

# MINJOO CHO

[www.minjoocho.com](http://www.minjoocho.com)

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

## BRAIN PIANO

The interplay of artificial Intelligence with human brain in the form of musical expressions

## HOW WILL AI CHANGE YOU

An artificial intelligence driven 3D distortion of human portraits

## RATCHAIR

Furniture move itself with vibration

## CALM AUTOMATON

A DIY toolkit for ambient displays

## SMART TROLLEY

Can we track food inventory without RFID tags?

## DIGITAL STEAM

Can we make the steamer more smart and connected?

## AR FOR FOOD INNOVATION

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

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

INTERACTIVE PROJECT

CLIENT PROJECT

# ABOUT ME

## PROFESSIONAL EXPERIENCE

### Creative Technologist, Indeed Innovation

May, 2017 - Present

Hamburg, Germany

#### 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

Jun 2013 — Oct 2014

Suwon, South Korea

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

Jan 2011 — Dec 2014

Suwon, South Korea

- 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

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

Daejeon, South Korea

### B.S in Electrical Engineering, KAIST

Mar 2006 — Feb 2011

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

Daejeon, South Korea

2017

# HOW WILL AI CHANGE YOU

An artificial intelligence driven 3D distortion of human portraits

**ROLE**

Concept development , SW/HW development, demonstration

**DEVELOPMENT PLATFORM**

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

**TEAM**

Creative Technologist 1, Graphic Designer 1

**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 fascimiles of the participants is altered using data inputs from the artificial intelligence engine.

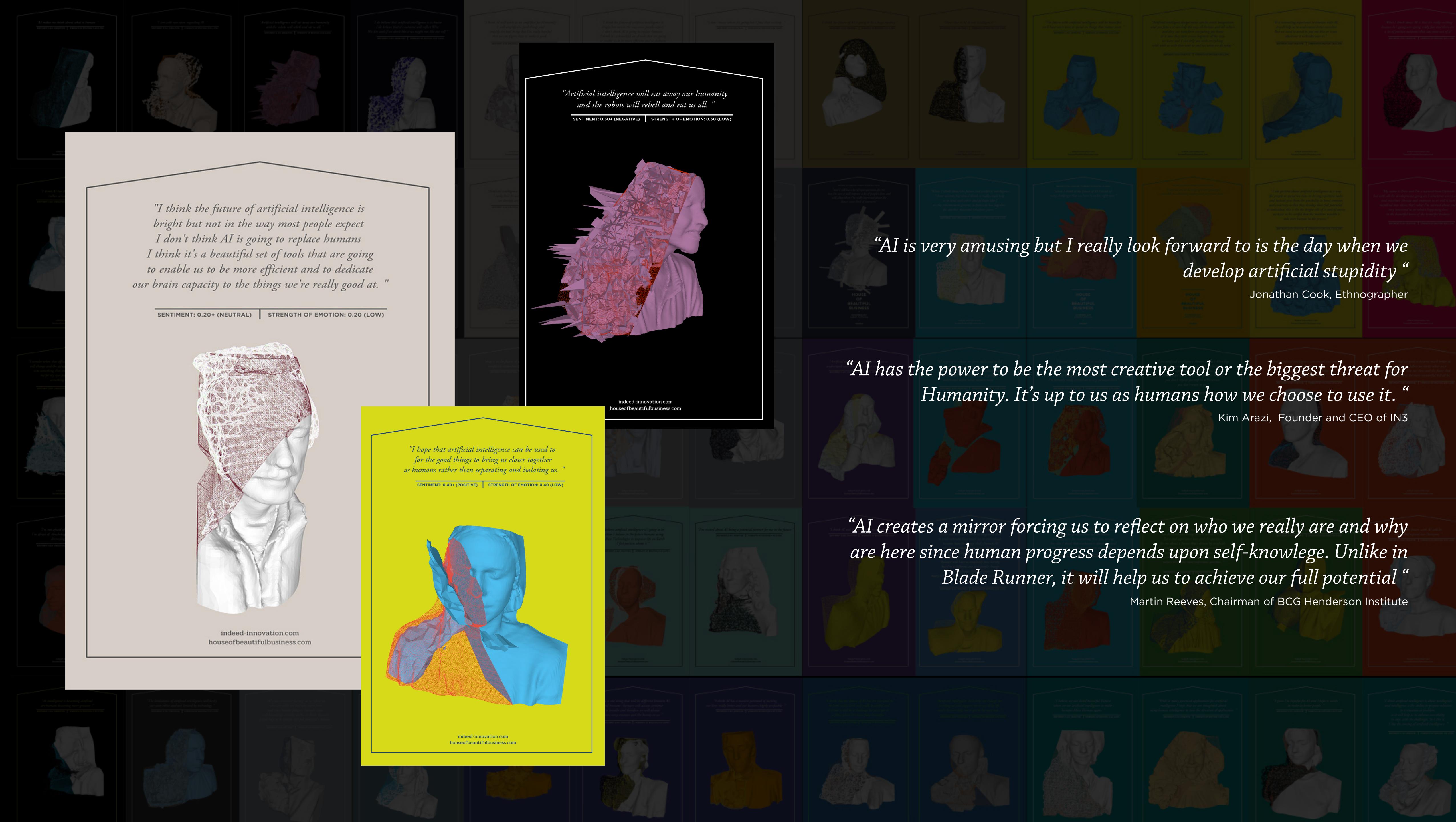




# PORTRAIT OF HUMAN ON THE VERGE OF SINGULARITY

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.





### 3D SCAN

A mesh data from 180 degree scan of the user is imported to the system



Now Cutting the Mesh with a Plane

### MESH OPTIMIZATION

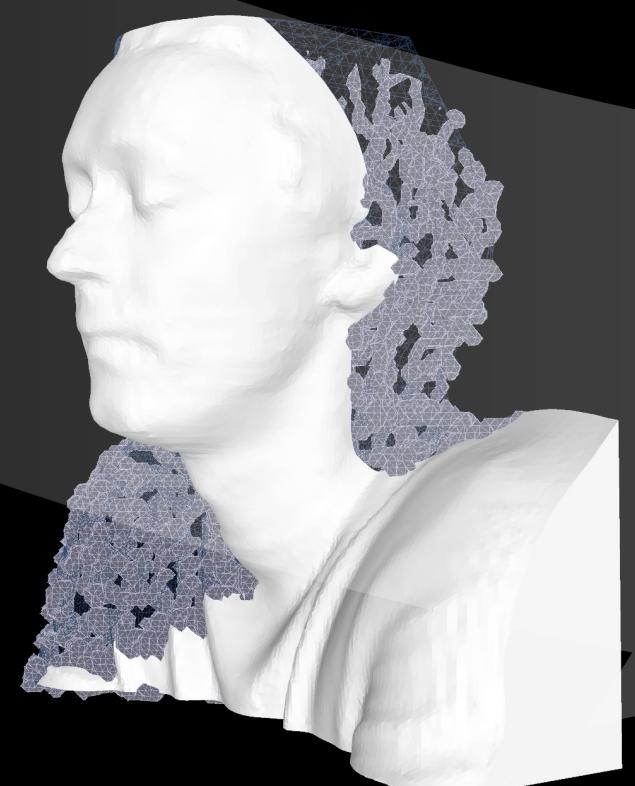
Mesh structure is cut into half and simplified for better graphical performance

