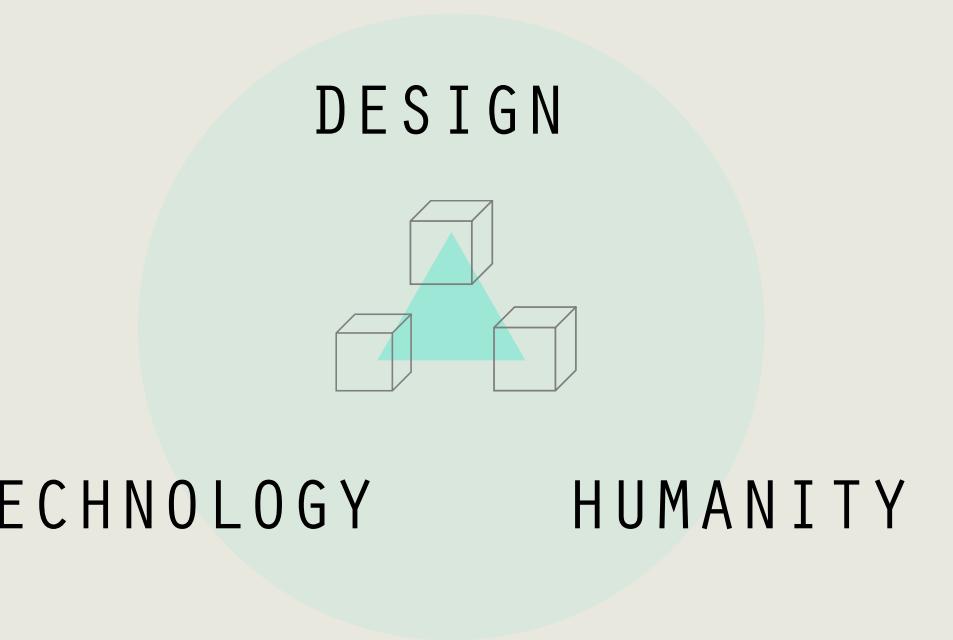


# MINJOO CHO

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



TECHNOLOGY

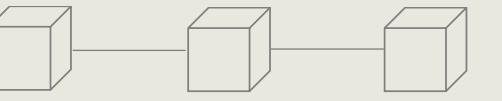
HUMANITY

I AM A POLYMATHIC CREATIVE TECHNOLOGIST WHO DESIGNS  
AND PROTOTYPE IDEAS FOR CONNECTED DEVICES TO ENHANCE  
THE EXPERIENCE BETWEEN USERS AND PRODUCTS, WITHIN  
PRODUCT NETWORKS, AND PRODUCTS TO THE WORLD.

I BRING TECHNICAL CONCEPTS THAT AUGMENTS HUMAN  
SOCIETY BASED ON DEEP AFFINITY TO HUMANITY AND DRAW  
THE EXPERIENCE WITH TECHNICAL TOOLKITS.

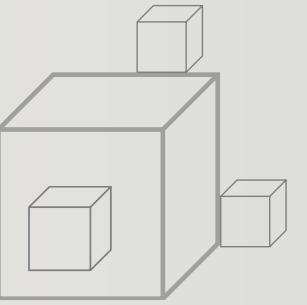
WE SHALL DO A GREAT DEAL FOR THE SCIENCE OF AESTHETICS, ONCE WE PERCEIVE NOT MERELY BY LOGICAL INFERENCE, BUT WITH THE IMMEDIATE CERTAINTY OF INTUITION, THAT THE CONTINUOUS DEVELOPMENT OF ART IS BOUND UP WITH THE APOLLONIAN AND DIONYSIAN DUALITY.

- BIRTH OF TRAGEDY, FRIEDRICH WILHELM NIETZSCHE



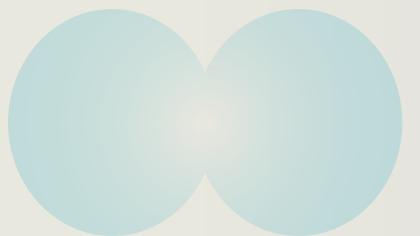
## APOLLONIAN

logical, analytical, pragmatic  
linear thinking



## DIONYSIAN

intuitive, poetic, artistic  
lateral thinking



I believe the successful product experience is achievable from balanced consideration of human intuitiveness and pragmatic implementation iterated by switching between linear and lateral thinking processes.

# ABOUT ME

## PROFESSIONAL EXPERIENCE

### Creative Technologist, Indeed Innovation

May, 2017 - Present

Hamburg, Germany

#### IoT product strategy and PoC implementation (HW/SW)

- 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 charge 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

Daejeon, South Korea

- 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

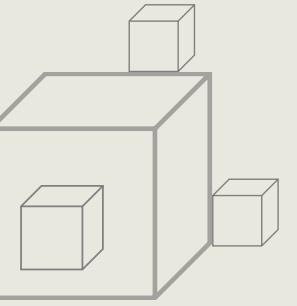
### B.S in Electrical Engineering, KAIST

Mar 2006 — Feb 2011

Daejeon, South Korea

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

ARTISTIC



INTERACTIVE INSTALLATIONS

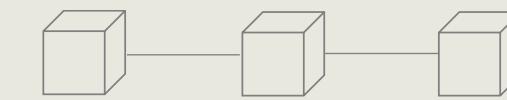
## BRAIN PIANO

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

## HOW WILL AI CHANGE YOU

An artificial intelligence driven 3d mesh distortion of human portraits

PRAGMATIC



CREATIVE IoT DEVELOPMENT

## RATCHAIR

Furniture move itself with vibration

## CALM AUTOMATON

A DIY toolkit for ambient displays

IoT CLIENT PRACTICES

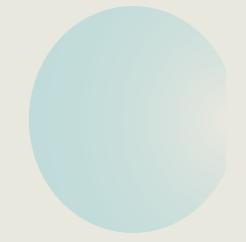
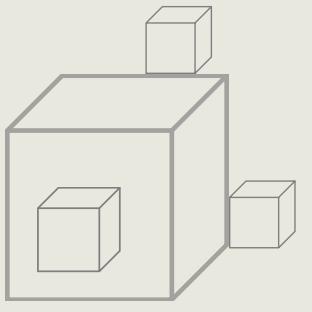
## SMART TROLLEY

How can we track the food inventory in the air cabin without RFID tags?

## DIGITAL STEAM

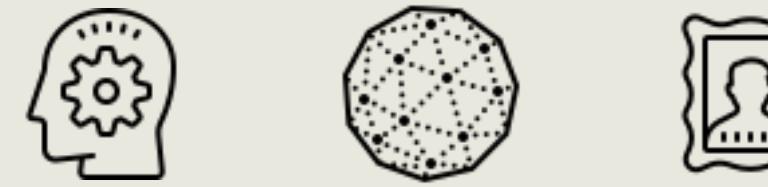
How can we ensure users of the cleaning quality while using steam device?

## ARTISTIC



## INTERACTIVE INSTALLATIONS

These projects were presented to explore the **possibility of emerging technology as a medium for artistic storytelling**. The development process took intensive learning-by-doing tactics where I actively acquired new technical skills while building experience for public participants in a short period of time. (avg 1.5 months)



## HOW WILL AI CHANGE YOU

An artificial intelligence driven 3d mesh distortion of human portraits



## BRAIN PIANO

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

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)

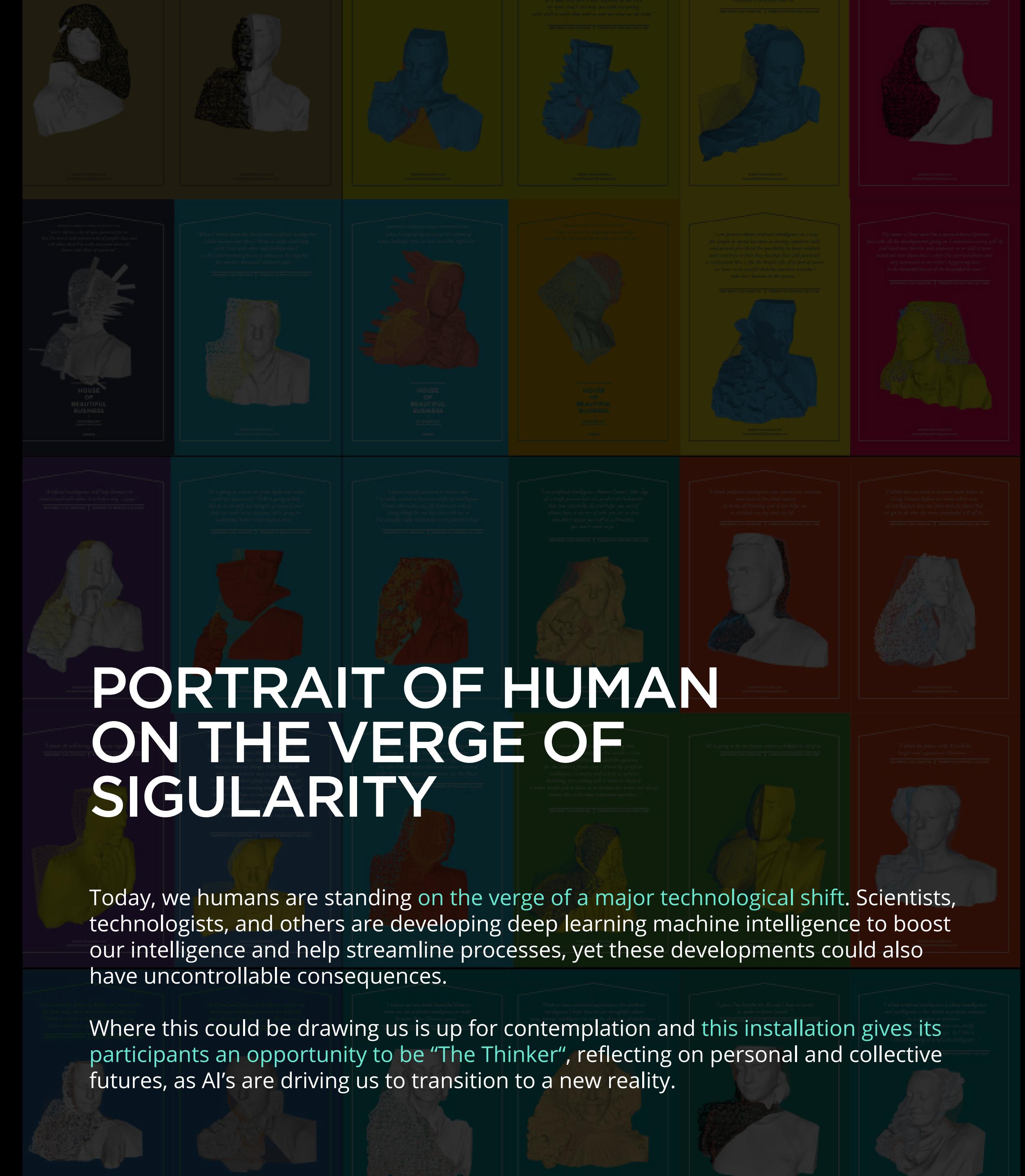
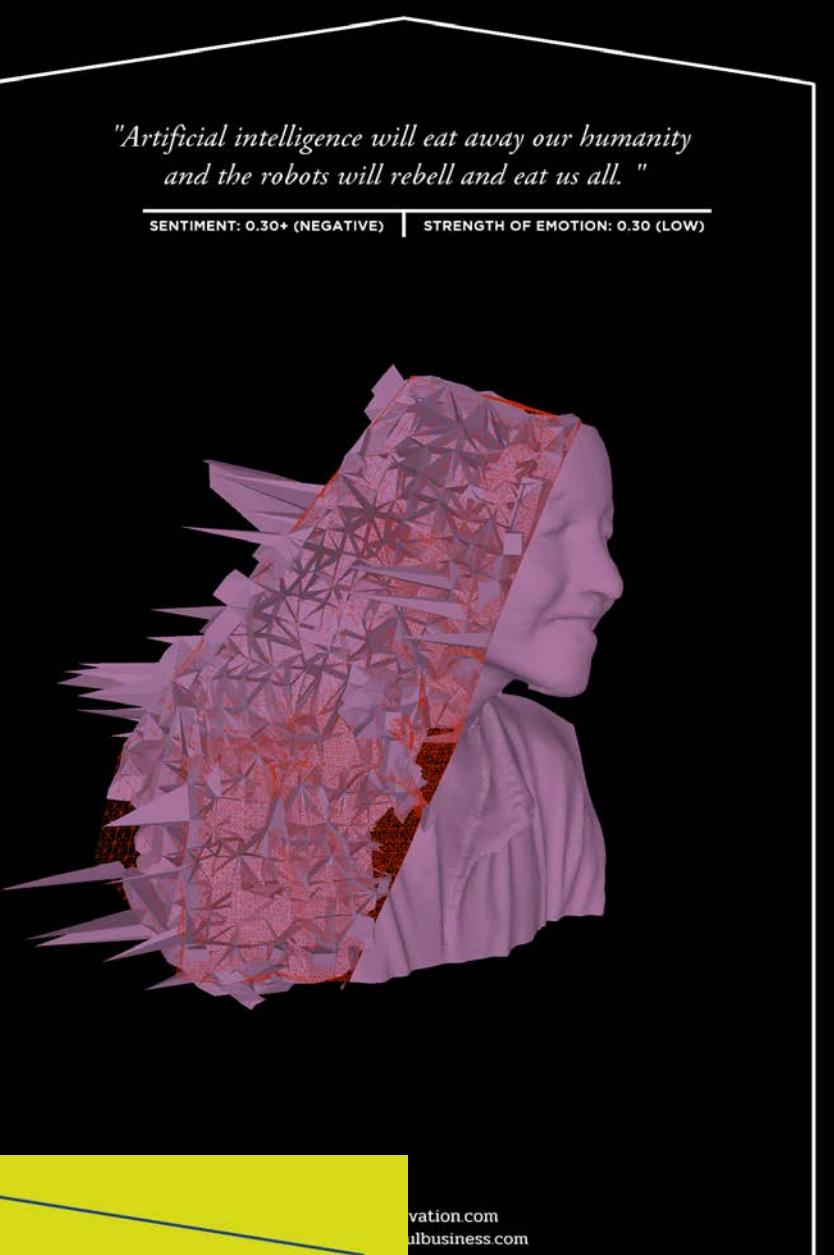
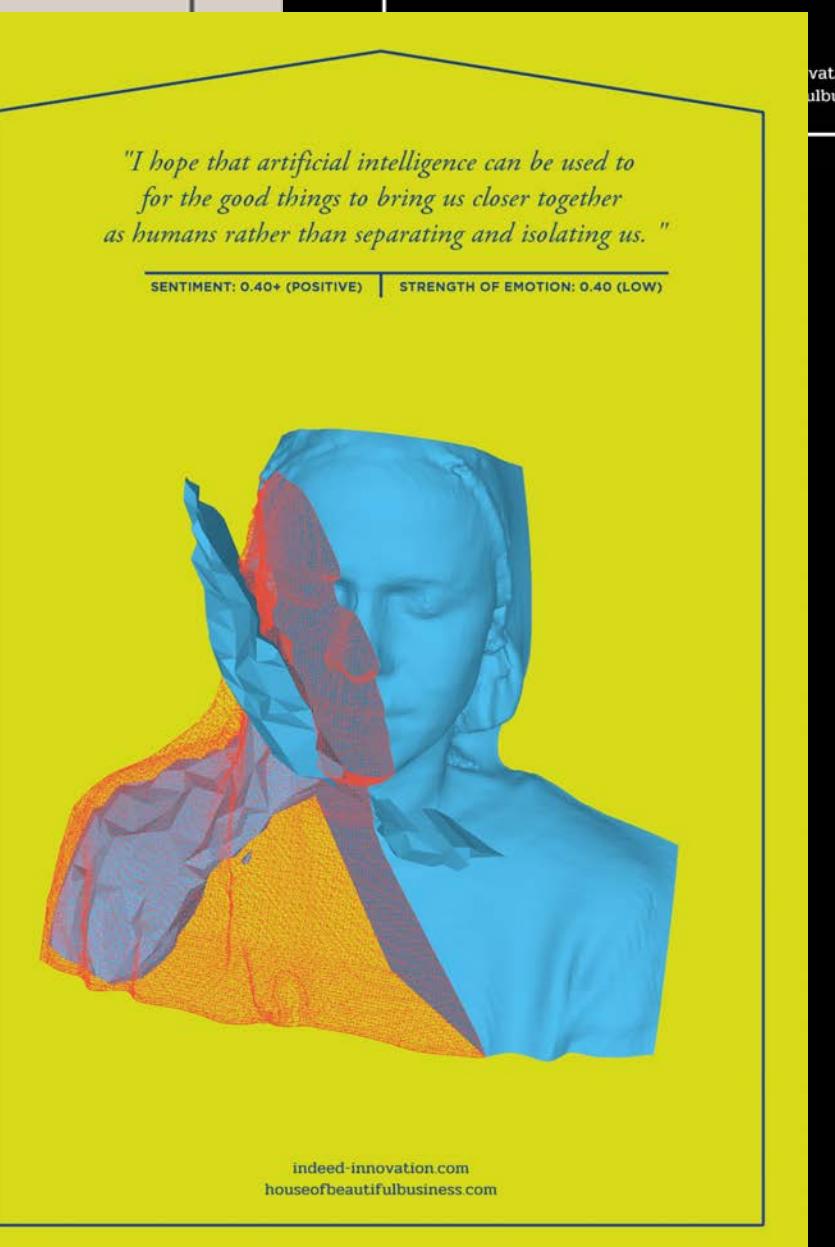
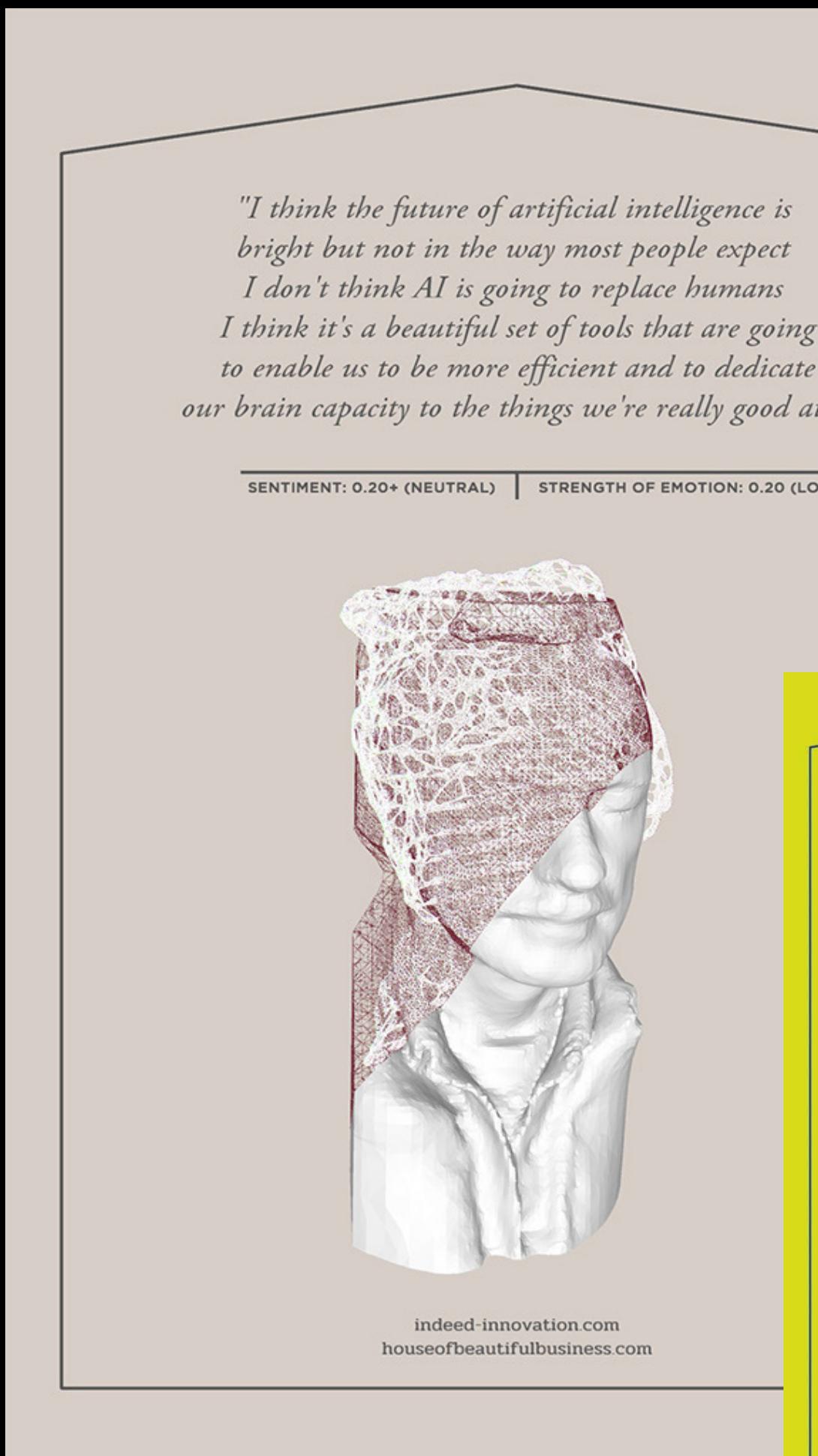
**TEAM**

