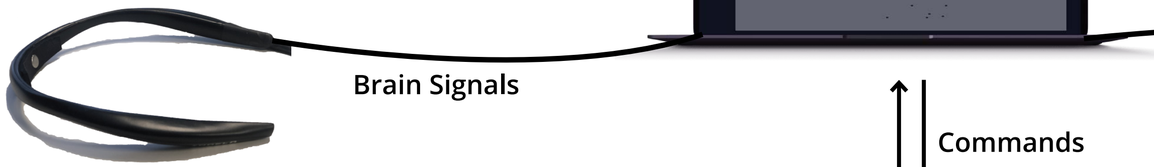
Self Cranking

As individual as each of your thoughts is your melody. Digital as well as analog. Listen to the songs of the other thinkers or play your own tune anytime from here.

System Architecture

Client (html/css/javascript)

1. Read brain signals and visualize on the screen
2. Translate signals into melody line
3. Transcribe melody into midi notes (Magenta.js)
4. Execute punch codes to the machine



Brain Signals

Commands

Punch Stream

Server (Python - Flask)

1. Generate melody (Polyphony RNN)
2. Translate the resulting melody into punch code
3. Save to text file and save into the database

Punching Machine

Punching Module

30 servo motors to open and close the punching holes

The big motor applies high torque to punch 7-8 holes at the same time

Playing Module

The puching music sheet flows throw the embedded music box.

Generated music is played through the acoustic speaker facing the front

Music Interface

The purpose of the visual interface lies in two folds. First, to elevate engagement of users wearing brain interface by showing the real-time visual effects linked with the brain signals, and secondly to convert the signals into the music melody lines and transcribe into midi note format that is readable to AI-Engine.

The melody is transcribed for 5-6 seconds and later send to the AI-backend engine to generate a polyphonic melody with transcribed melody as an input.

Note Transcription

The played midi notes are transcribed in real-time with “OnsetAndFrame” model from Magenta.js

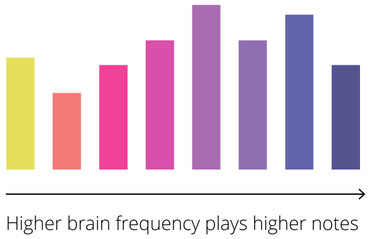
Visual Effects

When the intensity of each brain signal exceeds threshold value, it generates popping visual effects and remains traces on the screen