### EMOTIONAL ANALYSIS

Emotional states of users are analyzed from their comments with AI Engine from Google Cloud Platform

**TYPE**  
positive / neutral / negative

**STRNEGH**  
0 - Infinity



### MESH DISTORTION

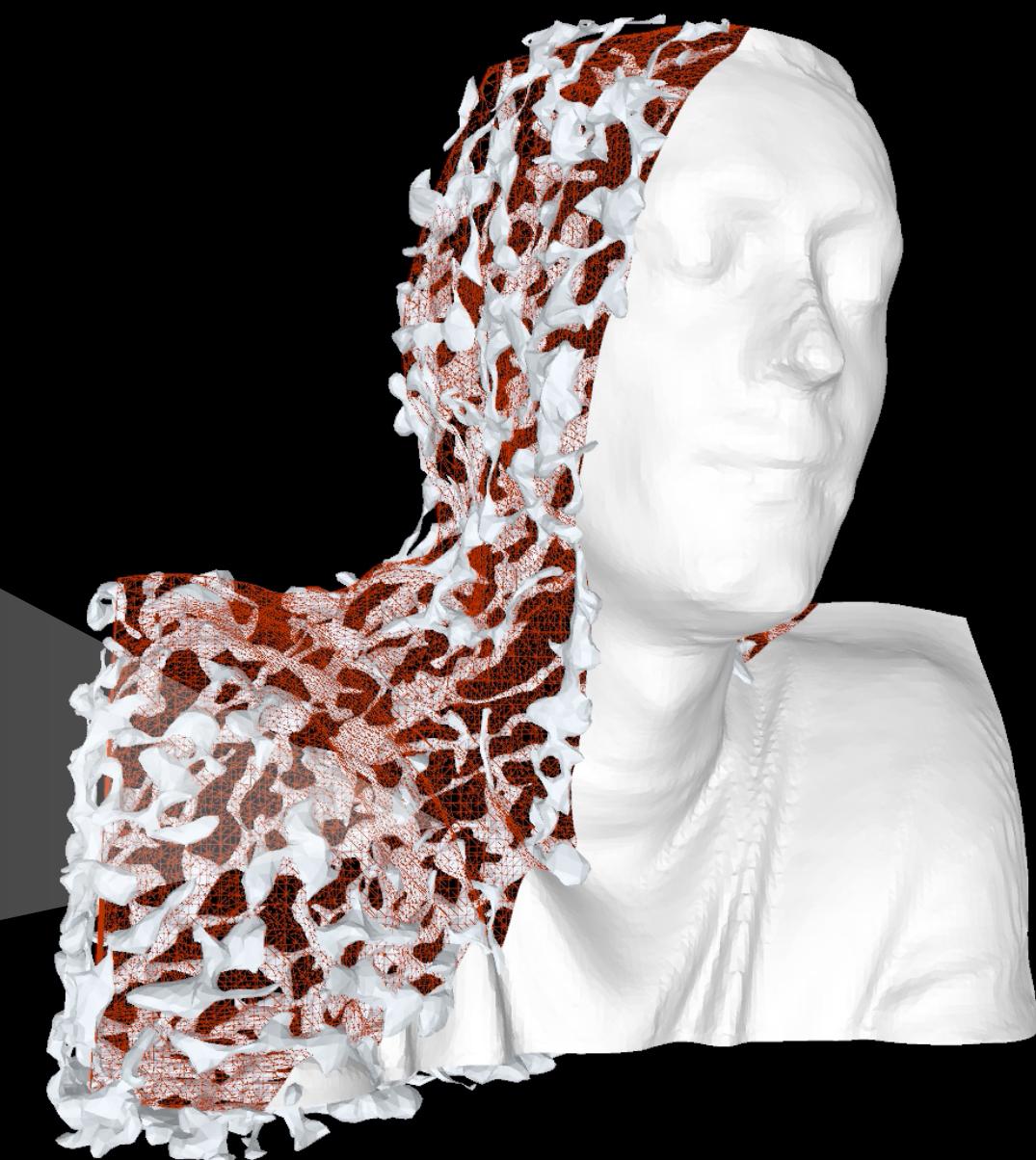
A mesh goes through distortion scheme depending on the result from emotional analysis

Dev. Platform : Processing 3 with Hemesh, Toxilib library

*"I do believe that artificial intelligence is a chance  
I do believe that it's outcome will reflect Who  
We Are and if we don't like it we might not like our self "*

SENTIMENT: 0.60+ (NEGATIVE)

STRENGTH OF EMOTION: 0.60 (LOW)



indeed-innovation.com  
houseofbeautifulbusiness.com

### CARD GENERATION

The program generates graphical card presented with distinctive color palette within emotional values

# 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".



[Click to watch the demonstration video](#)



STEP 1

## CONTEMPLATION & 3D SCAN

"Please close your eyes and think about the future with artificial intelligence for a while"

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

STEP 2

## INTERVIEW

"Please let us hear what you feel"

The voice of the participant is automatically transcribed and analyzed 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.

STEP 4

## POST CARD GENERATION

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

A photograph of a woman with long dark hair, wearing a grey cardigan over a yellow top, standing in a room with warm lighting. She is holding a smartphone and taking a picture of a wall that is covered from top to bottom with a dense grid of small, colorful portrait photographs. The wall has a warm, golden glow. In the background, another person is visible, and hanging lights are visible in the distance.