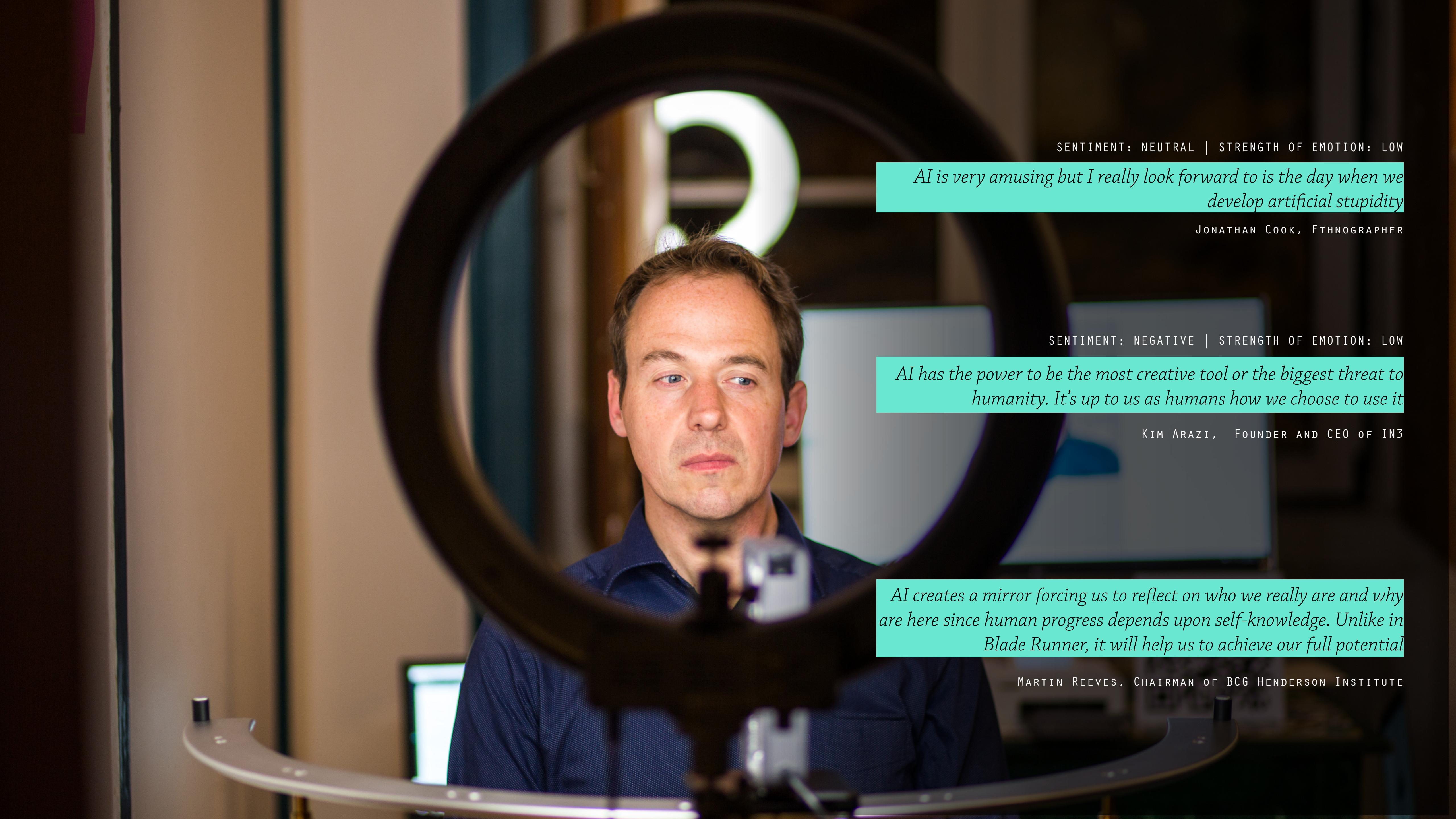
Creative Technologist 1, Graphic Designer 1

**EXHIBITION**

House of Beautiful Business (2017)







SENTIMENT: NEUTRAL | STRENGTH OF EMOTION: LOW

*AI is very amusing but I really look forward to is the day when we develop artificial stupidity*

JONATHAN COOK, ETHNOGRAPHER

SENTIMENT: NEGATIVE | STRENGTH OF EMOTION: LOW

*AI has the power to be the most creative tool or the biggest threat to humanity. It's up to us as humans how we choose to use it*

KIM ARAZI, FOUNDER AND CEO OF IN3

*AI creates a mirror forcing us to reflect on who we really are and why are here since human progress depends upon self-knowledge. Unlike in Blade Runner, it will help us to achieve our full potential*

MARTIN REEVES, CHAIRMAN OF BCG HENDERSON INSTITUTE



### 3D SCAN

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



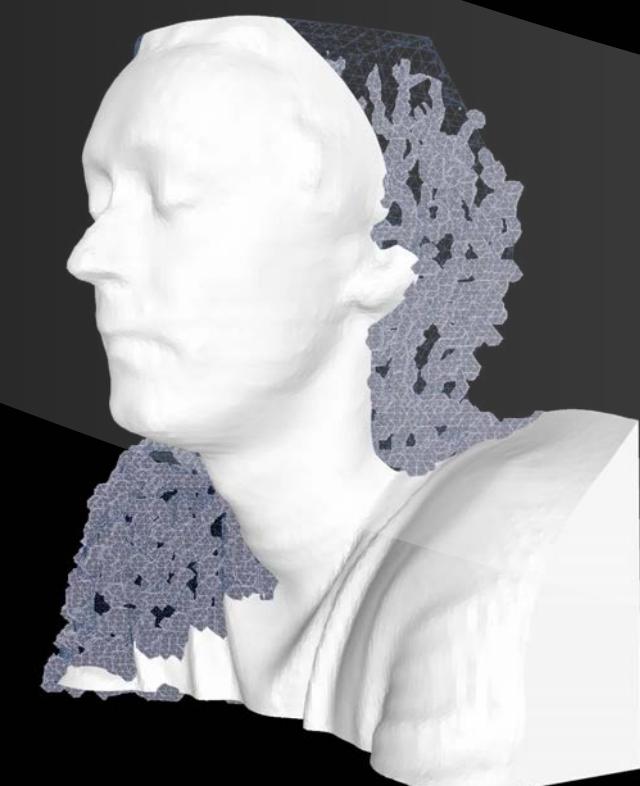
Now Cutting the Mesh with a Plane

### 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

### STRENGTH

0 - Infinity

### MESH DISTORTION

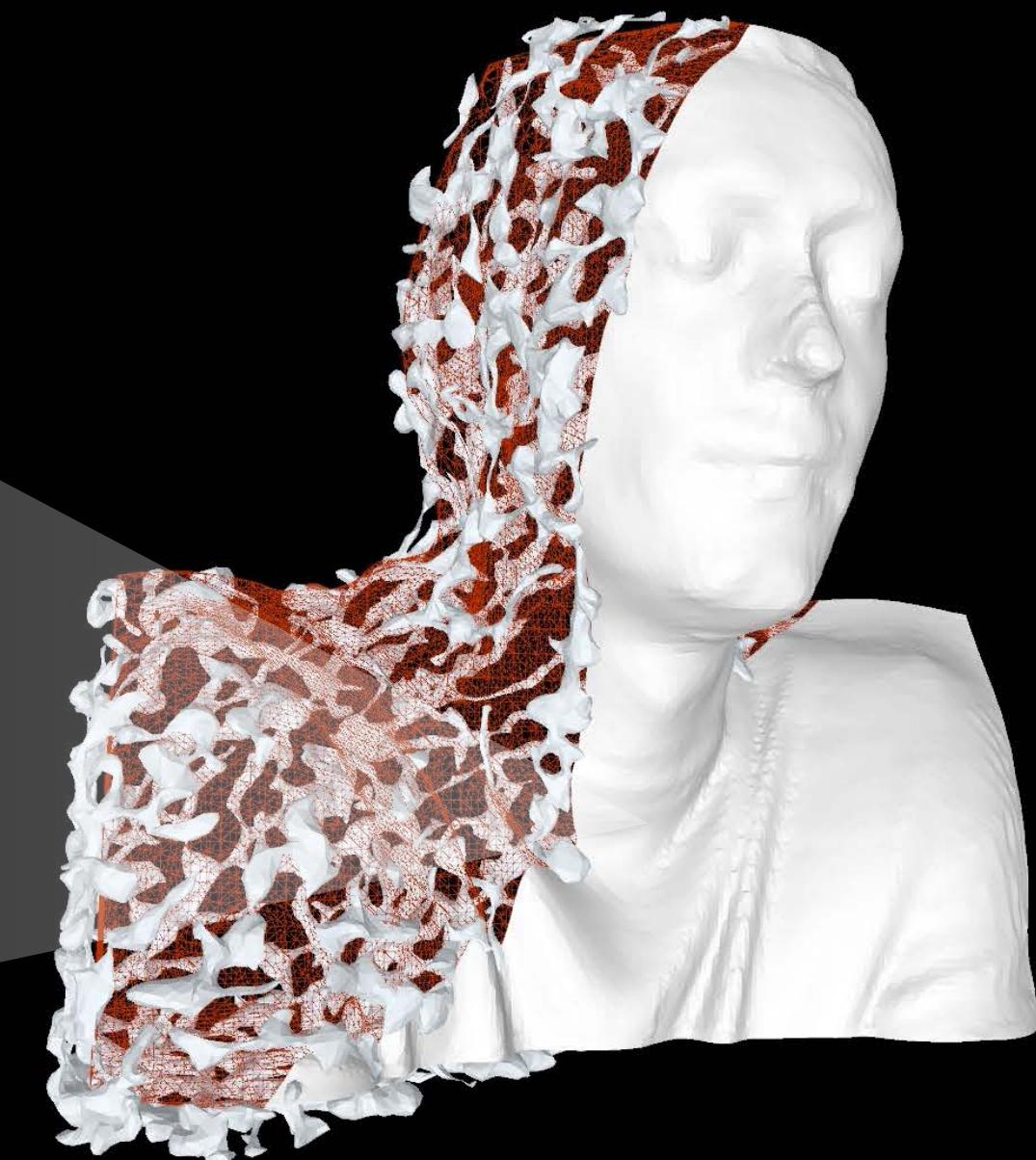
A mesh goes through distortion scheme depending on the result from emotional analysis