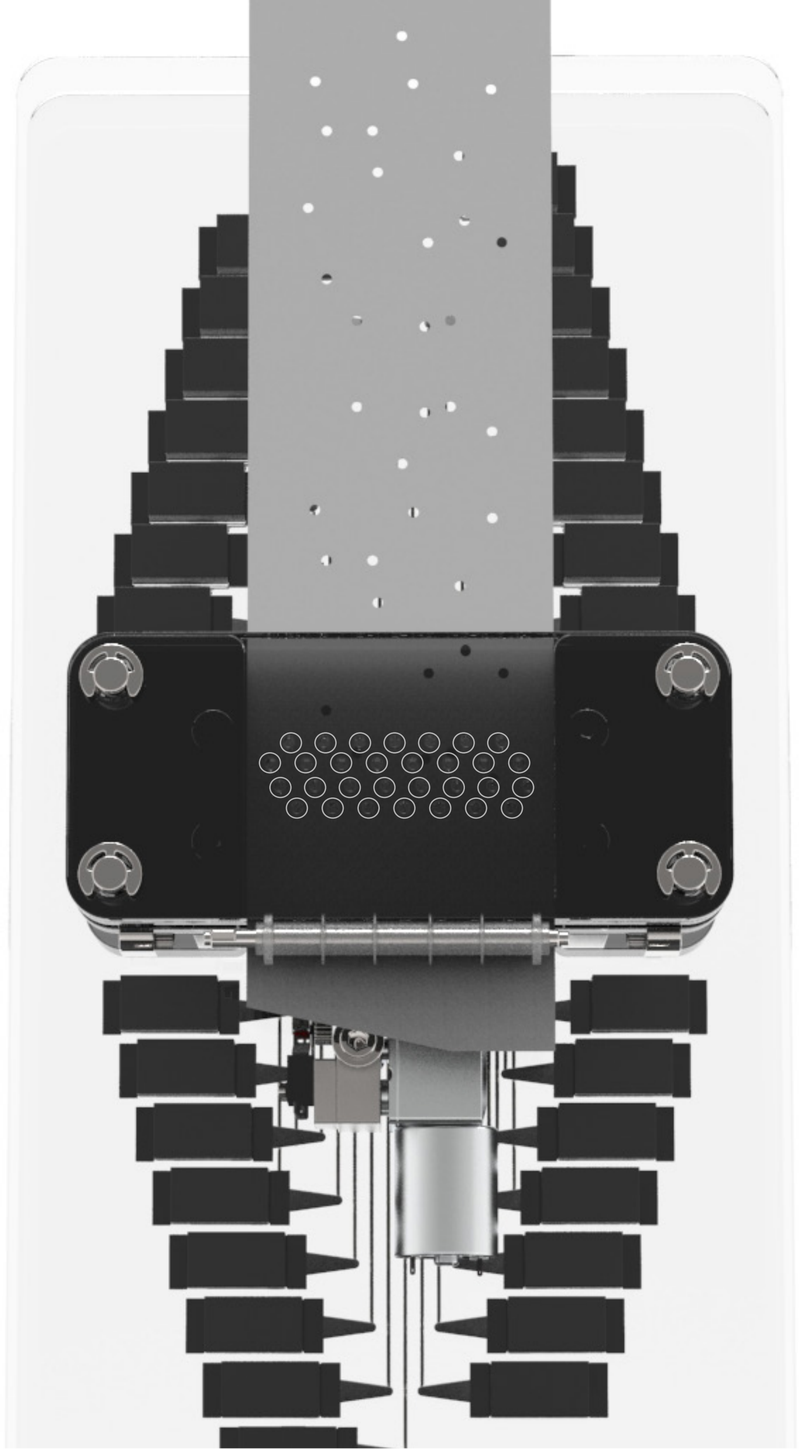
Brain Signals

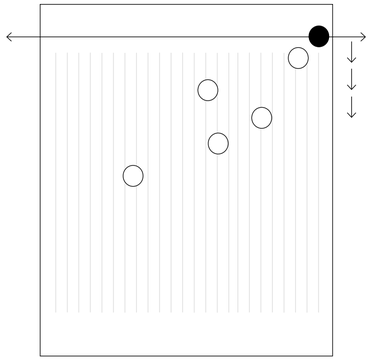
This part visualizes 8 raw brain signals received from the brain Interface.

The 8 bars indicate the intensity of each signal and it hits hidden midi plano hidden in the background



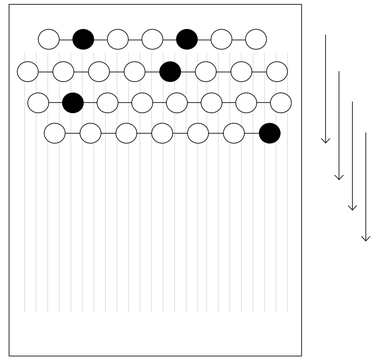
Higher brain frequency plays higher notes





Single Punching

- To punch one hole, the machine need to go through 30 notes.
- Too much time consuming job to punch polyphonic notes



Accumulative Punching

- Holes are arranged in 4 batches of holes, and one batch can cover 7 to 8 holes
- Dramaticaly reduces punching time in the price of hight power

Punching Machine

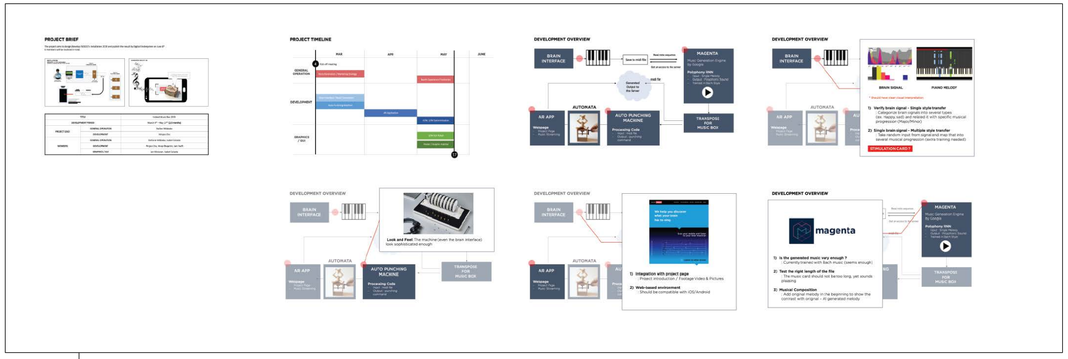
Starting from the open-source punching machine tutorial, we explored ways to bring up the punching performance and to deliver an analog look to the machine. To deliver a successful user experience, the punching speed had to be dramatically increased. Given the polyphonic music stream as an output, we had to redesign the punching modules that allow multiple hole punching at the same time.

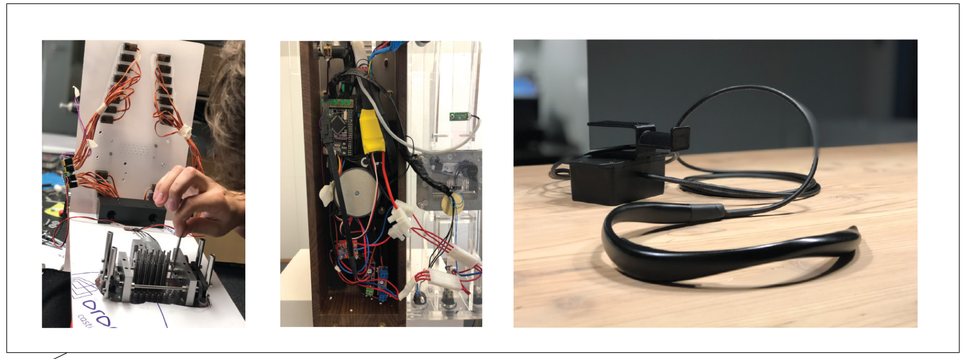
As a result, 30 notes were arranged in 4 lines (7-8-8-7) and designed to punch multiple holes for each line as the punching progresses. 30 servo motors that open/close the hole were individually controlled with the streamed machine commands from the web server.