# SHOWCASE EXHIBITION

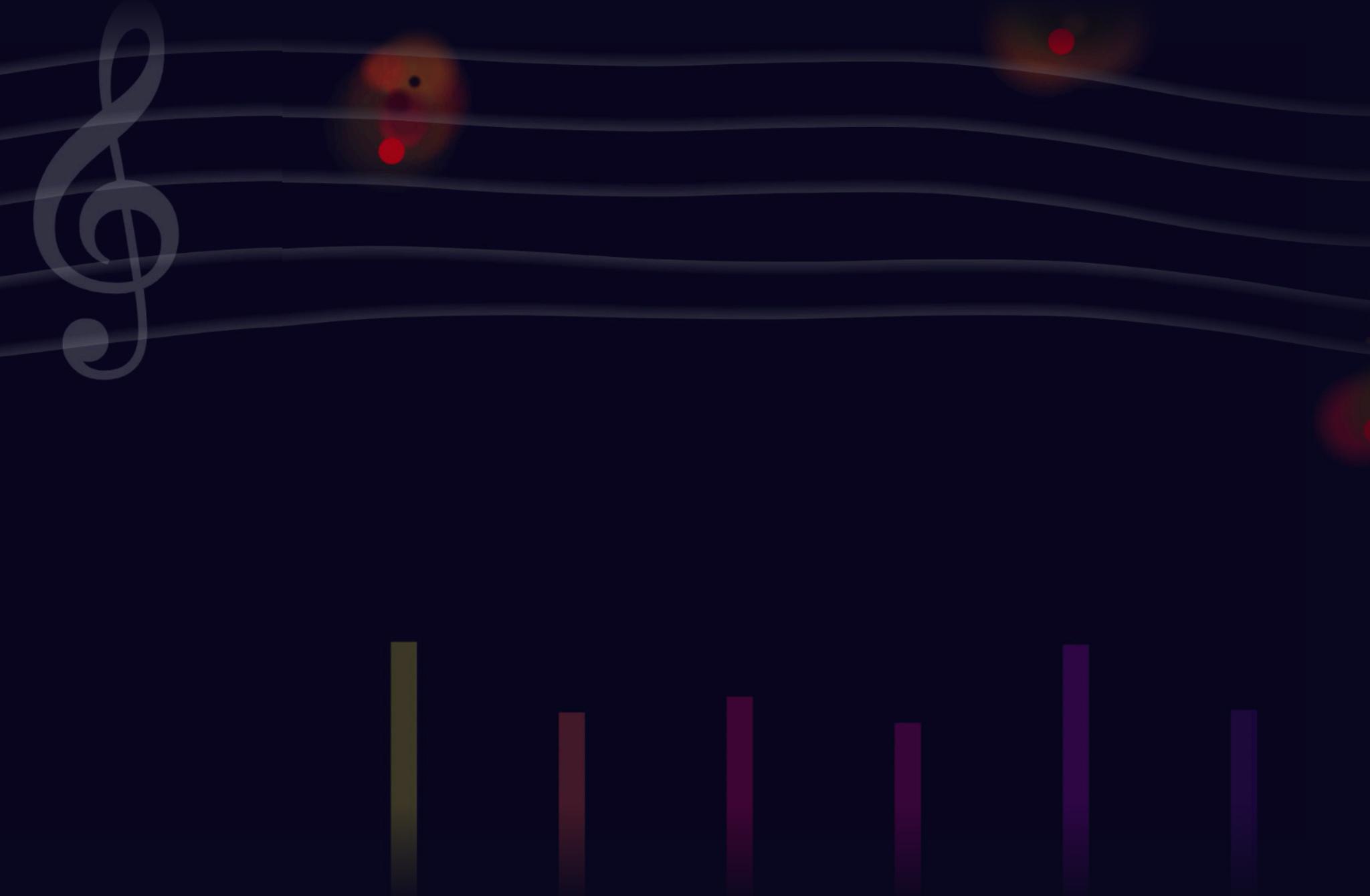
The installation was showcased in 2017, at the Business Romantic Societies “house of Beautiful Business”, a pop-up community for discussion in the age of Artificial Intelligence in Lisbon.

More than one hundred participants experienced the installation over six days, which resulted in the massive collage of portraits of people of the age.

2019

# BRAIN PIANO

The interplay of artificial Intelligence with human brain in the form of musical expressions



#### ROLE

Concept development , SW/HW development, demonstration

#### DEVELOPMENT PLATFORM

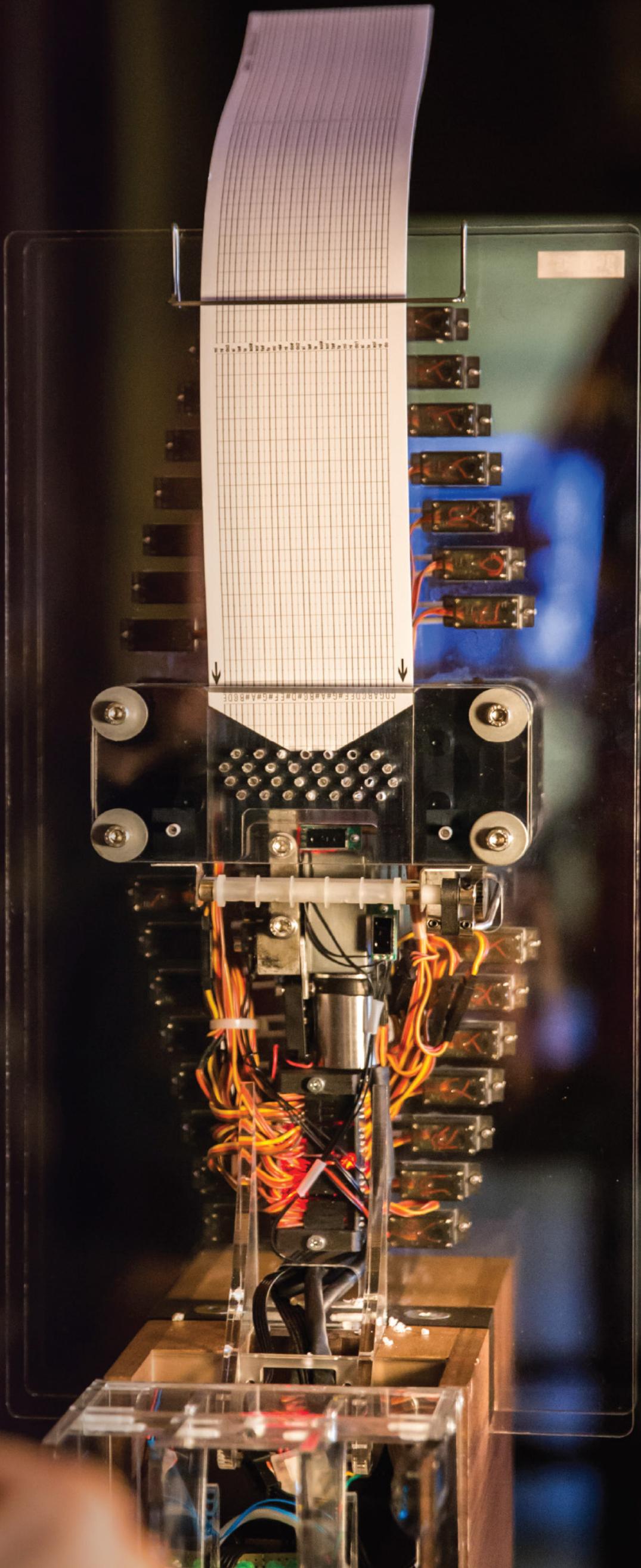
Embedded (Arduino), Frontend (Javascript), Engine (Magenta.js)