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

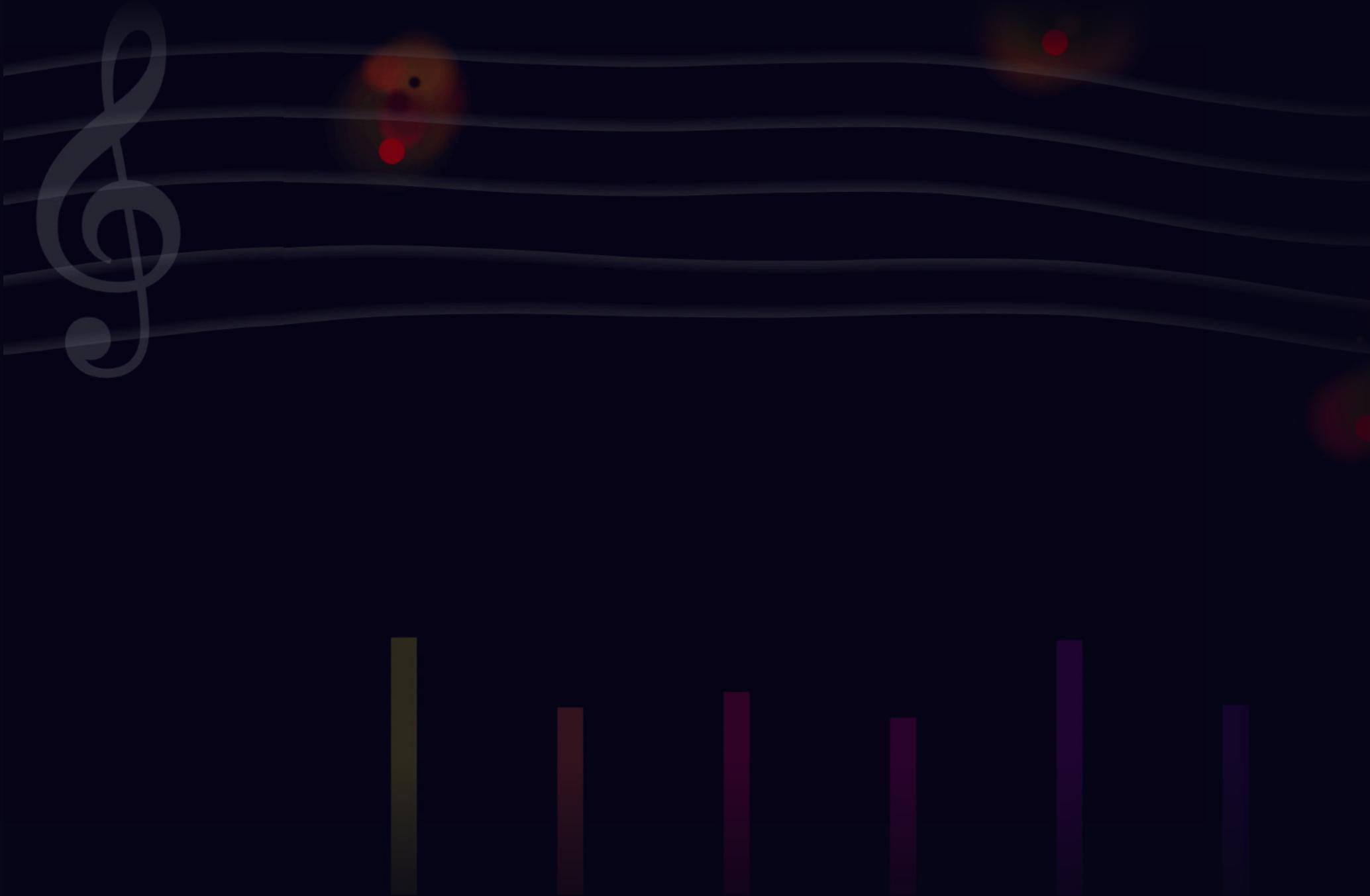
### CARD GENERATION

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

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

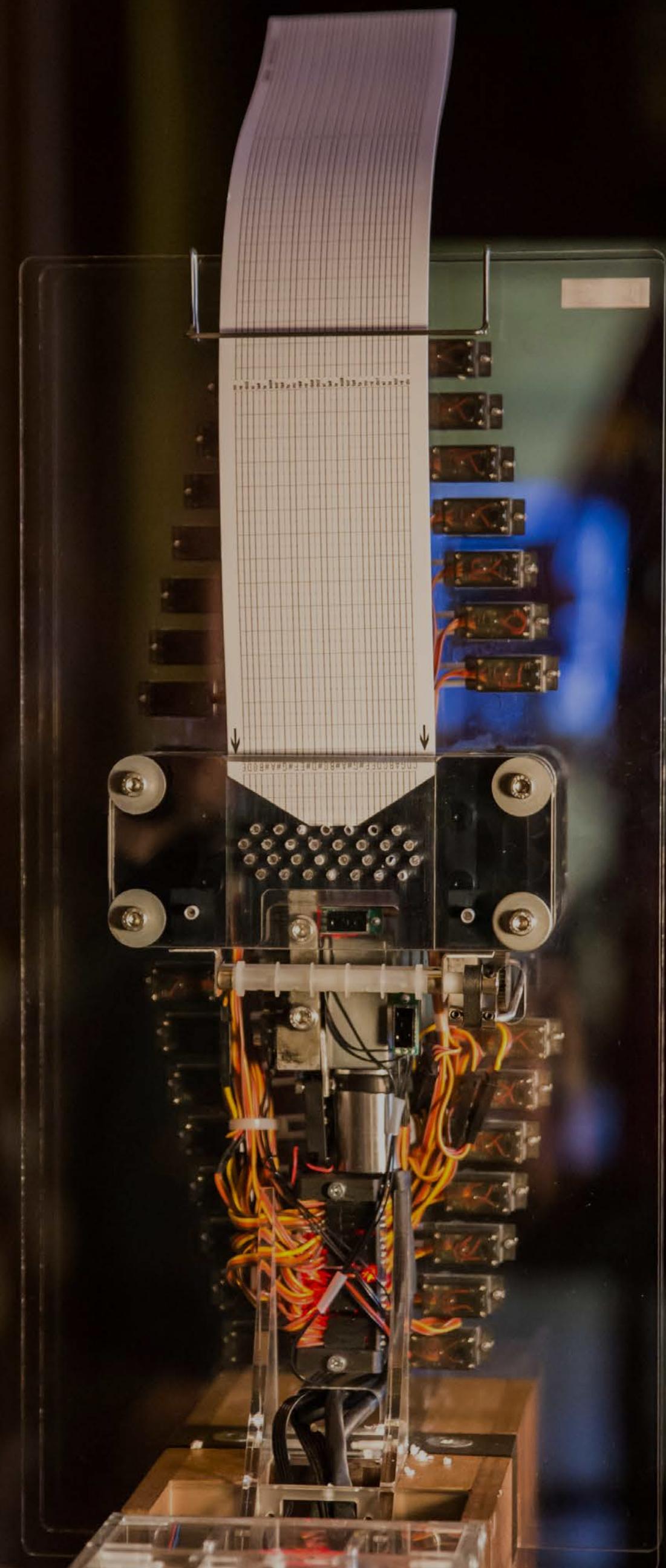
Embedded (Arduino), Frontend (Javascript), Engine (Magenta.js)

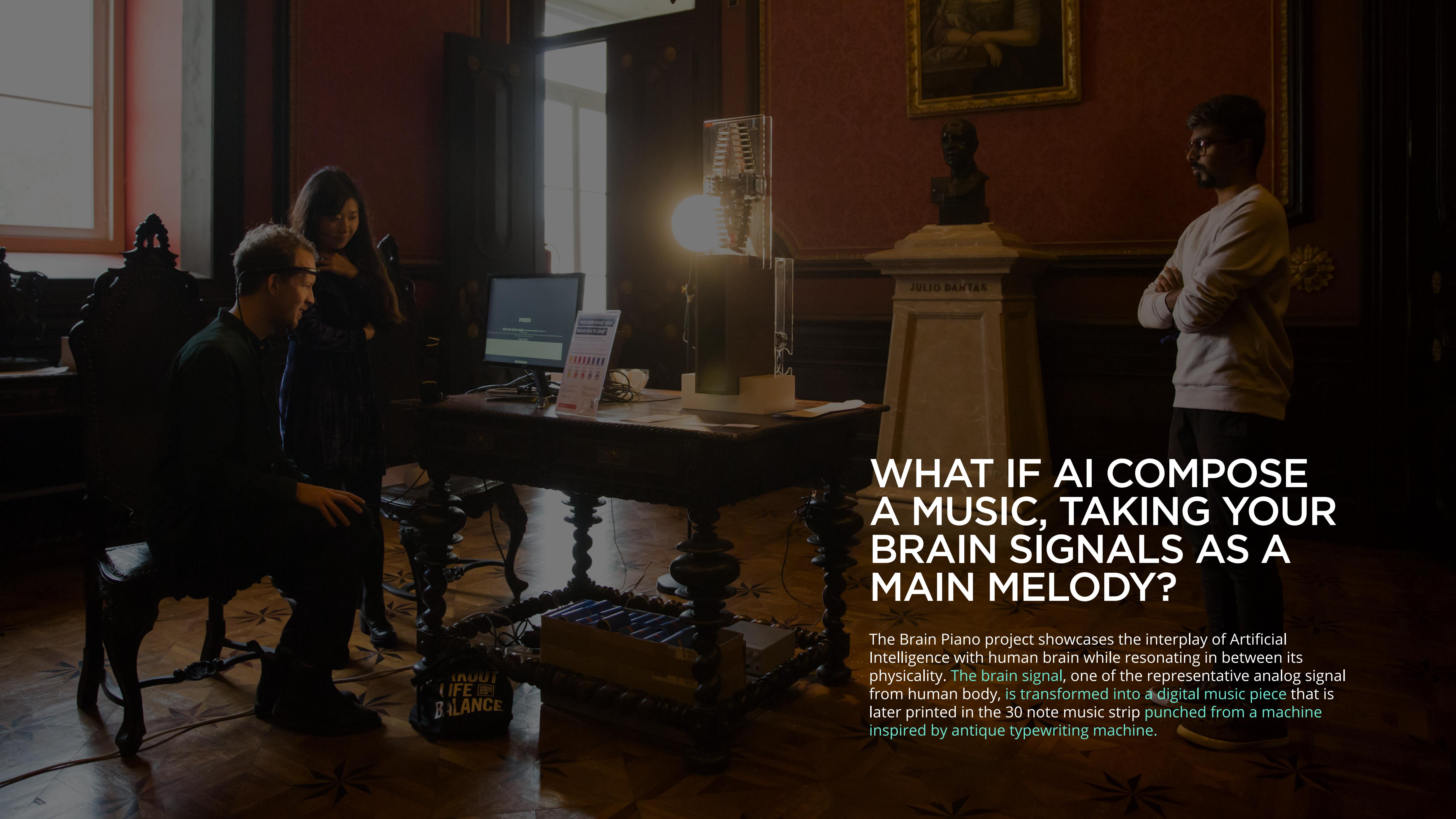
## TEAM

Creative Technologist 1, mechanical engineer 2

## EXHIBITION

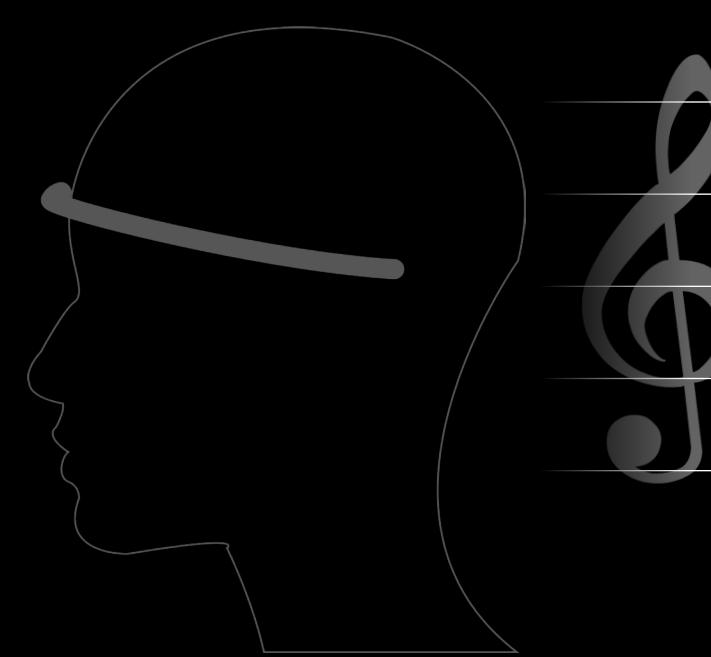
House of Beautiful Business (2019)





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

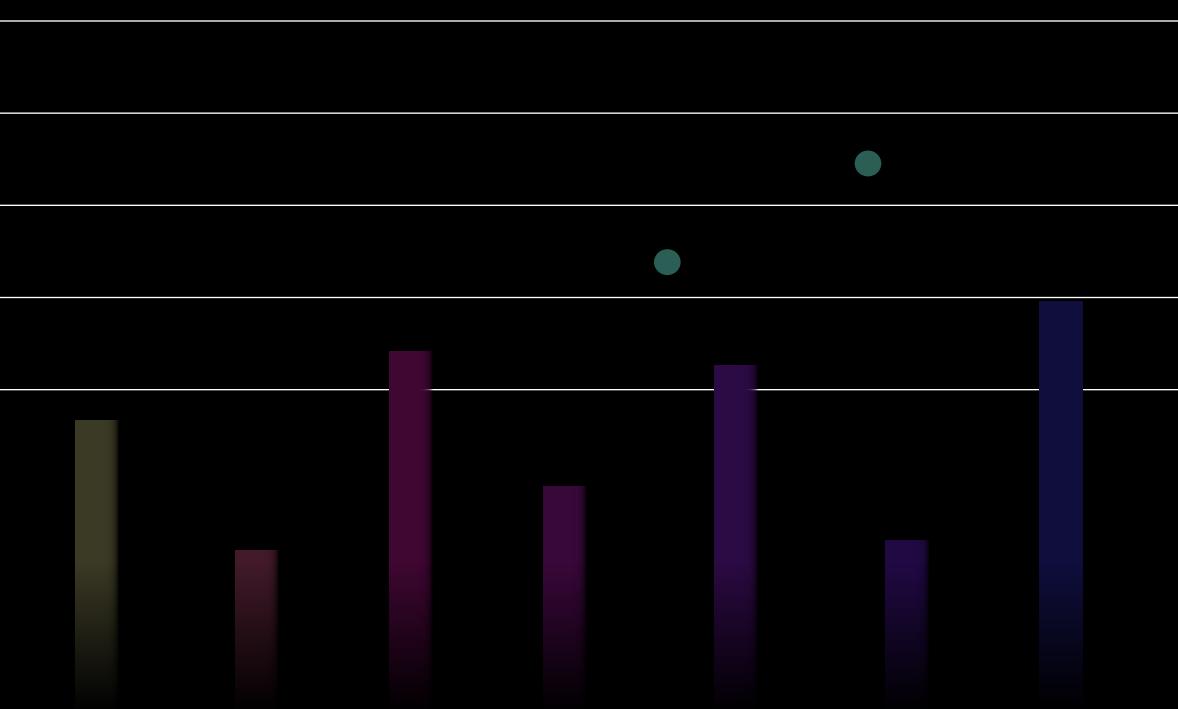
The Brain Piano project showcases the interplay of Artificial Intelligence with human brain while resonating in between its physicality. [The brain signal](#), one of the representative analog signal from human body, is transformed into a digital music piece that is later printed in the 30 note music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



#### BRAIN INTERFACE

##### **READ BRAIN SIGNAL FROM A PARTICIPANT**

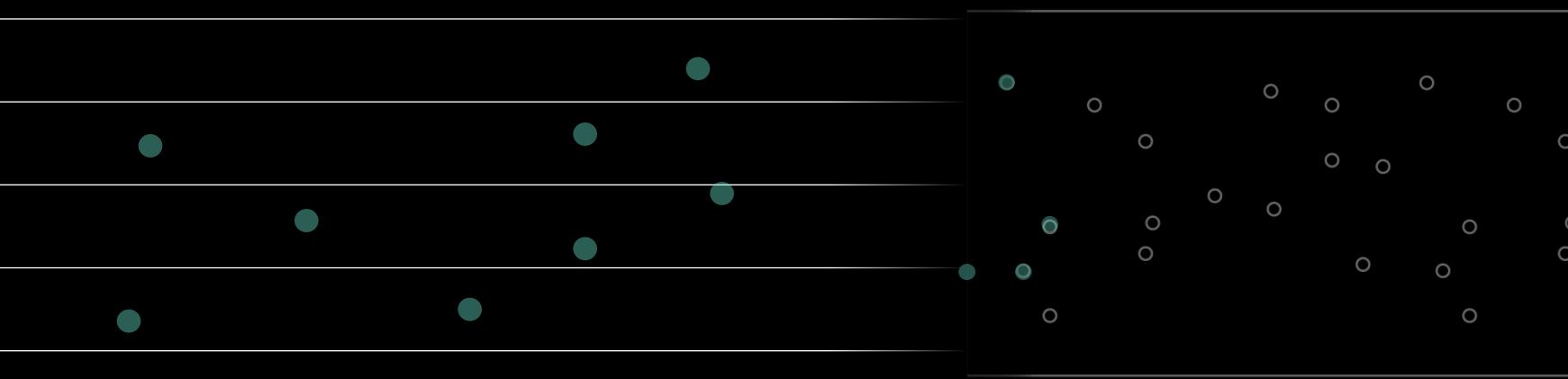
A brain interface with [EEG](#) sensors reads brain signals from a participant