Product Development Process

It took 2 months in total for 2.5 people working full-time to develop the whole experience after the project was set up after pitching 2-3 ideas for the installation. The important criteria for the experience were as following: Deliver a clear branding message of the agency as product-based service agency and Engage users by personal experience and provide a meaningful giveaway.

Closing to the system integration, we collaborated with the marketing team to produce a give-away package for the music sheet and digital landing page





Project Kickoff

Software Development

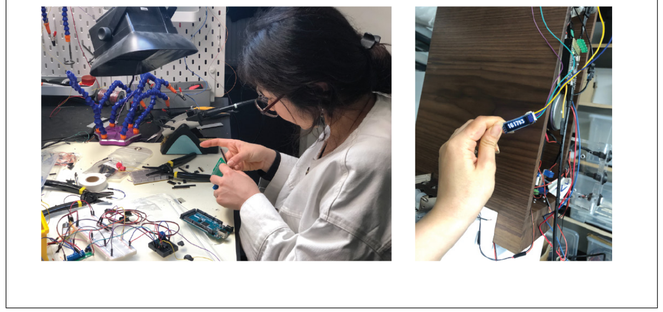
Mechanical Development

Circuit Design Implementation

System Integration

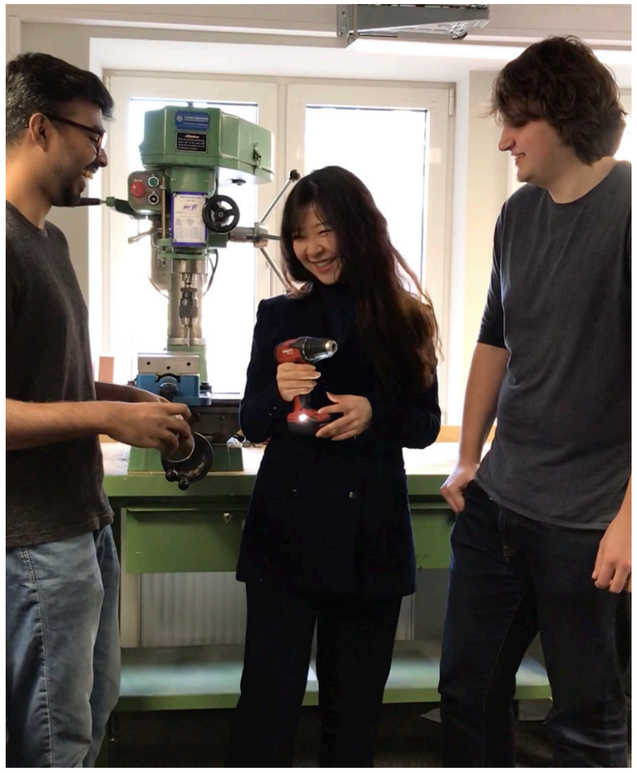
Marketing Campaign

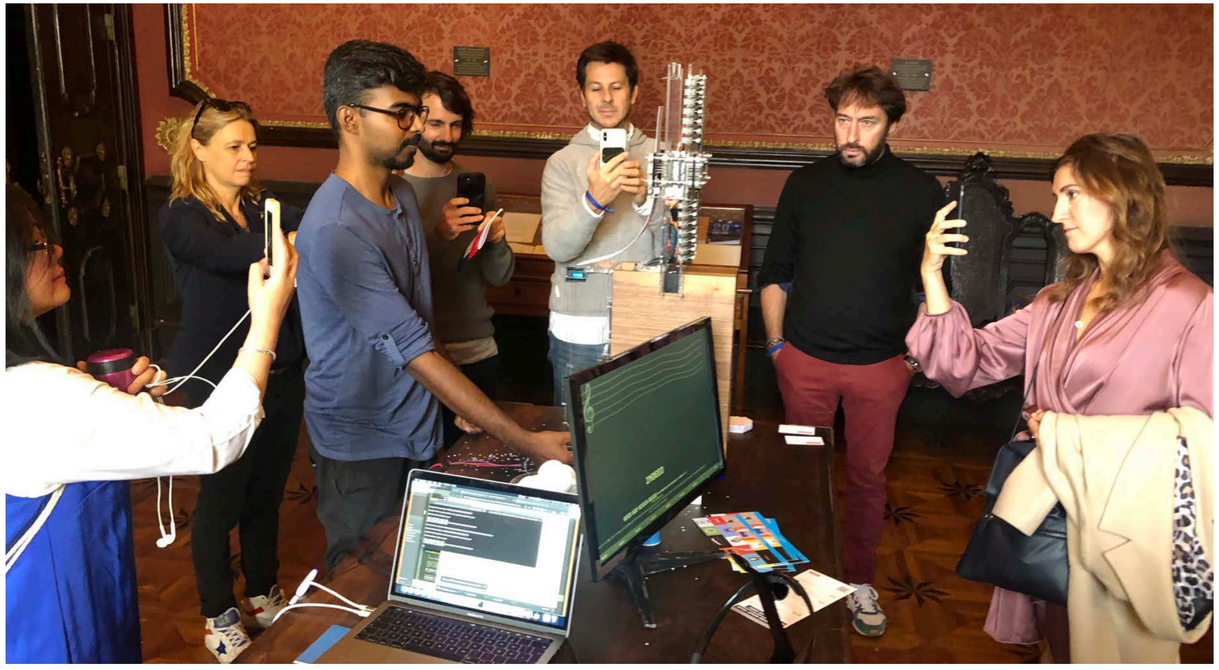
Demonstration



Demonstration in Public

The first version of the Brain Piano was demonstrated at Digital Kindergarten (Hamburg, 2019) and was operated for 3 hours by covering around 30-40 participants. After several iterations of revise and demonstration in several other events, it has been successfully demonstrated at the House of Beautiful Business covering over 150 participants running during 3 days conference.





To find more stories ...

To find more information on the project, there are several posts published featuring behind the scene stories.

Personal blog | Indeed Journal

HOW WILL AI CHANGE YOU

ROLE
Concept development , SW/HW development, demonstration

DEVELOPMENT PLATFORM
Processing (HeMesh.lib), Google Cloud Platform (NLP, Sentiment Analysis)