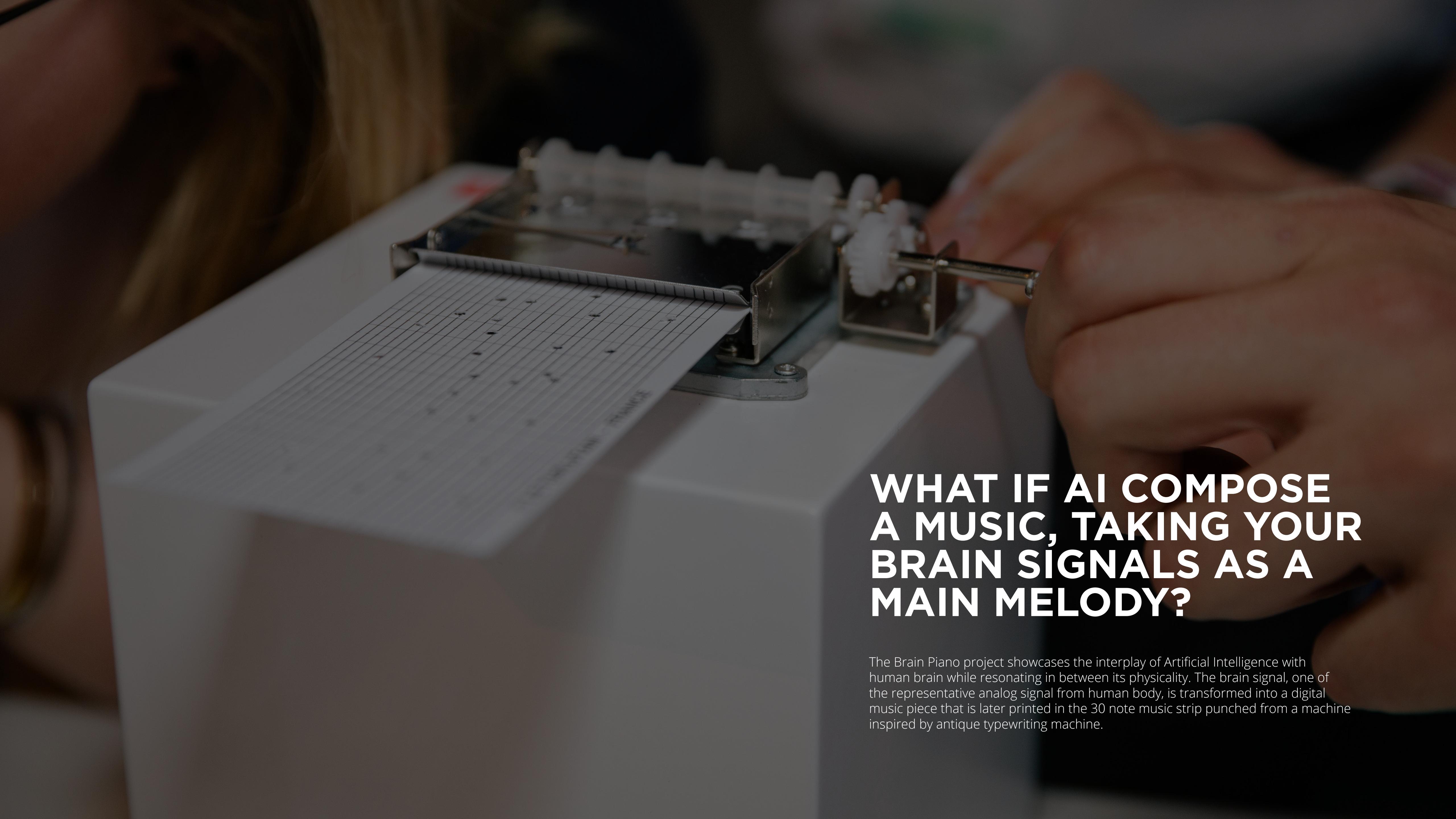
#### TEAM

Creative Technologist 1, mechanical engineer 2

#### EXHIBITION

House of Beautiful Business (2019)





# WHAT IF AI COMPOSE A MUSIC, TAKING YOUR BRAIN SIGNALS AS A MAIN MELODY?

The Brain Piano project showcases the interplay of Artificial Intelligence with 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.



STEP 1

## RECORD YOUR BRAIN SIGNALS IN MELODY

As you concentrate, we measure the electrical activity of your cerebral cortex. Each electro-chemical discharge will produce 8 different raw brain signals become your finger to play a virtual piano.

STEP 2

## LET AI COMPOSE MUSIC OUT OF THE MELODY

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

STEP 3

## MAKE YOUR MELODY TANGIBLE

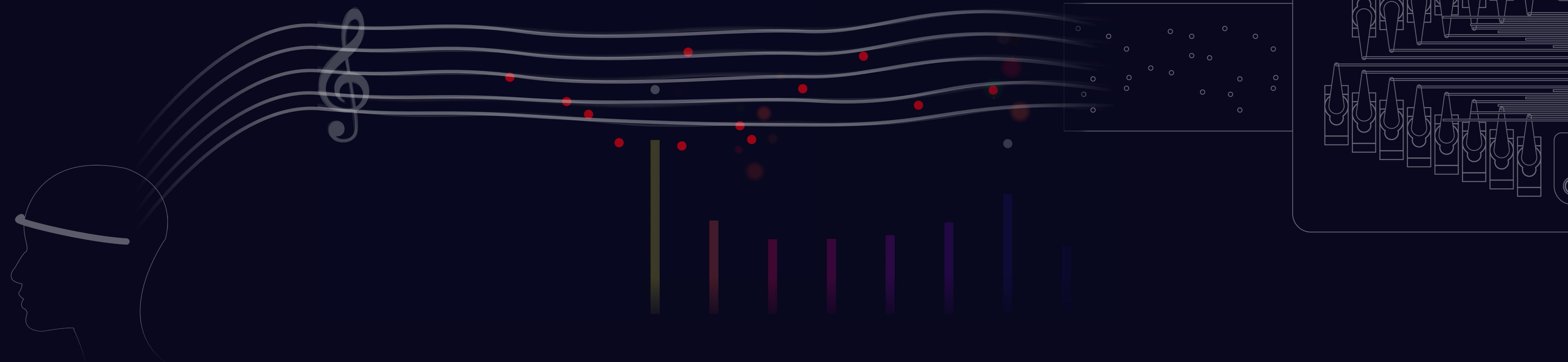
The puncher makes your music audible and tangible outside of the digital. Thanks to the 3D printer, ingenuity and engineering, the puncher is virtually a polaroid of your mental vibration profile.

STEP 4

## REVISIT YOUR MUSIC ANYWHERE

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.

# SYMPHONY OF HUMAN AND AI IN RESONANCE OF PHYSICALITY



## READ BRAIN SIGNAL FROM A PARTICIPANT

A brain interface with EEG sensors reads brain signals from a participant

## CONVERT BRAIN SIGNALS INTO A MELODY LINE

Eight raw brain signals act as a finger and generate melody by hitting the hidden piano on the web interface.

BRAIN INTERFACE

## AI TAKING THE MELODY LINE AND COMPOSE POLYPHONIC MUSIC

Artificial Intelligence engine takes the melody line and compose music in the style of Bach.