#### CLIENT (HTML/CSS/JAVASCRIPT)

##### **CONVERT BRAIN SIGNALS INTO A MELODY LINE**

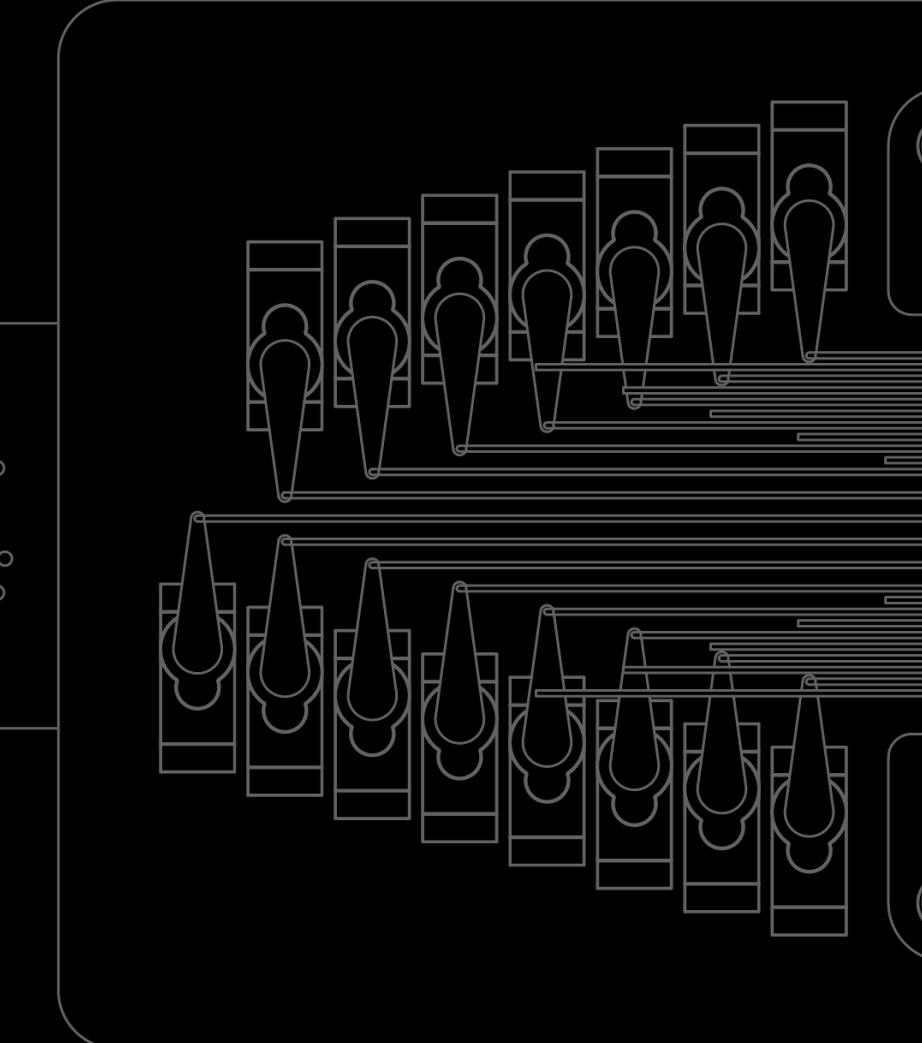
Eight raw brain signals act as [fingers](#) and generate [melody](#) by hitting the hidden piano on the web interface.



#### SERVER (PYTHON=FLASK)

##### **AI TAKING THE MELODY LINE AND COMPOSE POLYPHONIC MUSIC**

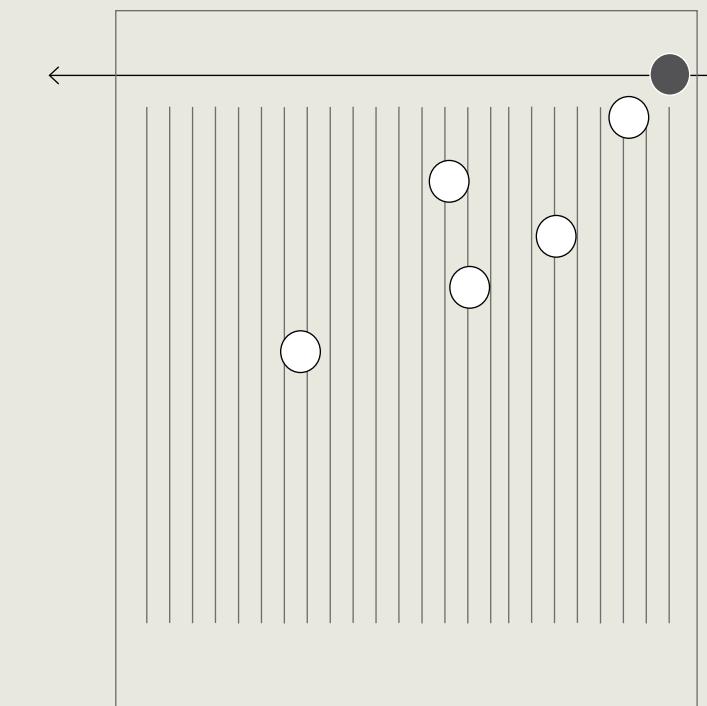
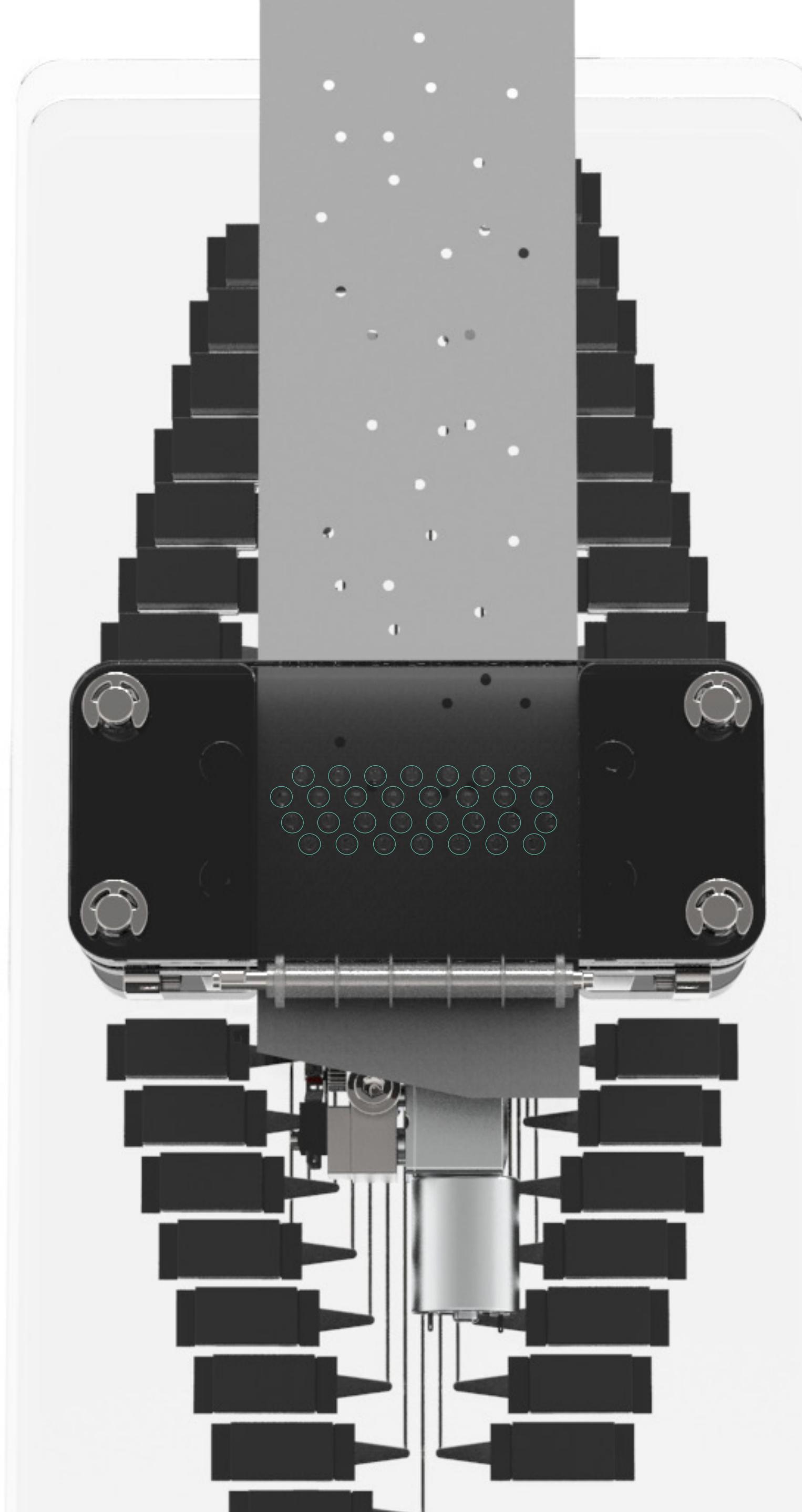
Artificial Intelligence engine takes the melody line and [compose](#) music in the style of Bach.



#### PUNCHING MACHINE (ARDUINO)

##### **MACHINE PLAYS MUSIC AS IT IS COMPOSED**

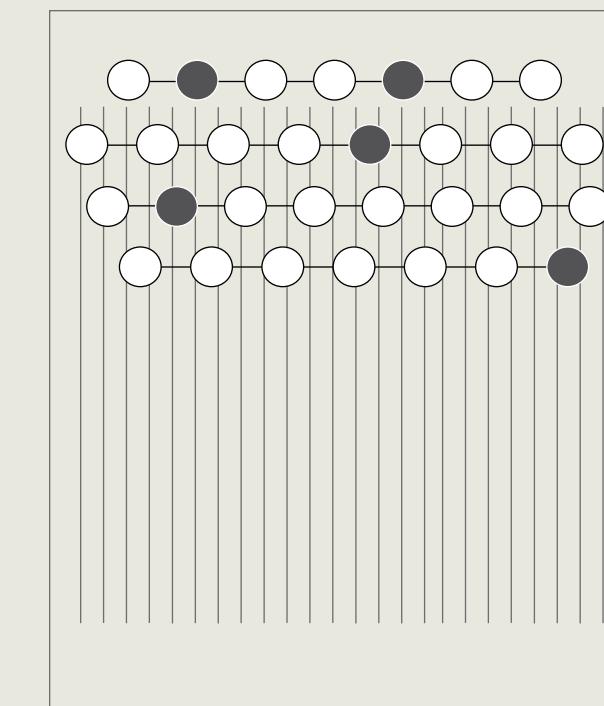
The resulting music is optimized for 30 scale music notes and [punched on to the paper sheet](#) while the resulting music is [uploaded](#) to the web cloud.



### 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.

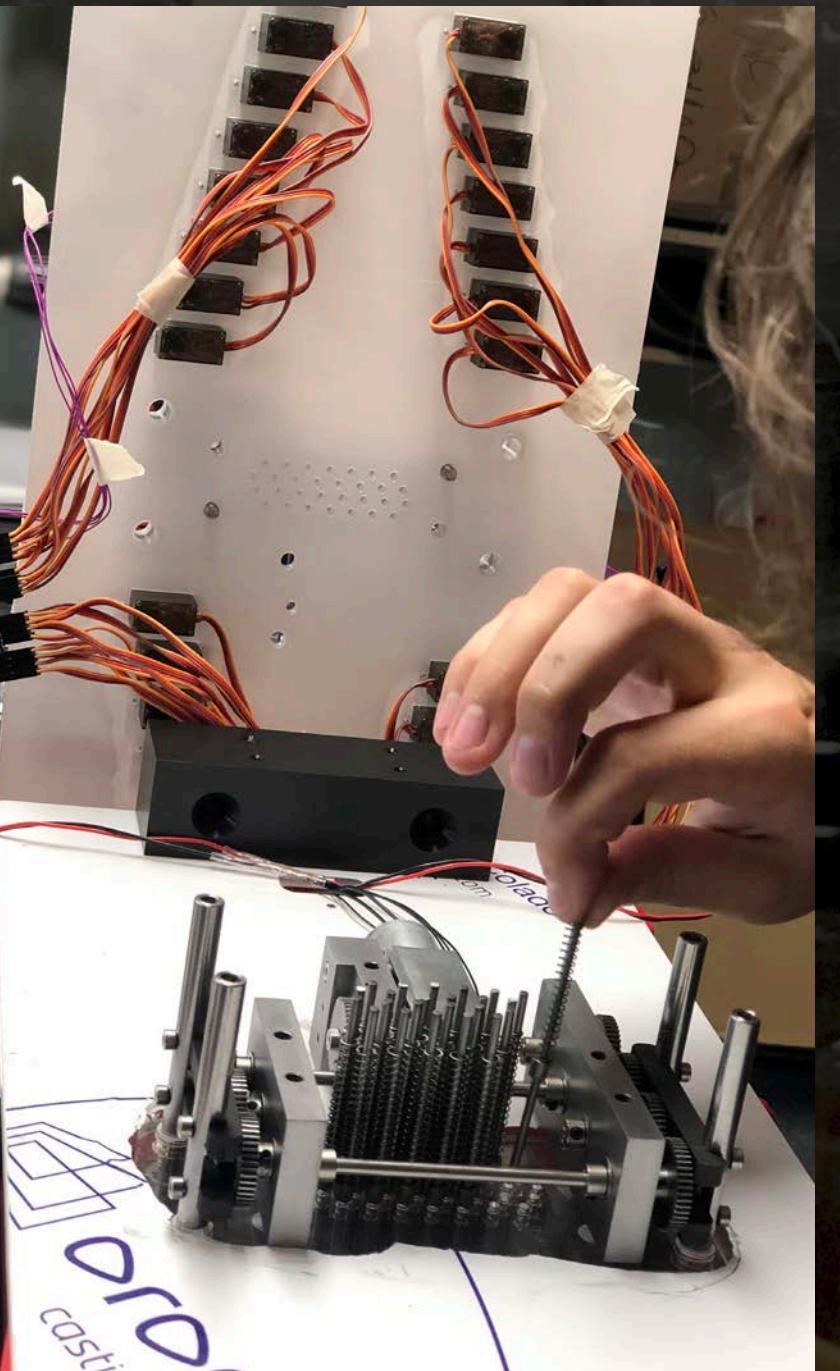
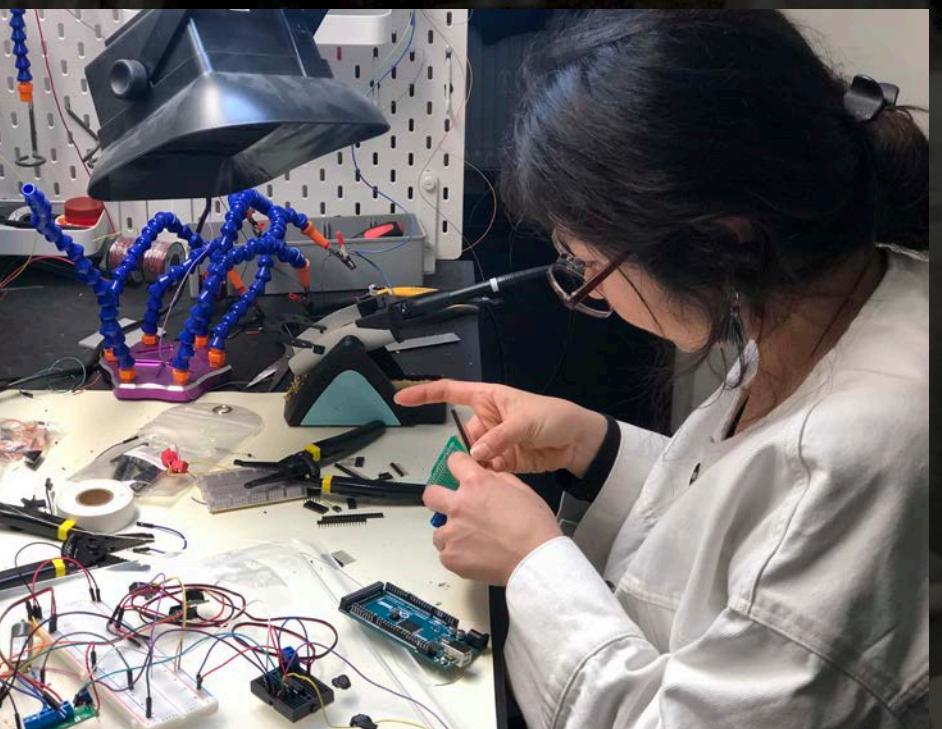
As a result, 30 notes were arranged in 4 lines (7-8-8-7) and designed to punch multiple holes for each line as the punching progresses. 30 servo motors that open/close the hole were individually controlled with the streamed machine commands from the web server.