EXHIBITION
House of Beautiful Business (2017)

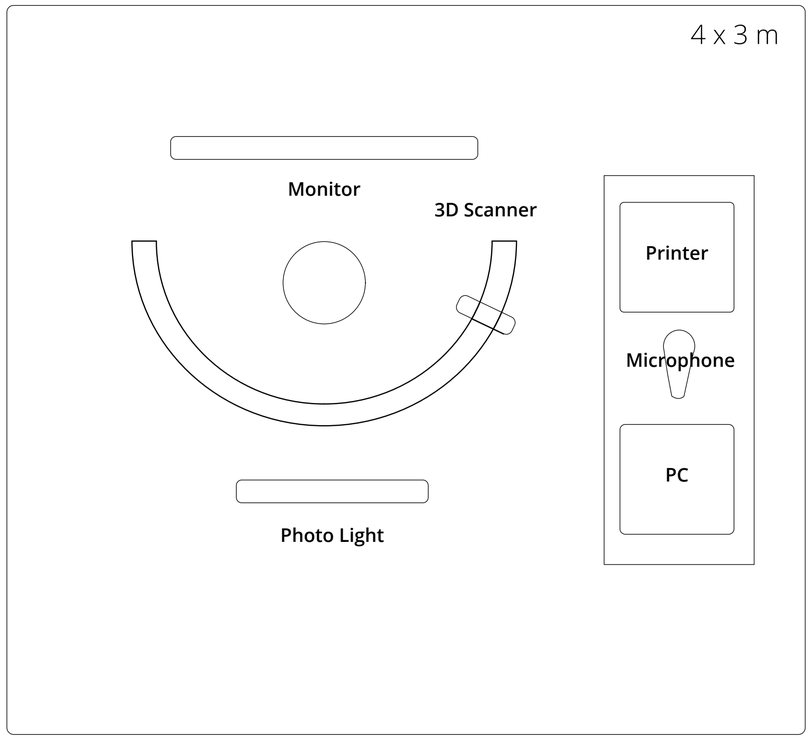
How will AI Change You provides participants an opportunity to be “A Thinker”, reflecting on personal and collective futures with intelligent machines. During the experience, scanned digital fascimilies of the participants is altered using data inputs from the artificial intelligence engine.

Portrait of Human on the Verge

Today, we humans are standing on the verge of a major technological shift. Scientists, technologists, and others are developing deep learning machine intelligence to boost our intelligence and help streamline processes, yet these developments could also have uncontrollable consequences. Where this could be drawing us is up for contemplation and this installation gives its participants an opportunity to be “The Thinker“, reflecting on personal and collective futures, as AI’s are driving us to transition to a new reality.

Installation Setup

The installation requires two laptops for operation, one display for showing visual distortion of the 3D data, a sensitive microphone for recording the quote even within noisy surrounding, a 3D scanner, a printer to printout the generated postcard, and a half circle dolly on tripods as well as a additional lighting to improve the scan quality.



Interaction Flow




Step 1.
Contemplation & 3D Scan

A participant is invited into the photo booth for a 3D scan and a moment of contemplation.

Then, the participant is asked to think about their feelings about the future that may be brought on with AI technologies.