The resulting music is optimized for 30 scale music notes and punched on to the paper sheet

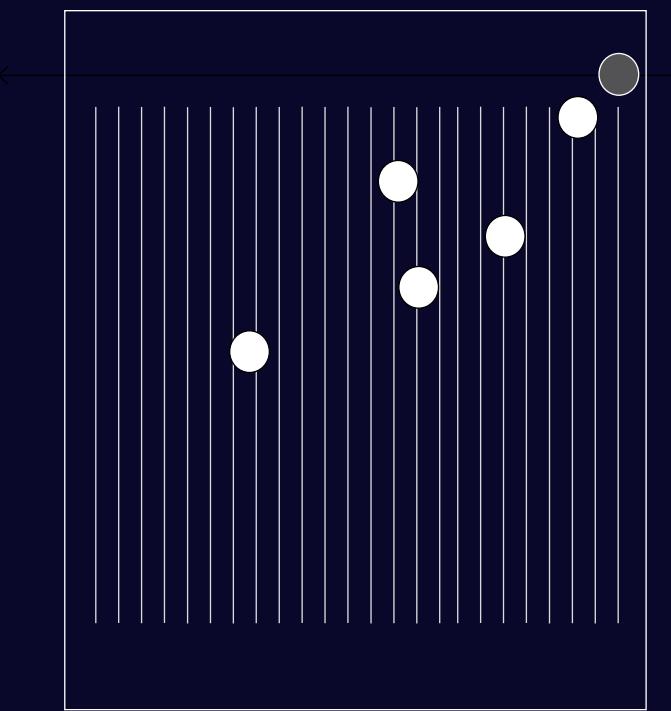
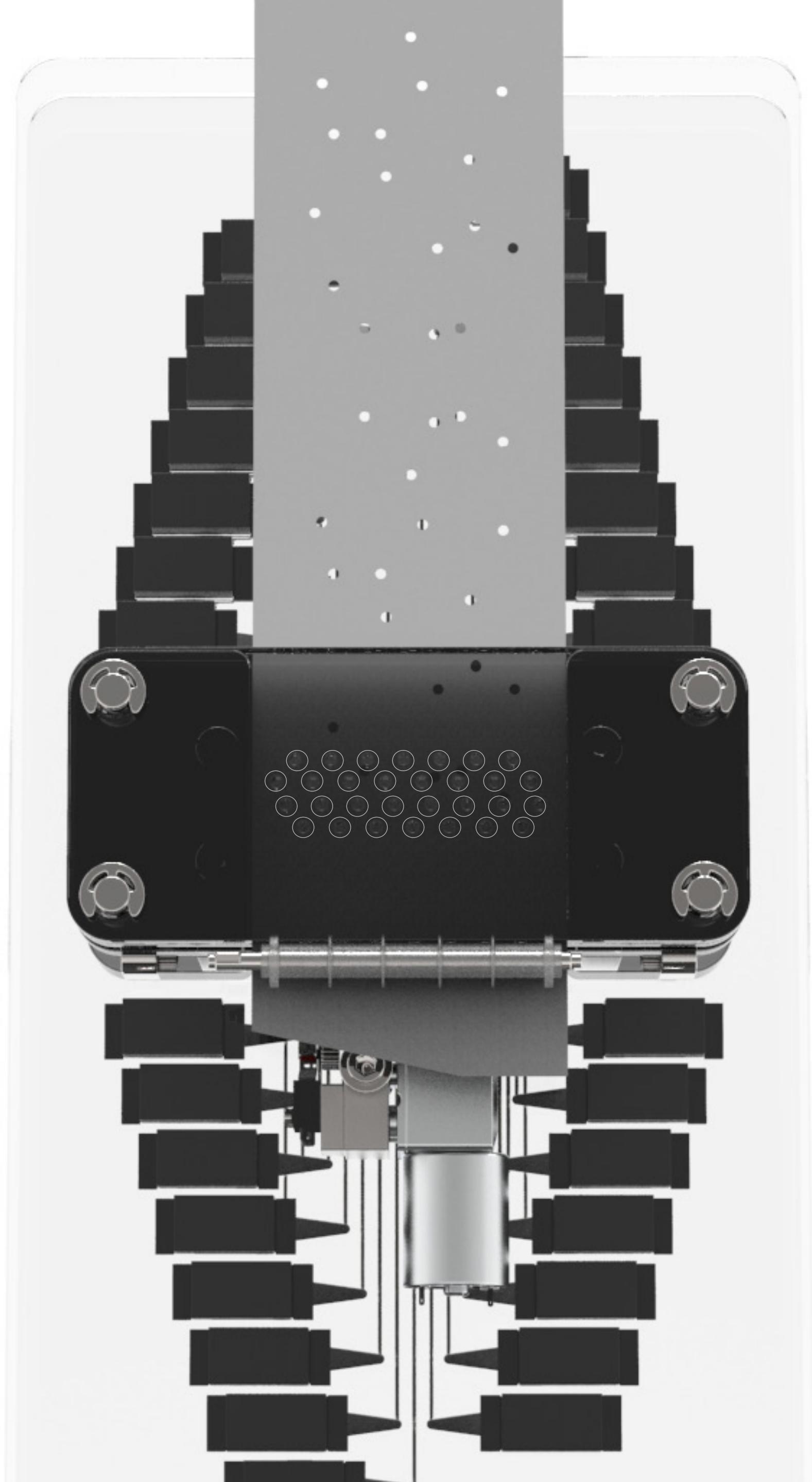
CLIENT (HTML/CSS/Javascript)

SERVER (Python-Flask)

## MACHINE PLAYS MUSIC AS IT IS COMPOSED

The music is uploaded to the web cloud, and the punching machine plays the music as it is being composed

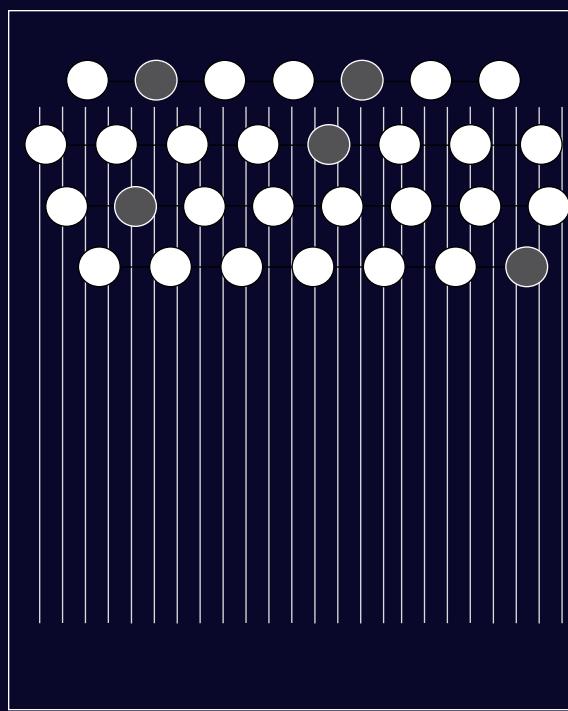
PUNCHING MACHINE (Arduino)



### LINEAR 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

Dramatically reduces punching time in the price of hight power

*Can we produce music sheets within in few minutes?*

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.