# 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.

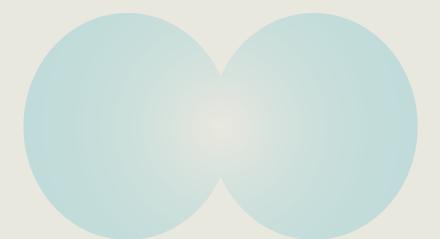
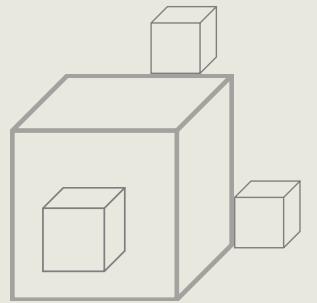
FIND MORE STORIES FROM FOLLOWING LINK  
[PERSONAL BLOG](#)    [INDEED JOURNAL](#)



## CREATIVE IoT DEVELOPMENT

These projects are conceptual IoT project mostly presented or demonstrated in academic conferences. Though a conceptual prototype, it was designed through iterative design processes, validated by small group of users.

ARTISTIC



PRAGMATIC



## RATCHAIR

Furniture moving itself with vibration



## CALM AUTOMATON

A DIY toolkit for ambient displays

2016

# RATCHAIR

Furniture moving 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](#).

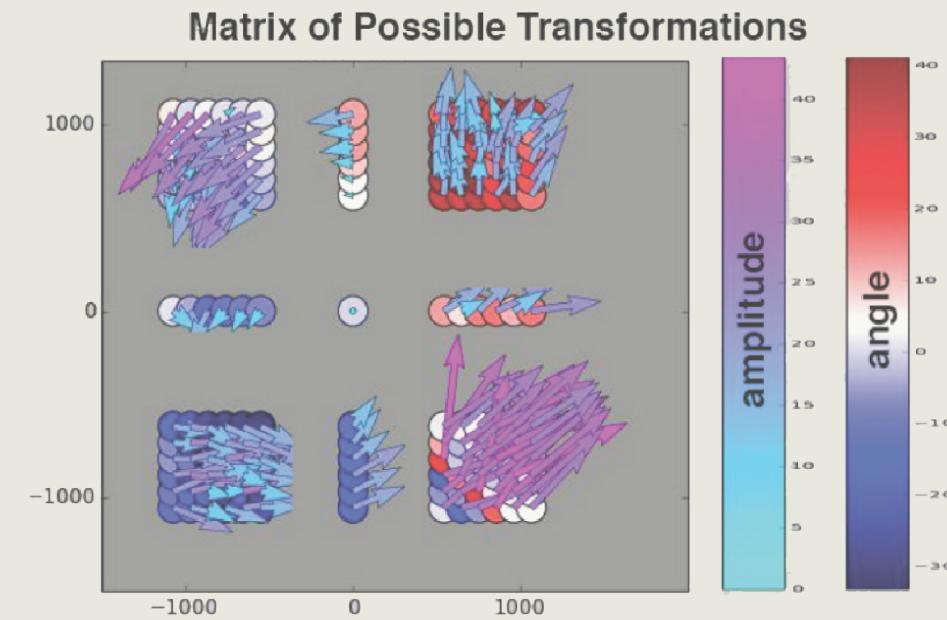
Tetiana Parshakova, Minjoo Cho, Alvaro Casinelli, Daniel Saakes  
SIGGRAPH 2016, DC EXPO 2016



# MODULAR DESIGN

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





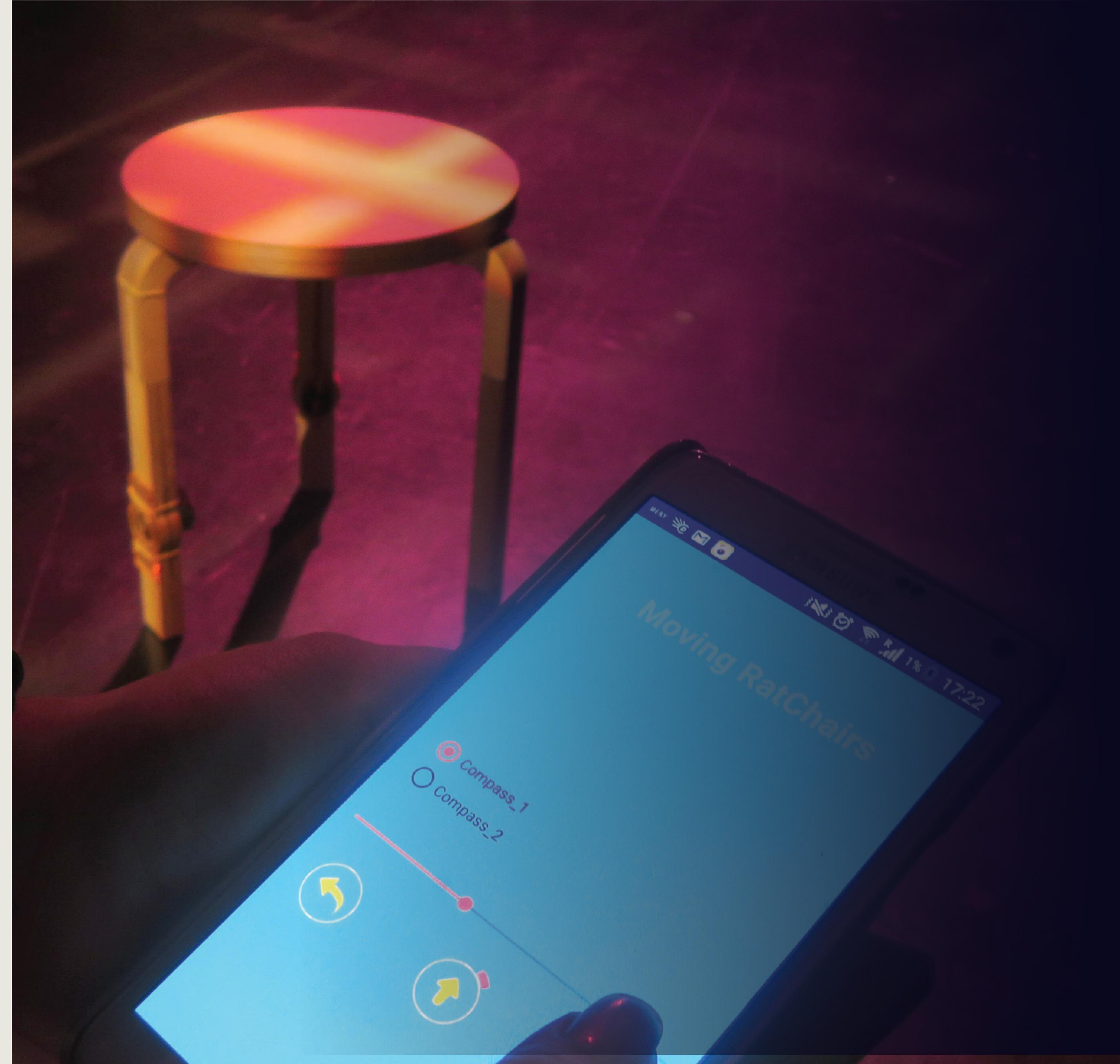
## LEARNING PHASE

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.



## PATH OPTIMIZATION

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



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

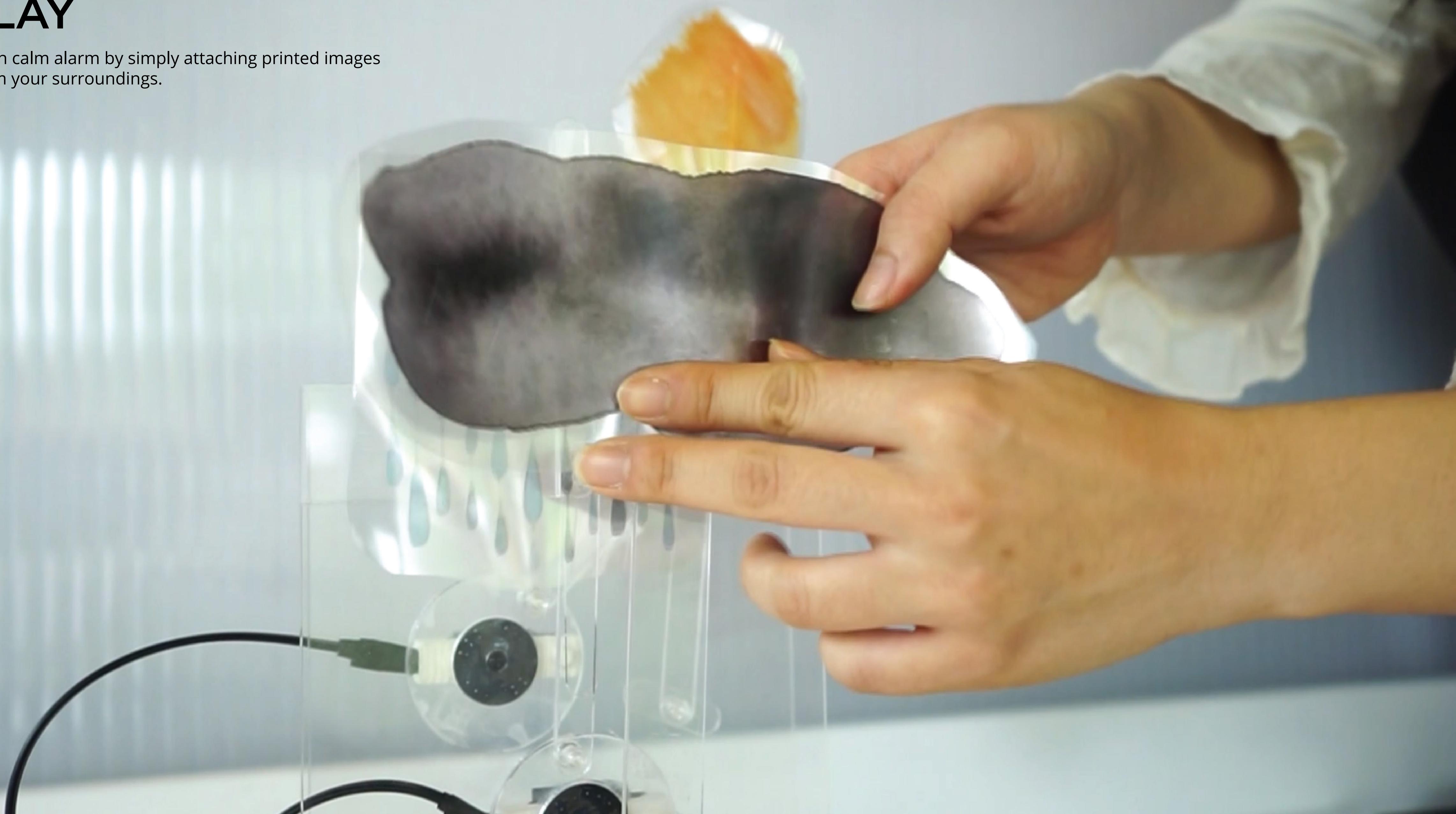
# SHAPE CHANGING DISPLAY WITH GENTLE NOTIFICATION

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



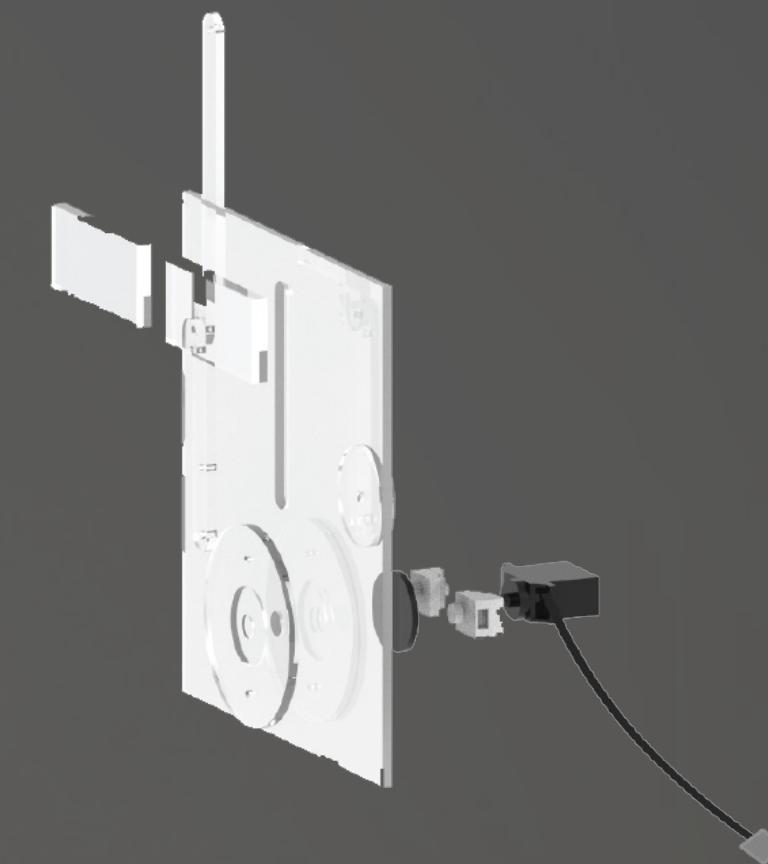
# USER CUSTOMIZABLE DISPLAY

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

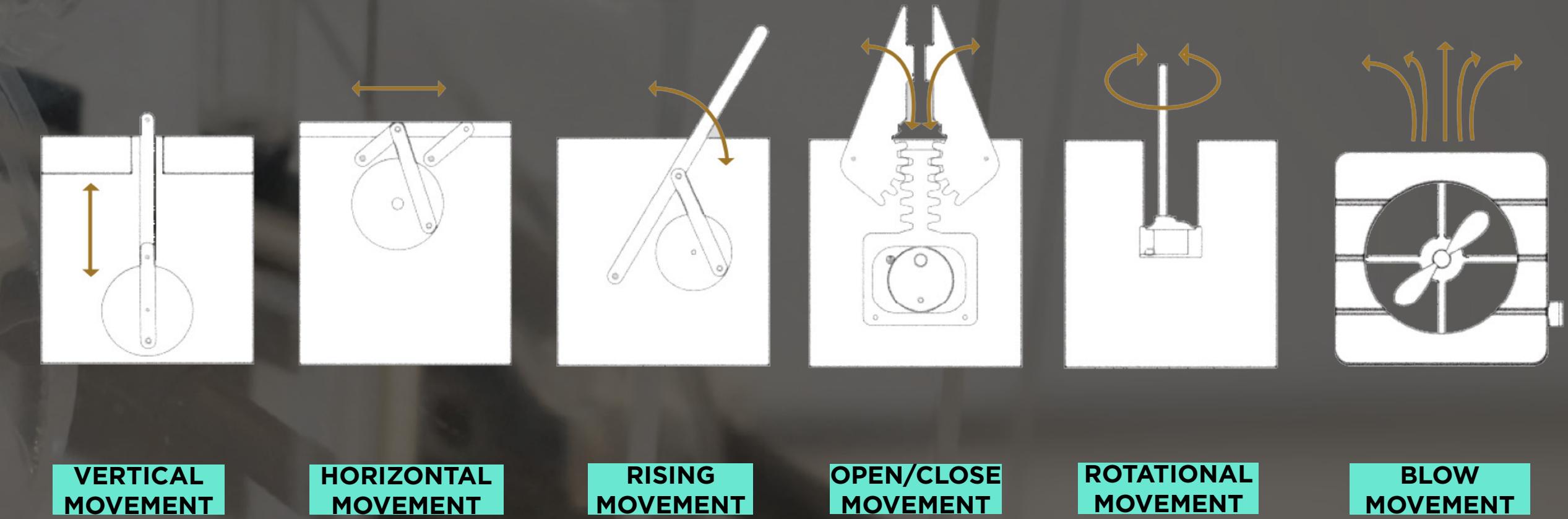


# 2D MECHANICAL LAYERS

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.