As they ponder, a 3D scanner moves along a semi-circular rail, in order to capture their thinking face.

Step 2.
Interview

The participants are asked to vocalize their thoughts about the future that artificial intelligence will bring.

The voice of the participant is automatically transcribed and analysed for its sentiment, using an actual AI Engine.

Step 3.
AI-driven Mesh Distortion

The output from the AI analysis drives the visual distortion of the participants 3D scanned geometry.

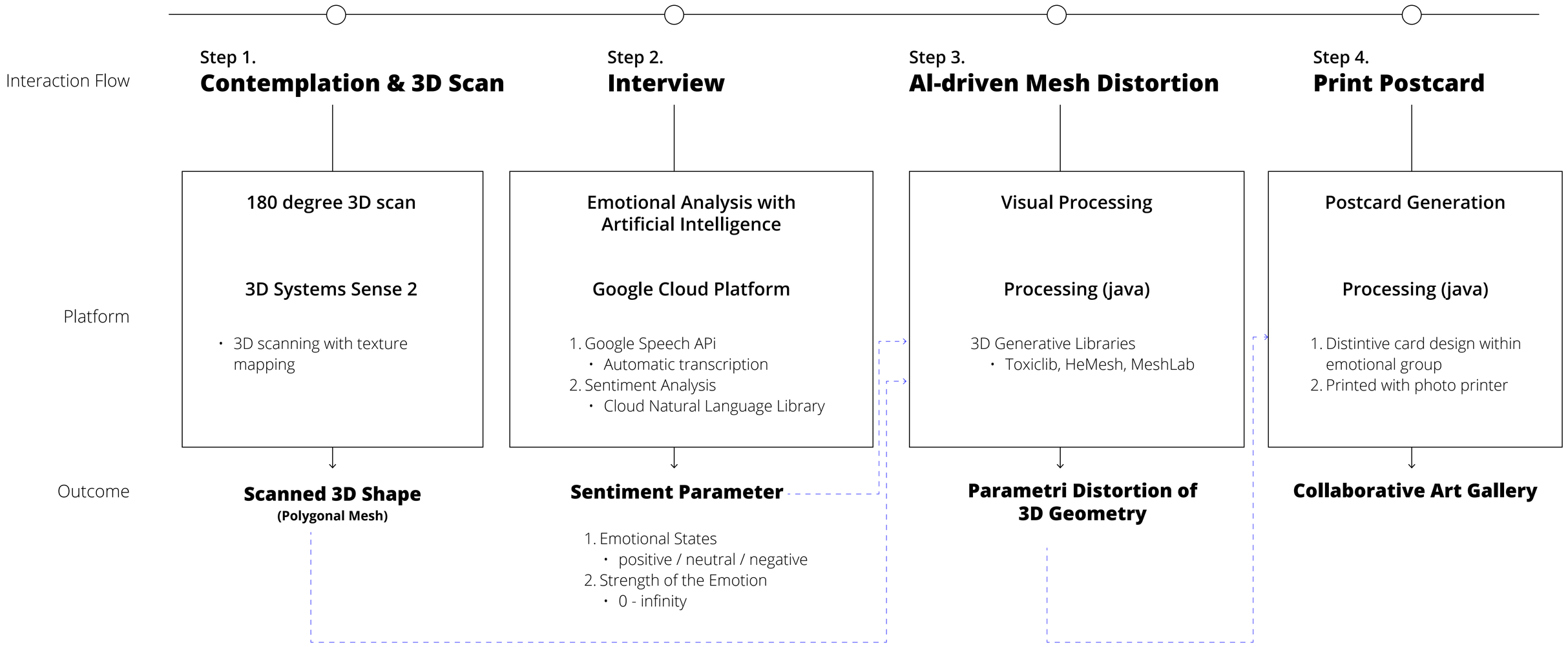
Different sets of visual distortion are triggerd based on how the AI understood the users sentiment.

Step 4.
Print Postcard

A postcard is generated according to the emotional qualities. The post card is then handed to the participant.

System Diagram

During the experience, the scanned digital facsimile of the participants is modified and altered through the artificial intelligence engine, which works to interprets the emotion delivered through the participants comments. In the end, the participant faces a portrait of themselves, generated by the power of advancing technology.



Exhibition

The installation was showcased last year, at the Business Romantic Societies “house of Beautiful Business“, a pop-up community for discussion in the age of Artificial Intelligence in Lisbon. More than one hundred participants experienced the installation over six days, which resulted in the massive collage of portraits of people of the age.

Negative — Neutral — Positive

Collaborative Interactive Art

The portraits are made from generative 3D mesh distortions, which always results in the distinct portraits for each participant. Not only the distortion schemes but also the colour combinations differ within emotional categories (positive, neutral, negative). As more people participated, the growing collective portrait reflected the current emotional state of all the participants as they contemplated the “AI future“.