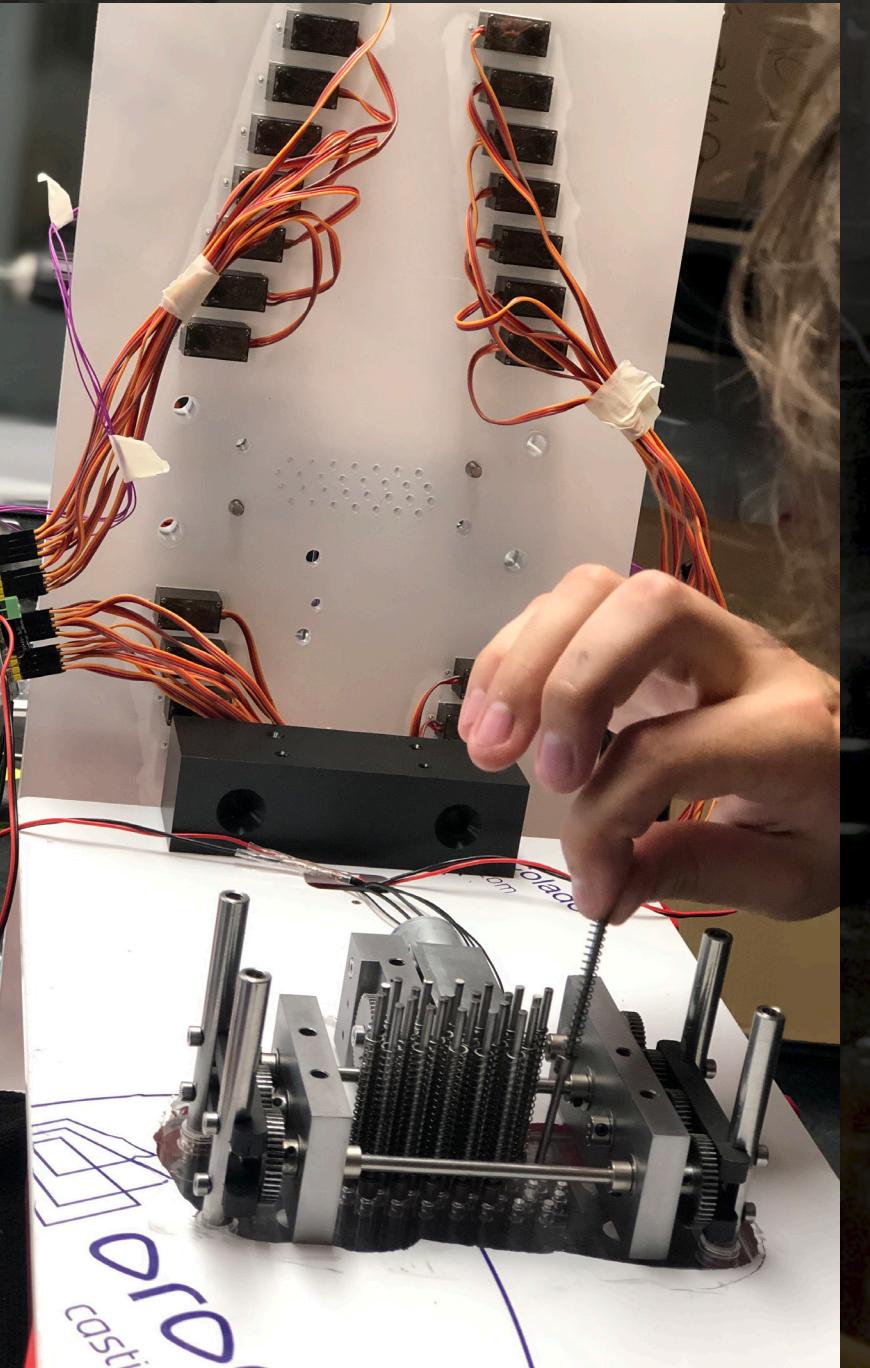
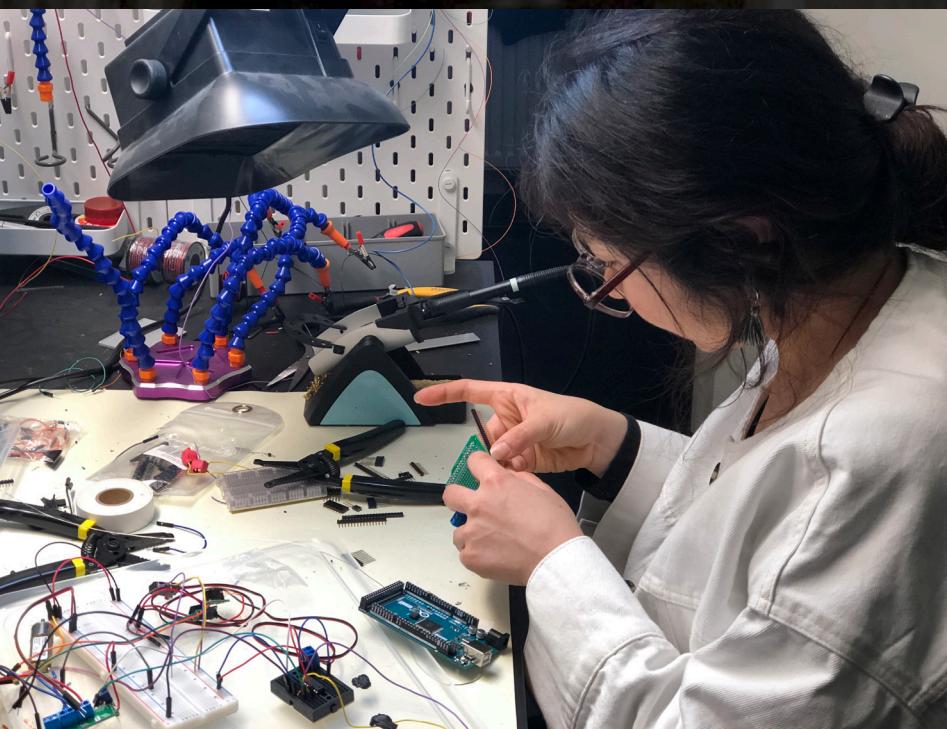
# TWO MONTHS OF MARATHON SPRINTS

It took two months in total for 2.5 people working full-time to develop the whole experience after the project kick off.

Closing to the system integration, I spent time on constituting online music repository where participants can revisit and hear their personal melody with the given ID.

Find more information from following link

[PERSONAL BLOG](#) [INDEED JOURNAL](#)



2016

# RATCHAIR

Furniture move itself with vibration

Ratchair is a strategy for displacing big objects by attaching relatively small vibration sources. After learning how several random bursts of vibration affect its pose, an optimization algorithm discovers the optimal sequence of vibration patterns required to (slowly but surely) move the object to a specified position.