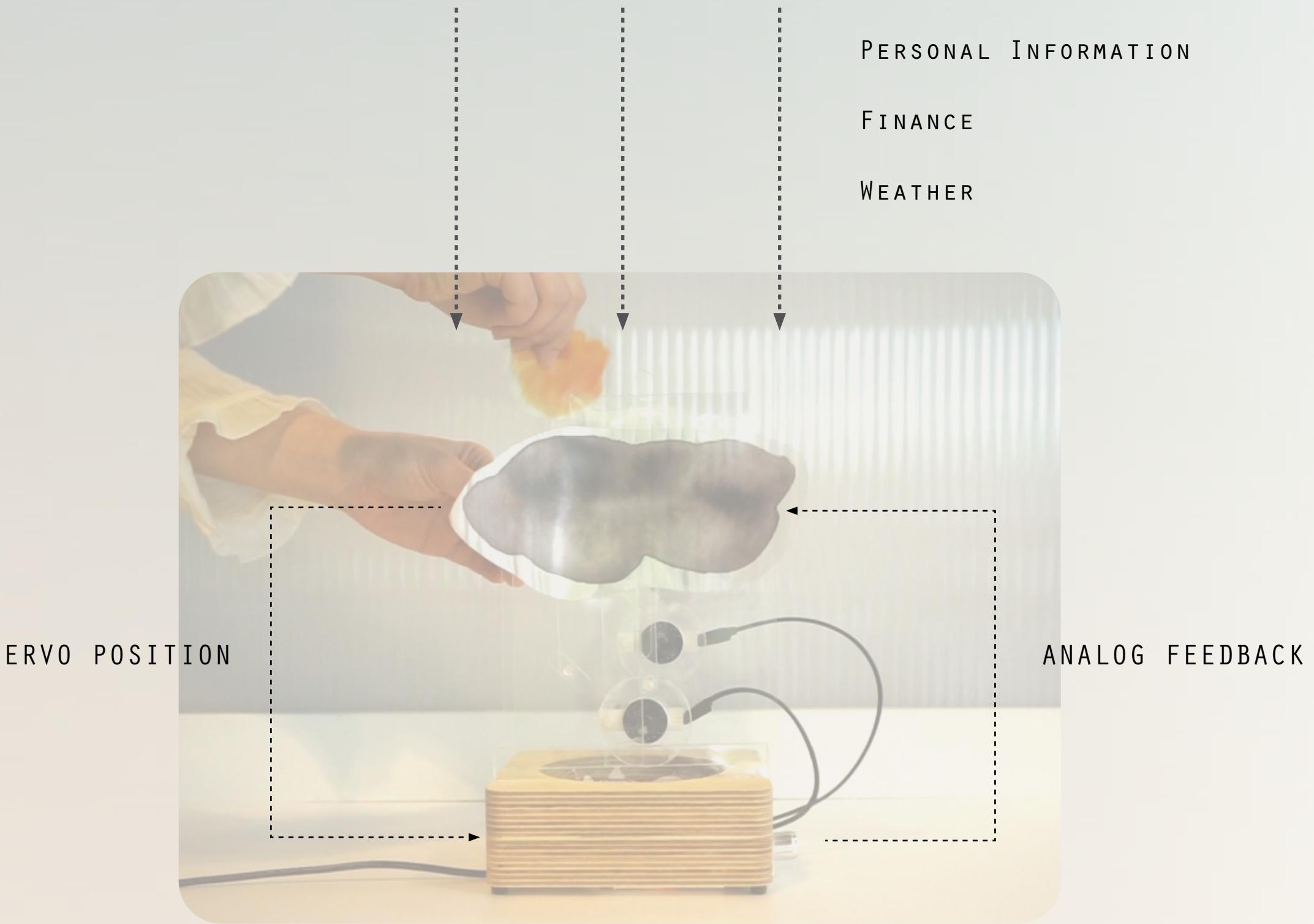


# SYSTEM DIAGRAM

READ XML FROM WEB PAGES

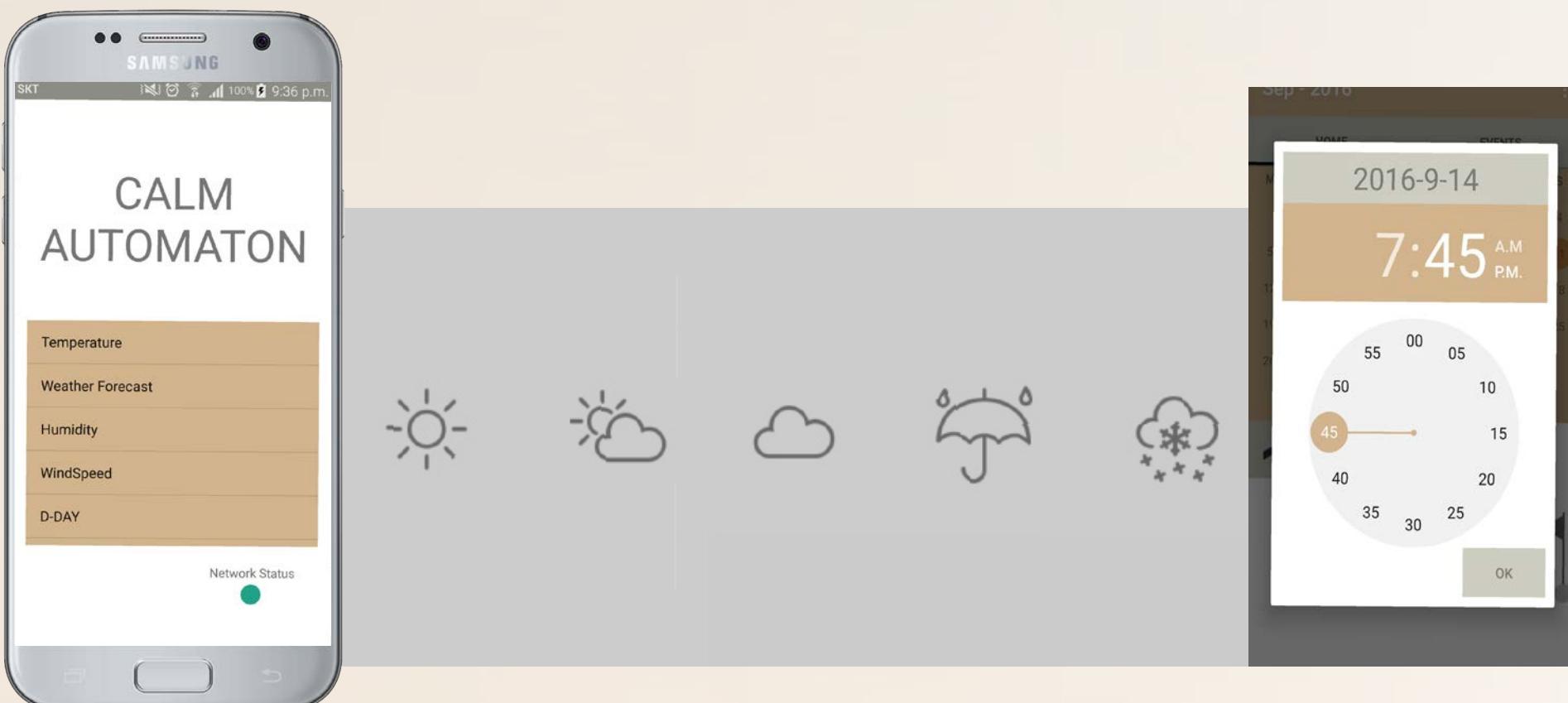
## Tangible Programming

Tangibly programming of the motion with web information

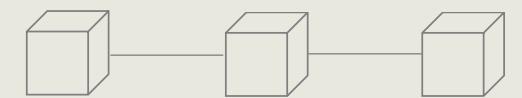


## Mobile Application

Select the type of information you want to be notified.



PRAGMATIC



## SMART TROLLEY

How can we track the food inventory in the air cabin  
without [RFID tags](#)?

## IoT CLEINT PRACTICES

These projects highlights my daily work in the current studio. As we all know, clients approaches us for the break through ideas, however, (not always but mostly) with strong technical limitations. Each project highlights journey of my thoughts to come up with solutions despite obstacles.



## DIGITAL STEAM

How can we [ensure users of the cleaning quality](#) while using steam device?

2018

# SMART TROLLEY

How can we track the food inventory in the air cabin  
with out RFID tags?

## ROLE

Form exploration , SW/HW development, System Integration

## DEVELOPMENT SCOPE

IoT proof of concept prototyping

## TEAM

PM 2, Creative Technologist 1

## CLIENT

An airline corporate

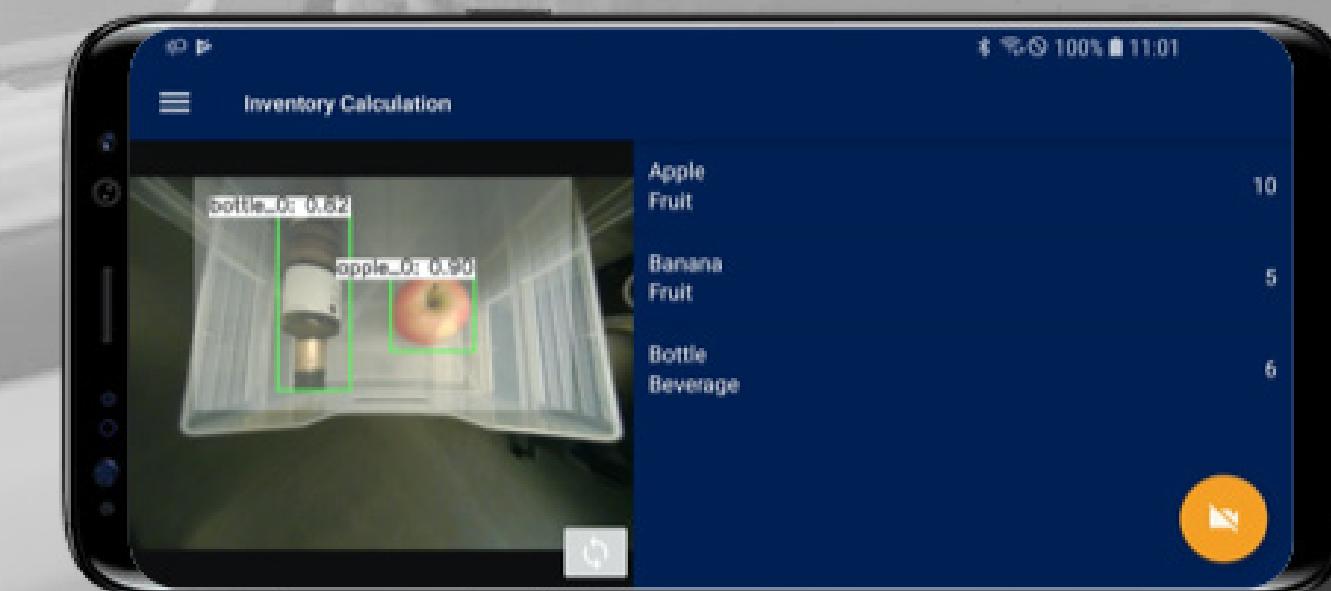
*Inventory Status*

Trolley ID : 001

Water bottle 30 (-1)

Chocolate 45 Beer  
cans 20

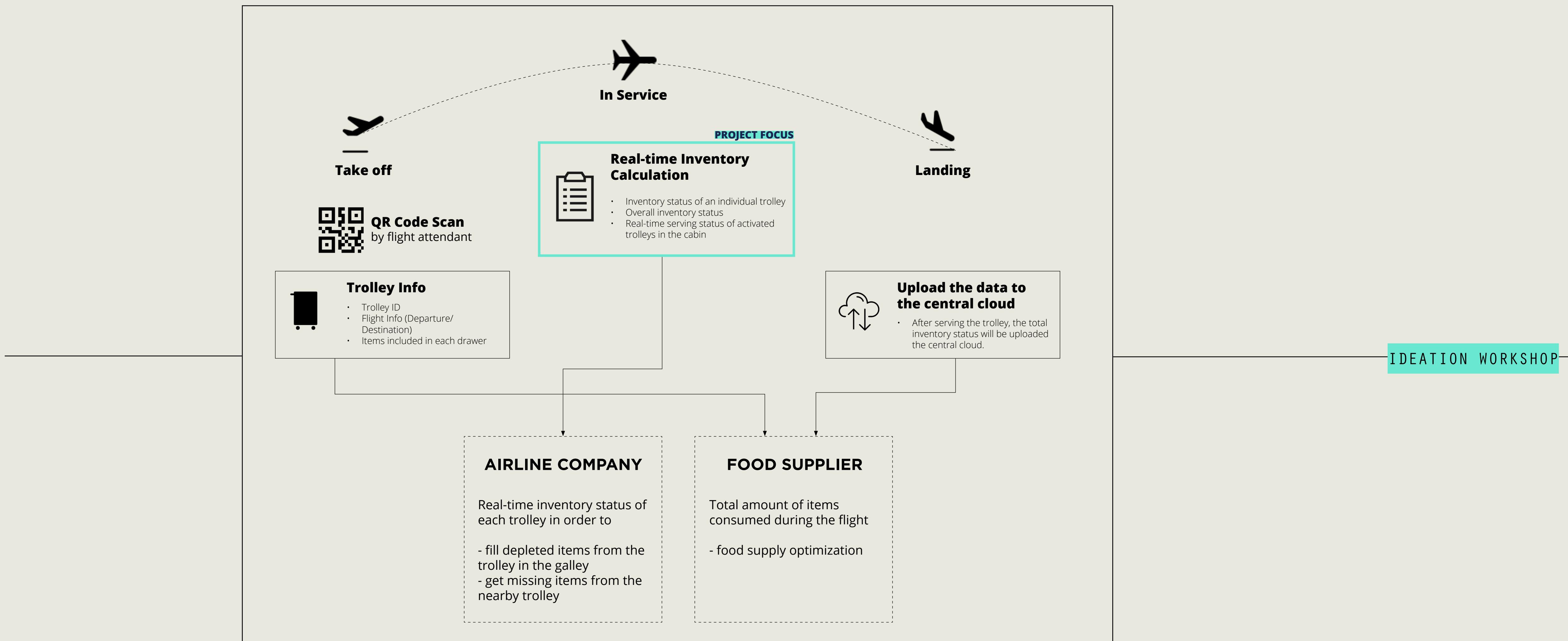
...



# IN FLIGHT INVENTORY TRACKING

Our client, one of the most renowned airline corporates, wanted to implement a **minimal invasive smart trolley solution** that tracks the items served in air cabins so that they can share the data with food supply chain to reduce wastes.