Onsite Gallery for Discussion

Through our offline exhibition during the House of Beautiful Business, we have observed that the post card gallery evokes the discussion among participants while looking at themselves displayed on the wall. As such, we believe that the installation will not only stimulate the individual contemplation but also provide a space to upbring the discussion about the future.

SELFIE-METRE

ROLE
Concept development , SW/HW development, demonstration guide

DEVELOPMENT PLATFORM
Raspberry Pi, Python(OpenCV, Pygame)

EXHIBITION
Hebei Design Week 2020 (Sep 17th - 23rd)

操作指南

1 快速顺时针摇动发电机摇臂来
电。顶端的指示条将显示您实
产生的电力。时间限制为10秒

2 十秒结束后，打印机将打印出您
的发电结果小卡片纪念品。小卡
片上还会有您摇动发电的纪念
片哦！

This installation was made as a part of the INDEED booth being presented in Hebei Design Week. As INDEED wanted to introduce the circular design strategy highlighting environmental issues inside the main booth, we wanted to make an interactive installation that triggers the environmental thoughts of visitors so that they can engage to the topic even before walking into the booth.

Data - Electricity - CO2

The Environmental Impact of your Selfie

Climate change is one of the most important challenges in our century, and its correlation with CO2 (Carbon Dioxide) is extensively demonstrated in scientific research. Despite the rising attention on this issue, many human-related activities have a hidden negative impact in terms of CO2 emissions, and their social costs might not be internalized by an unaware consumer.

To express the impact of online smartphone usage in terms of CO2, we identified a unit of measurement highly connected with it: a selfie.

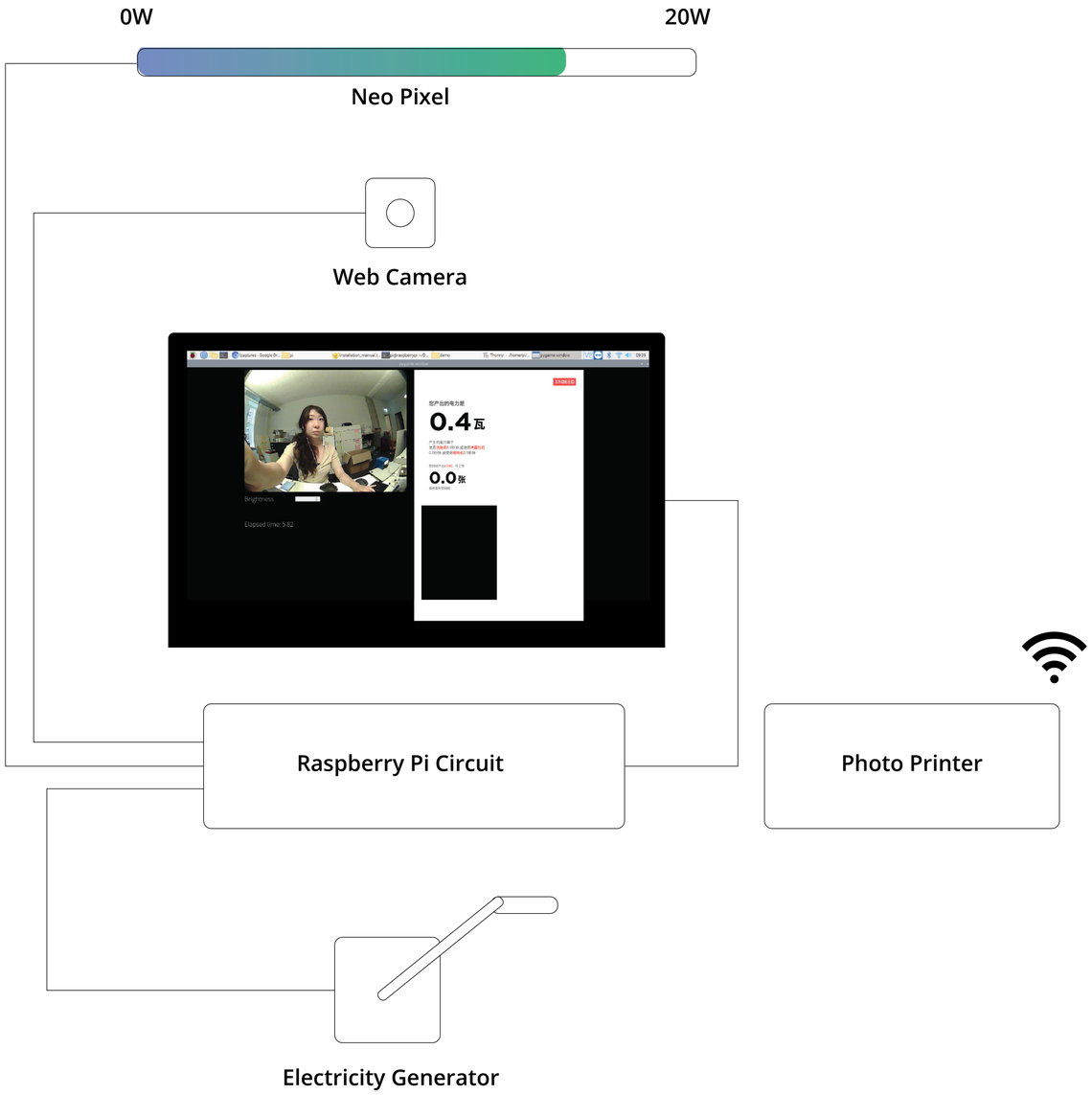
A picture might not seem that much, but if we put it online, it goes through several networks and data centres that require plenty of electricity to function; this process releases a lot of CO2 in the atmosphere.