Tetiana Parshakova, Minjoo Cho, Alvaro Casinelli, Daniel Saakes  
SIGGRAPH 2016, DC EXPO 2016



We designed sources of vibration that can be easily attached to furniture and objects. Embedding vibration modules as part of mass-produced objects may provide a low-cost way to make almost anything mobile. The principle is agnostic with respect to the shape of the object, number, type, or relative position of the actuators





## LEARNING PHASE

When the actuators are set, the system builds a matrix of possible transformations (rotations & translations) by sampling the space of possible vibration patterns and recording the resulting motion.



The optimal sequence of steps to get to the desired location is calculated using breadth-first search. The cost function is used to measure the proximity to the target for each final branch (distance and angle)

2017

# CALM AUTOMATON

A DIY Toolkit for Ambient Displays

Calm Automaton is a user-customizable automaton toolkit that functions as an ambient display for peripheral information. It allows users to be calmly notified of information changes with shape shifts of the automaton.

Minjoo Cho, Daniel Saakes  
CHI Interactive, 2017

## CALM + AUTOMATA

Slow movements

Designing for calm technology mean to provide non-invasive tools or cues for action that encalm while stimulation the scenes

Weiser, Mark & John Seely Brown. "The coming Age of Calm Technology" Xerox PARC : Oct 5 1996





# SHAPE CHANGING DISPLAY WITH GENTLE NOTIFICATION

Instead of noisy alarms disturbing your concentration, Calm Automaton lets you be aware of the sequence of information with slow and gentle shape changes over time

## USER CUSTOMIZABLE DISPLAY

Make your own calm alarm by simply attaching printout images or objects from your surroundings.



## Read XML from webpages



Personal Information

Finance

Weather

SERVO POSITION

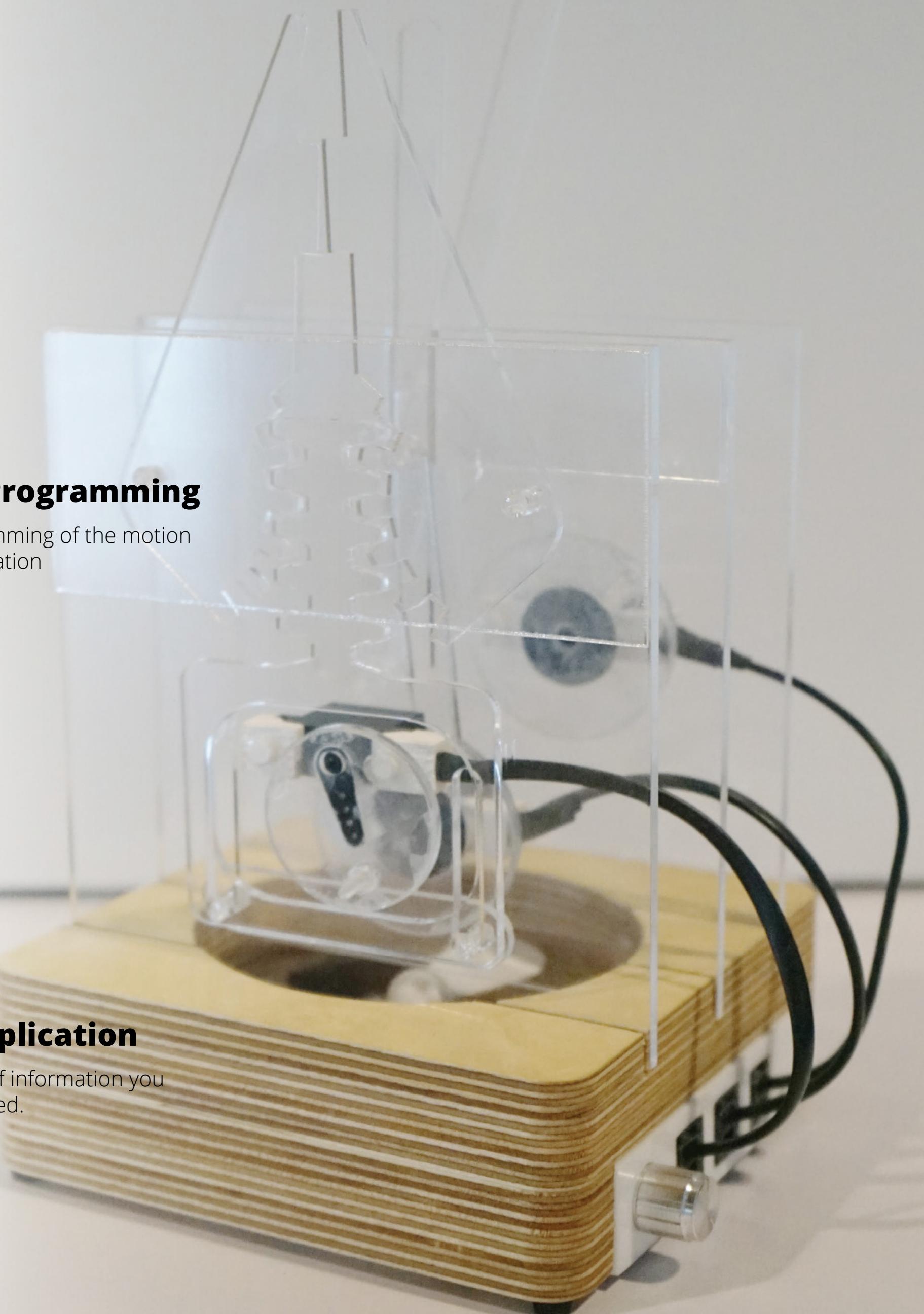
ANALOG FEEDBACK

## Tangible Programming

Tangibly programming of the motion  
with web information

## Mobile Application

Select the type of information you  
want to be notified.

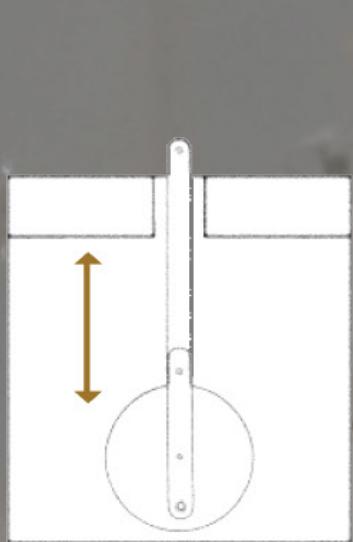


# TOP MODULE

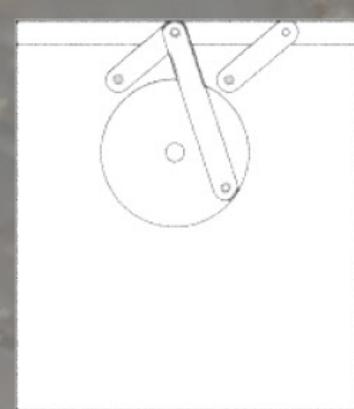
There are five different acrylic modules and one fan module defining identical mechanical movement . By layering two-dimensional plates a user can implement three-dimensional movements.