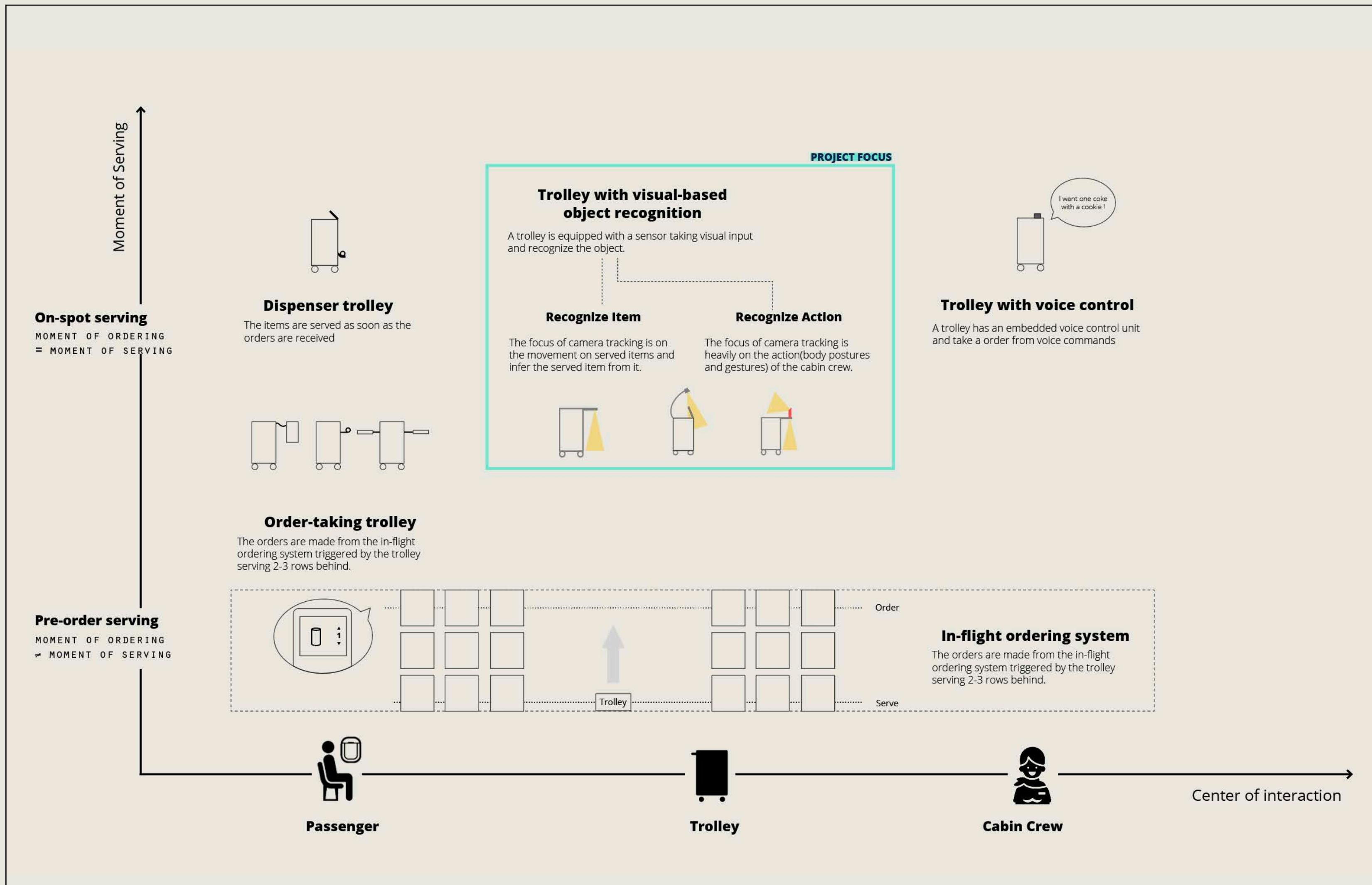
STAKEHOLDER MAP



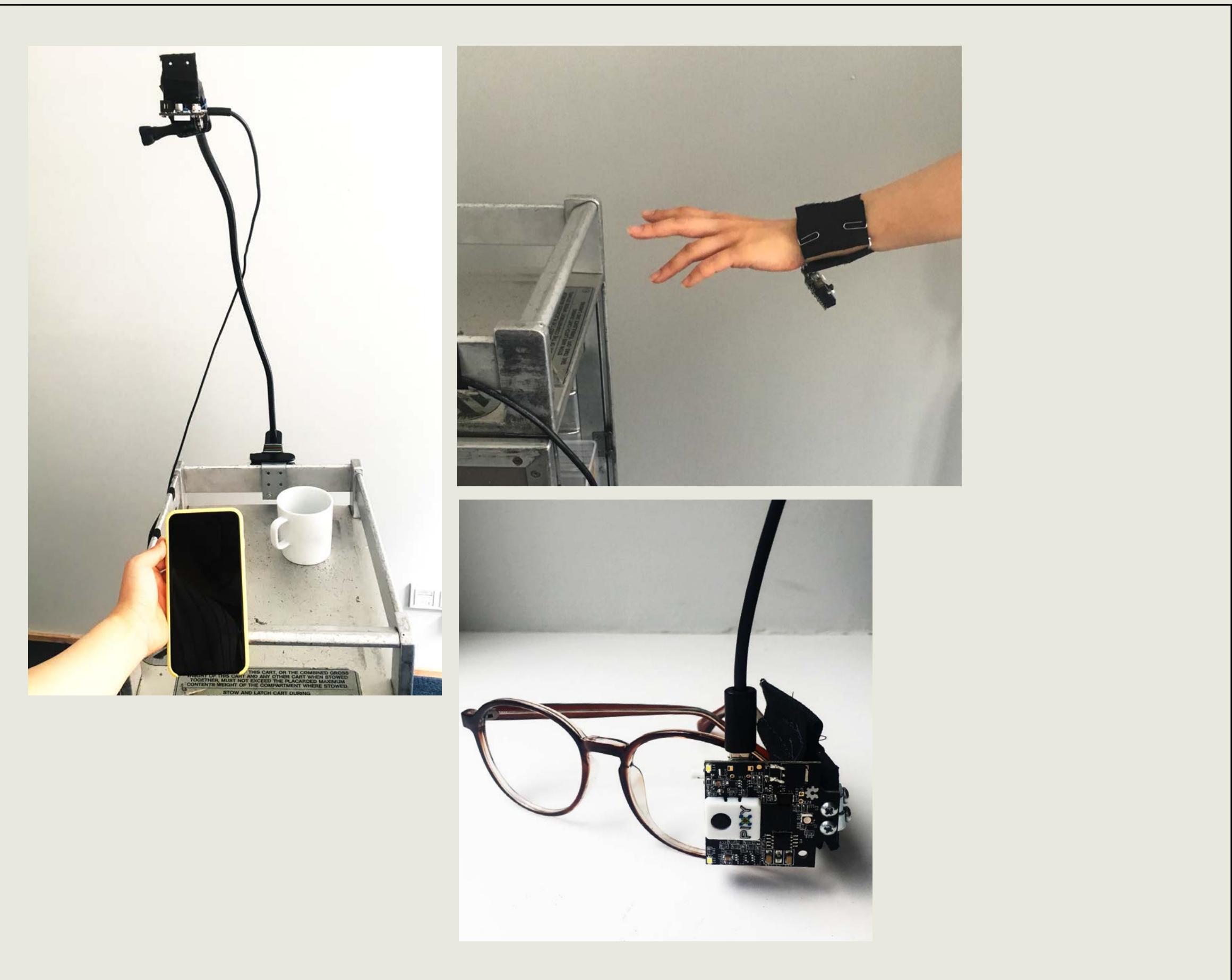
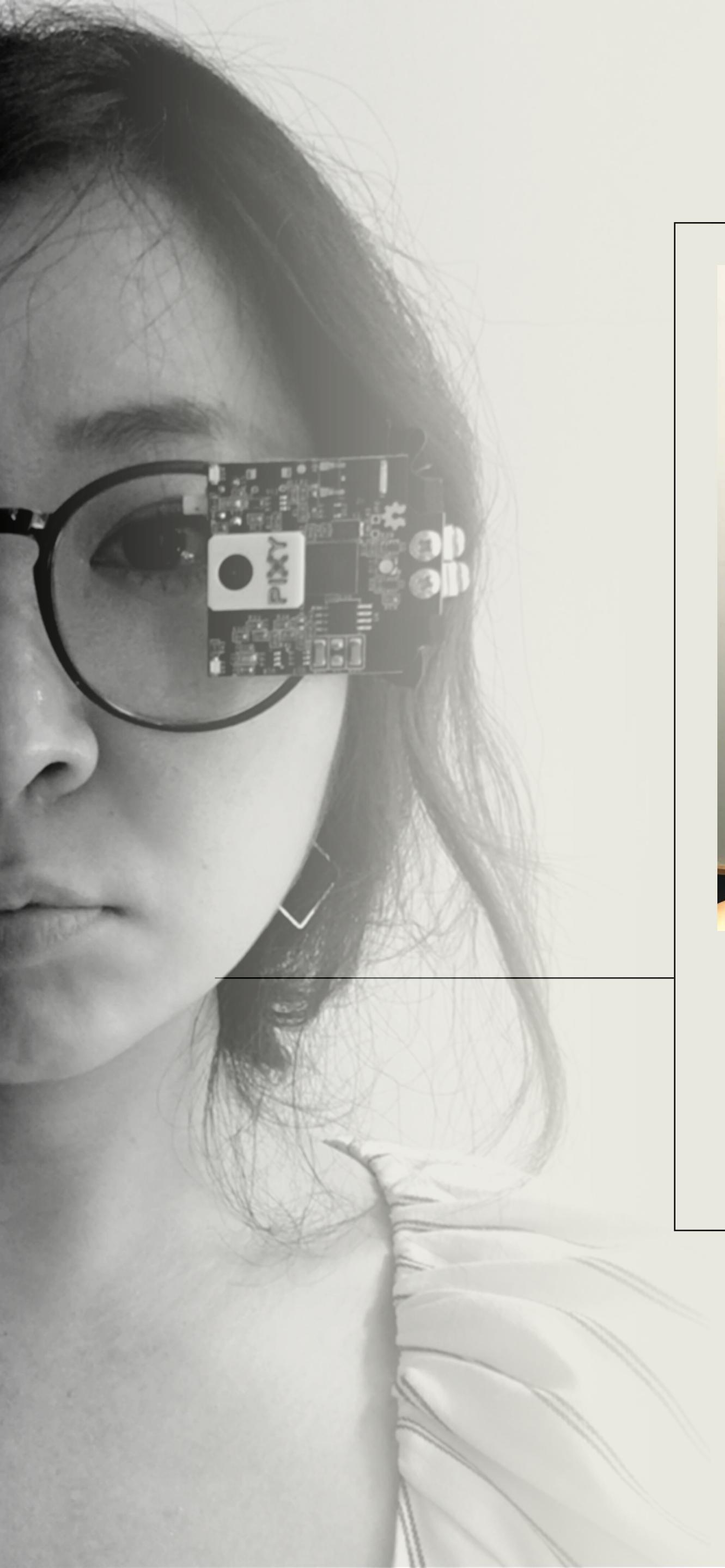
## TECHNOLOGY-SERVICE GRID

After a ideation workshop, various technical concepts are compared and reviewed under service framework mapping available approaches in two dimensional grid with two axes - focus of interaction and the moment of serving.

Visual-based object recognition is selected as it is considered to be the least invasive and the most plausible approach.



## ITERATIVE PROTOTYPING



## ITERATIVE PROTOTYPING

After the client agreed upon the visual-based technical approach, I explored through different camera with regard to it's locations.

I quickly iterated through ideas by iterative prototyping processes, and validated the feasibility by comparing the use case by role-playing the actual use case in the air cabin.

## PRETOPYING



### CAMERA BASED APPROACH

Item level tracking with camera-based object recognition

Utilize one mobile device on the top drawer to detect the movement of items

### DETECTABLE ITEMS (8 ITEMS)

Stückgut (Nuts / Chocolate bars)  
Cans (Coke / Sprite)  
Bottles (1 bottle of wine / 1 bottle of champagne)  
Duty-free items (2 different perfumes)

### RULES

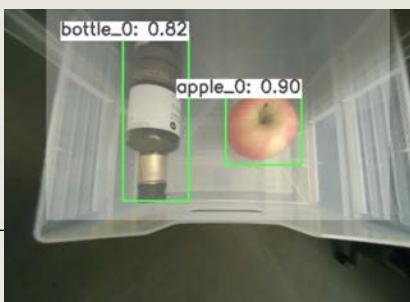
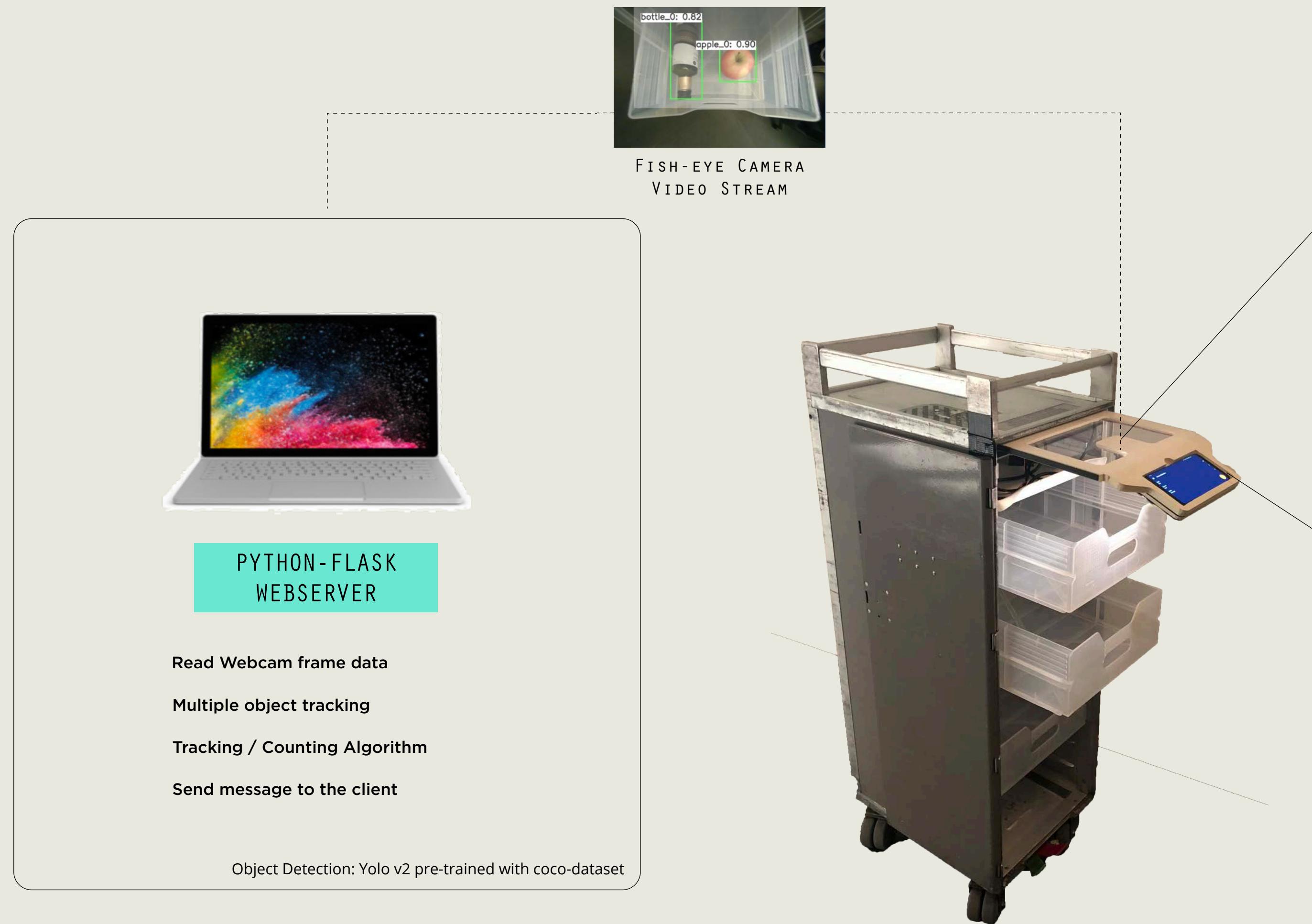
Only focus on the items only inside the drawers (we don't consider items placed on the table area)

### PRETOTYPING

Training custom machine learning model for object recognition required too much investment and efforts. Instead, we decided to validate concept with "pre"totype, a system that only works within pre-trained object recognition model.

### PRESENTATION

## PRETOTYPE SYSTEM OVERVIEW



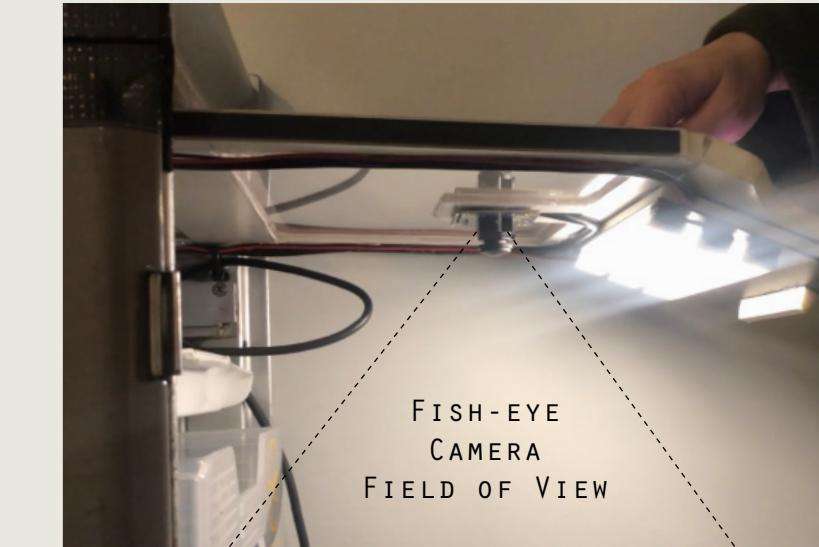
FISH-EYE CAMERA  
VIDEO STREAM



PYTHON-FLASK  
WEB SERVER

- Read Webcam frame data
- Multiple object tracking
- Tracking / Counting Algorithm
- Send message to the client

Object Detection: Yolo v2 pre-trained with coco-dataset



TRANSPARENT  
WORKING TABLE

Transparent working table to see-through items on the drawer

LED light on when mobile is placed on the charging station

Fish-eye Camera to track items in the drawers



MOBILE CLIENT  
(ANDROID)

Scan QR code to read initial inventory data

Add/deduct inventory as message from the server is received

Read real-time camera view from the server

2020 ~

# DIGITAL STEAM

Can we make a steamer smart so that users can receive feedback on the cleaning quality ?