The CO2 emissions of 10 selfies can be compared with 1 km traveled by an average EU car (European Environment Agency, 2017), and the daily CO2 absorption of an average tree can barely sustain 10 selfies a day.

Based on the Selfie Index, we implemented an installation that lets you experience how much energy is needed to upload the selfies to the data centres and to be able to compare the energy with the energy needed for other home appliances.

Resource : The environmental cost of being selfish, Core-econ

Interaction Flow



Step 1.

Generate electricity with the hand crank

A participant is asked to generate the power for 20 seconds by rotating the crankers that displays the amount of instant power generated from him/her and displayed with the LED strip.

Step 2.

Photos are taken while cranking

The web camera facing the participant keeps taking the selfie during the experience and save them into the instant buffer in the system.

Step 3.

Interpretation of the physical effort

After 20 seconds, the maximum instant power is translated into Wh and generates the card design that illustrates the environmental effect of the number of selfies generated from the machine.

Step 4.

Get the personal card from the printer

The final card design is sent to the printer by wifi network and the participant will be given with the card of their personal experience.

Card Design

Maximum cranking power

17.9W

Equivalent activities to the generated electricity

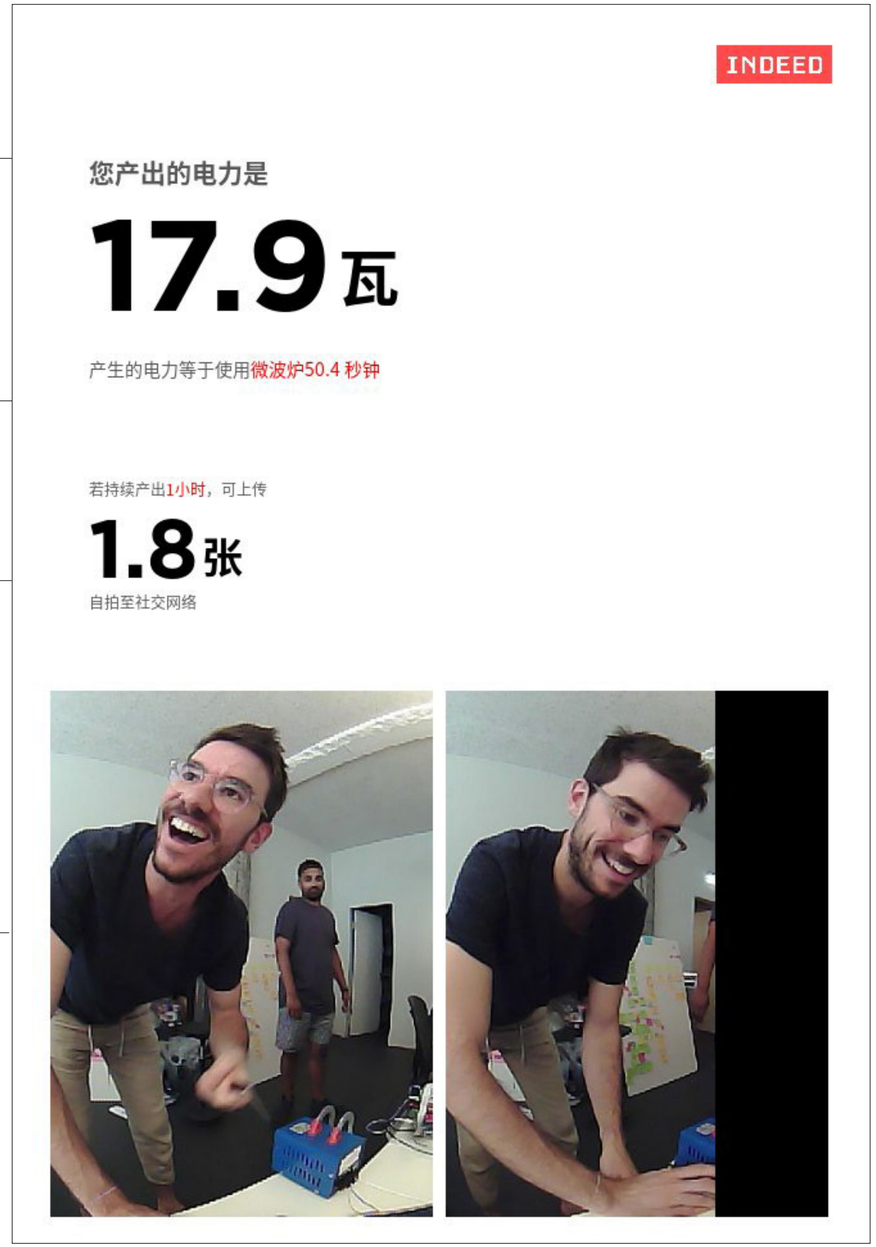
The generated energy is equivalent to watching TV for 3.35 minutes