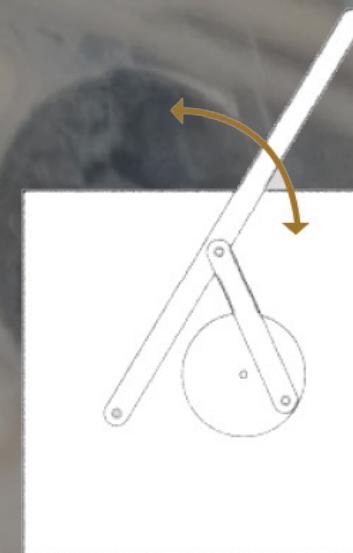
Each transparent acrylic plate defines a single motion, actuated by one analog feedback servo motor attached to the back.



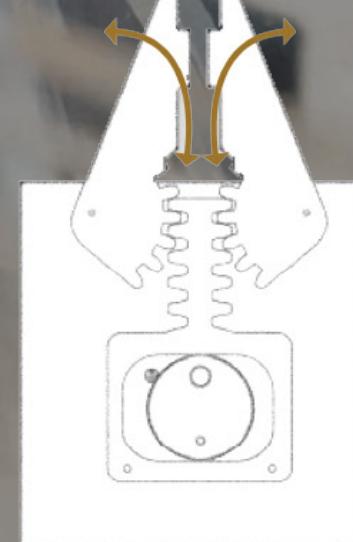
VERTICAL  
MOVEMENT



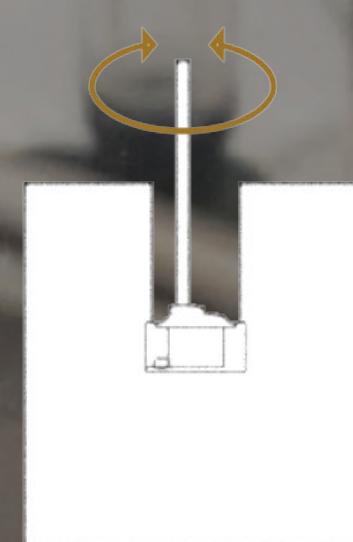
HORIZONTAL  
MOVEMENT



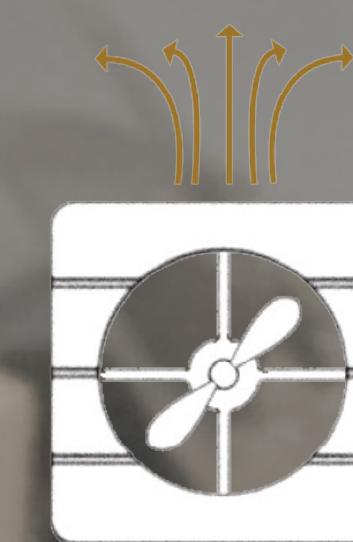
RISING  
MOVEMENT



OPEN/CLOSE  
MOVEMENT



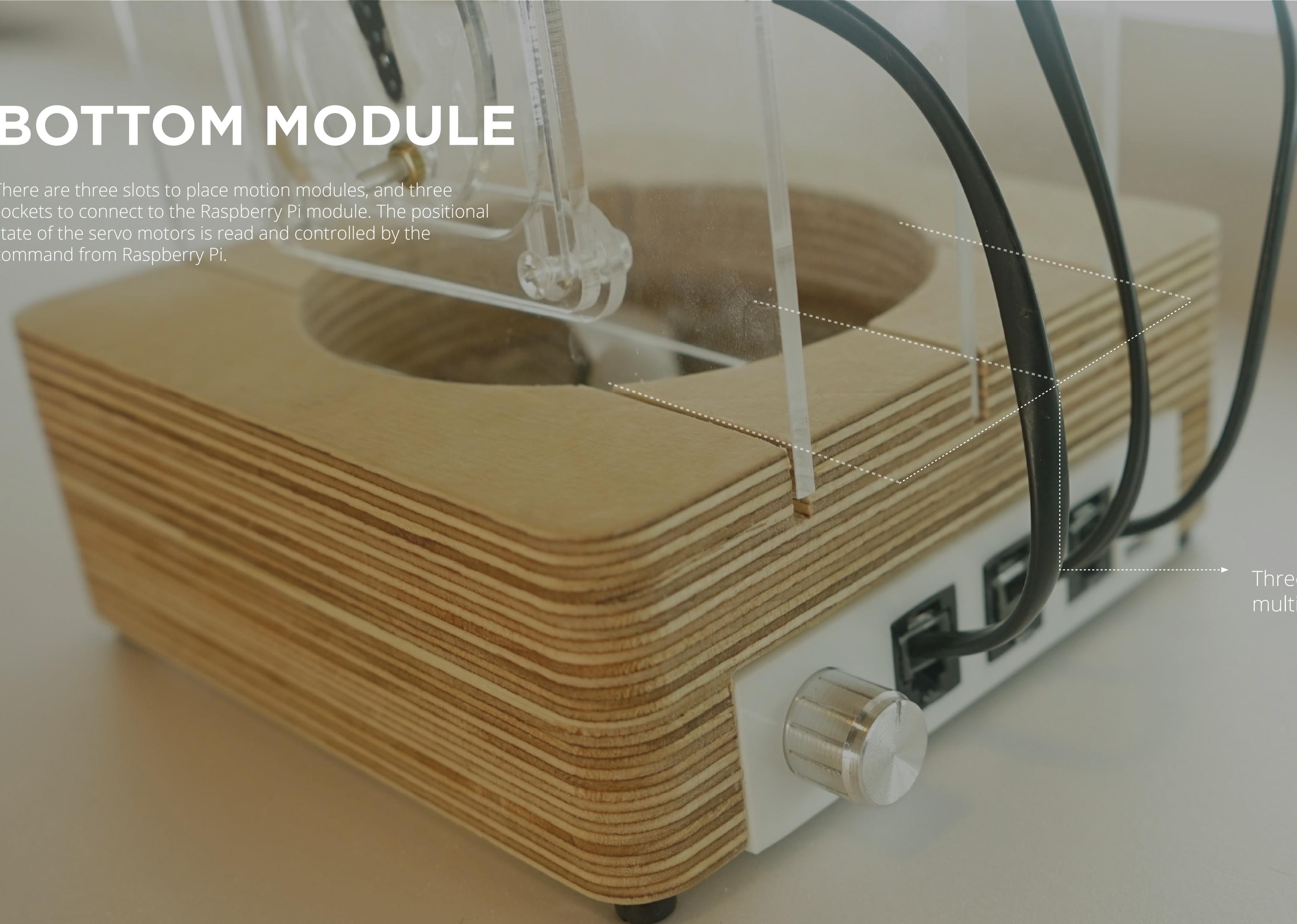
ROTATIONAL  
MOVEMENT



BLOW  
MOVEMENT

# BOTTOM MODULE

There are three slots to place motion modules, and three sockets to connect to the Raspberry Pi module. The positional state of the servo motors is read and controlled by the command from Raspberry Pi.



Three slots for modules to visualize multi-dimensional shape changes.