**ROLE**

Form exploration , SW/HW development, System Integration

**DEVELOPMENT SCOPE**

IoT prototype (with AWS integration)

**TEAM**

PM 1, Creative Technologist , Mechanical Engineer 1

**CLIENT**

A home appliance company



# HOW CAN WE NOTIFY USERS OF THE CLEANING QUALITY OF A STEAM DEVICE?

Our client, a home appliance company wanted to make their steam mop models a bit more smarter so that **it notifies users if they are steaming the floor in a right temperature and the speed.**

CLEANING SCORE

35

FLOOR TYPE : WHITE WOOD

SPEED TOO LOW

CLEANING SCORE

95

FLOOR TYPE : CARPET

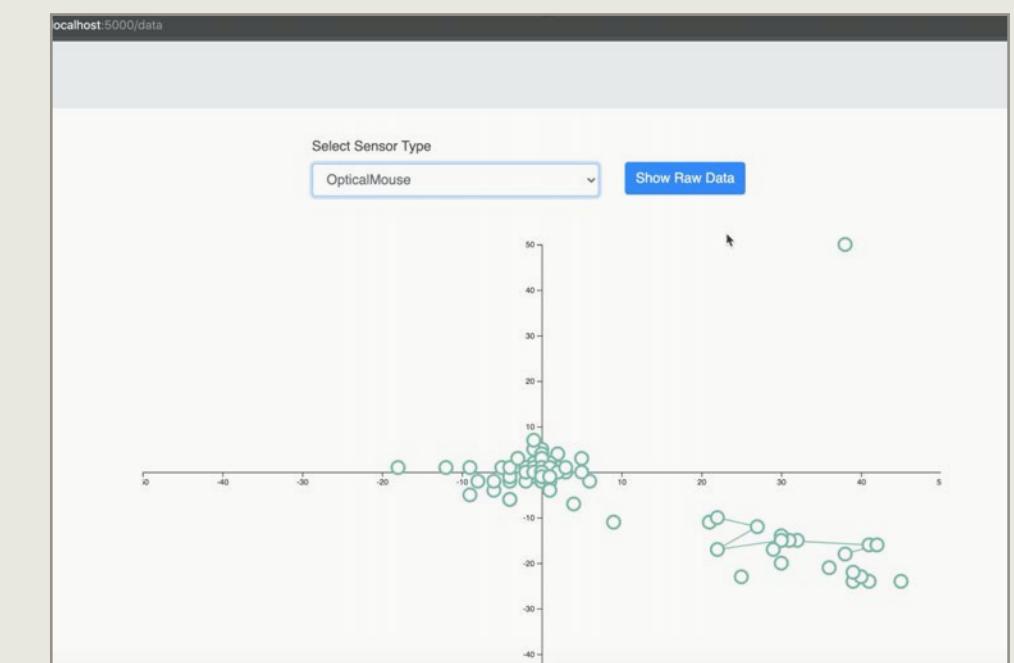
READY TO PROCEED



# PROTOTYPE DATAFLOWS

The sensor data collected from the device is stored in AWS Dynamo DB through MQTT protocol, and number of actuators are attached for the potential user feedback.

DIGITAL PROTOTYPE



AWS IoT Core

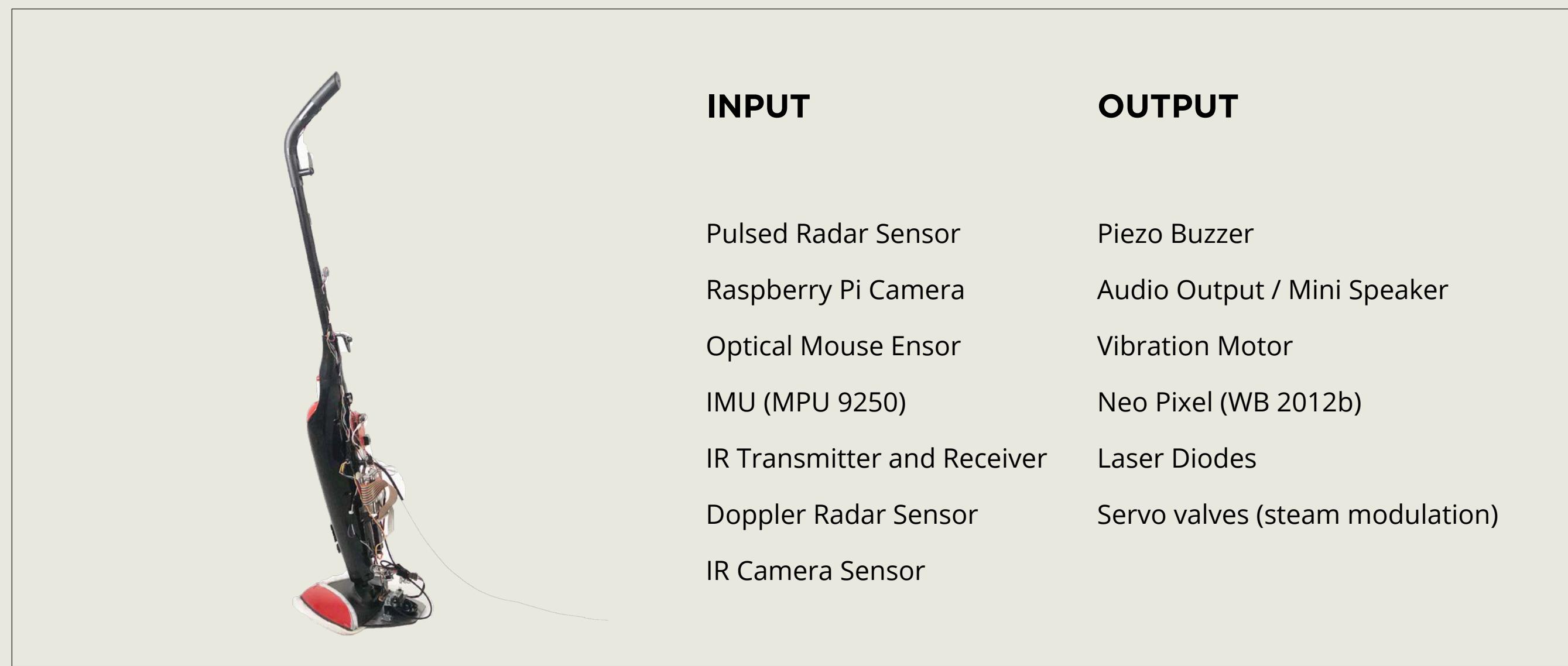


AWS Dynamo DB

STORE IN DATABASE

MQTT CLIENT  
MESSAGING

```
{  
  "message": {individual message  
depending on sensors},  
  "sensor_type": (Sensor name),  
  "row": (time_stamp)  
}
```



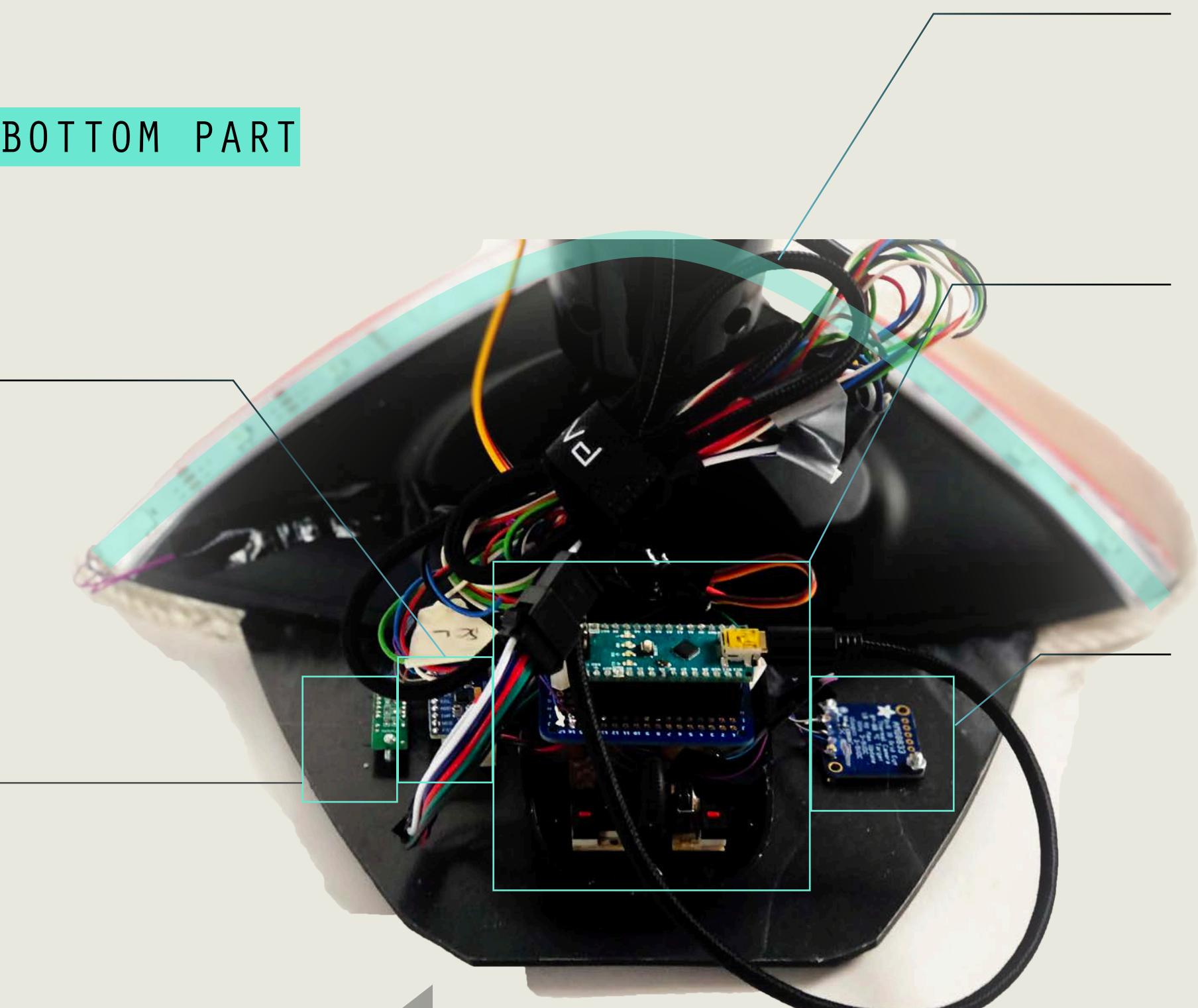
PYTHON-FLASK  
WEB SERVER

HARDWARE PROTOTYPE

DATA STREAMING  
(WEB SOCKET)

# BOTTOM MODULE FOR BETTER INTELLIGENCE

The core function of the bottom module is to get the sensor data to estimate the speed of the movement and floor type, and LED strips are attached to visualize the steamer states.



## MPU Sensor

Estimate the orientation of the steamer head

## IR Proximity Sensor

IR sensor detects if the steamer touches the floor

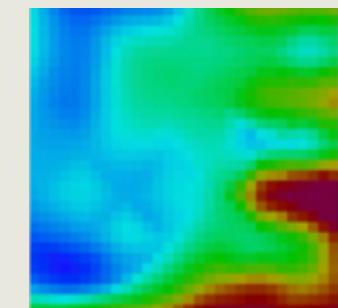
## Neo Pixel

Indication of steamer states by directional visualization with full color range

## Optical Mouse Sensor

Arduino Nano transmits the data read from the optical mouse sensor to Raspberry Pi via Seial port to estimate the movement of the device

## IR Grid Sensor

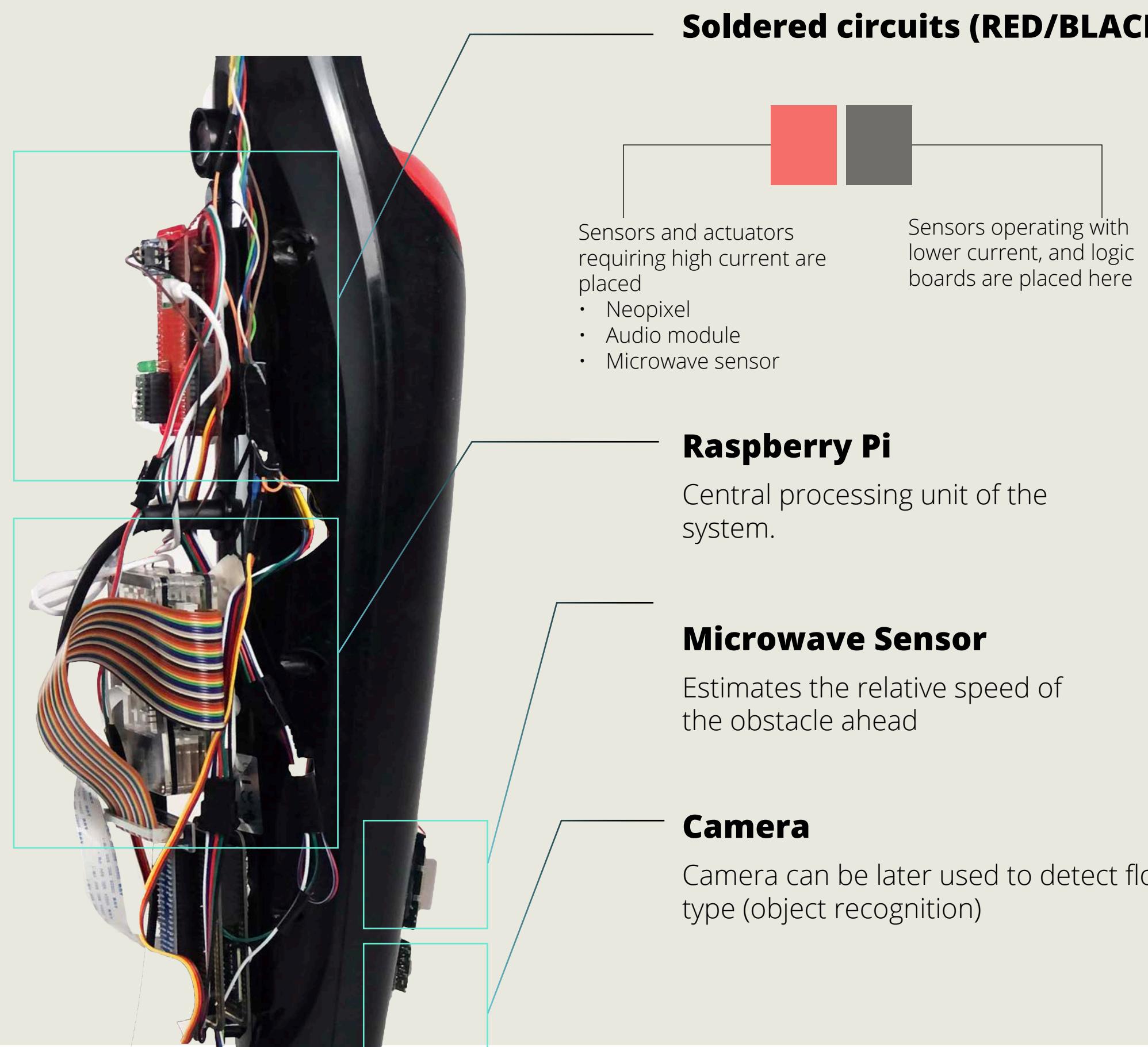


Measures the temperature of the floor in order to estimate the heat capacity of the floor.

# A CENTRAL PROCESSOR AND USER FEEDBACKS

The middle module is the heaviest unit having [Raspberry Pi](#) for the central processing and two circuits that interfaces the sensors and actuators. Top module has haptic actuator placed on the handle, and audio outputs (speaker / piezo buzzer) that will be used to indicate alert signals to the user

MIDDLE PART



TOP PART