Interpretation of the individual effort

If you crank the device at your max speed for one hour, you will be managed to upload 1.8 photos to your social media account

Interpretation of the individual effort by the number of selfies

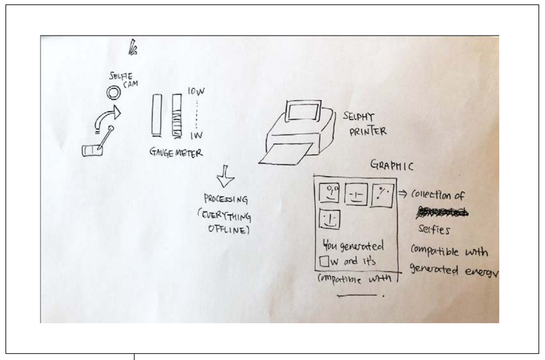
Visualization of 1.8 selfies

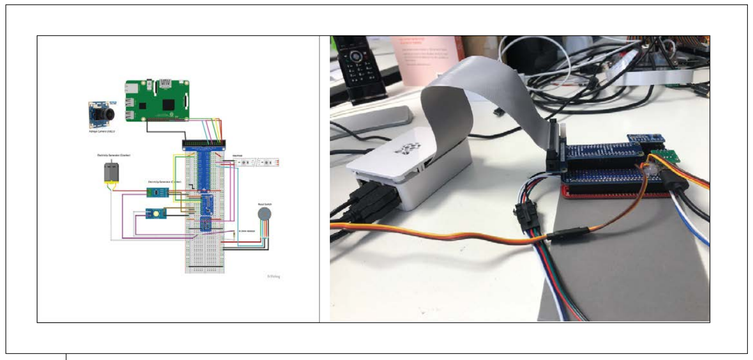


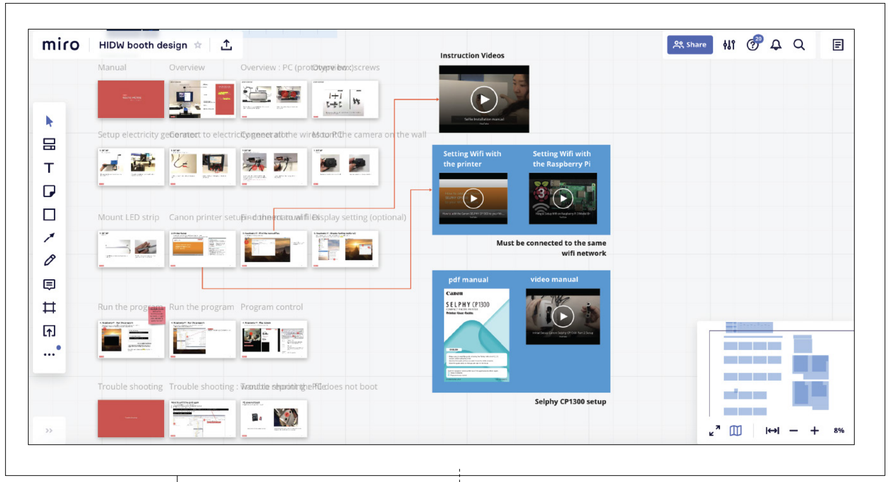
Product Development Process

The project was facing several challenges from the project planning stage. I was given only one month for the full implementation including the ideation phase, and none of the members of the event team can travel to China to run the installation due to the COVID situation, thus everything needed to be shipped and run by local exhibitors.

To cope with such difficulty, I avoided using unnecessary wireless connections and spend the latter half of the development time stabilizing the system and creating online/offline manuals.







Ideation

Idea Selection

Development (1st iteration)

GUI Design System Stabilization

Installation Manual Release

Shipping to China

Demonstration

2 weeks

2 weeks

1 week

Demonstration in Public

Over the span of the 4-day exhibition at Hebei Design Week, the installation has been one of the hottest spots at the fair. From audiences to exhibitors, from kids to middle-ages, from design week volunteers to even security staff, they all had quite some fun with the cranking machine. I hope when the initial thrill of interaction passed, our installation can trigger some awareness and thoughts about the environmental impacts of our daily life.

Inside the booth, we explained the concept of circular innovation, introduced INDEED's new blueprint, circular design tools and circular case studies to persuade the audiences of the benefits and potentials of circularity. At the center of the booth is a 4.5-meter tall installation that symbolizes the shift from a linear model to a circular one.

Source : HIDW Recap (http://www.indeed-innovation.com/journal/hidw-2020-recap)