

Project 01

Intelligent Hemiplegic Rehabilitation Assistant

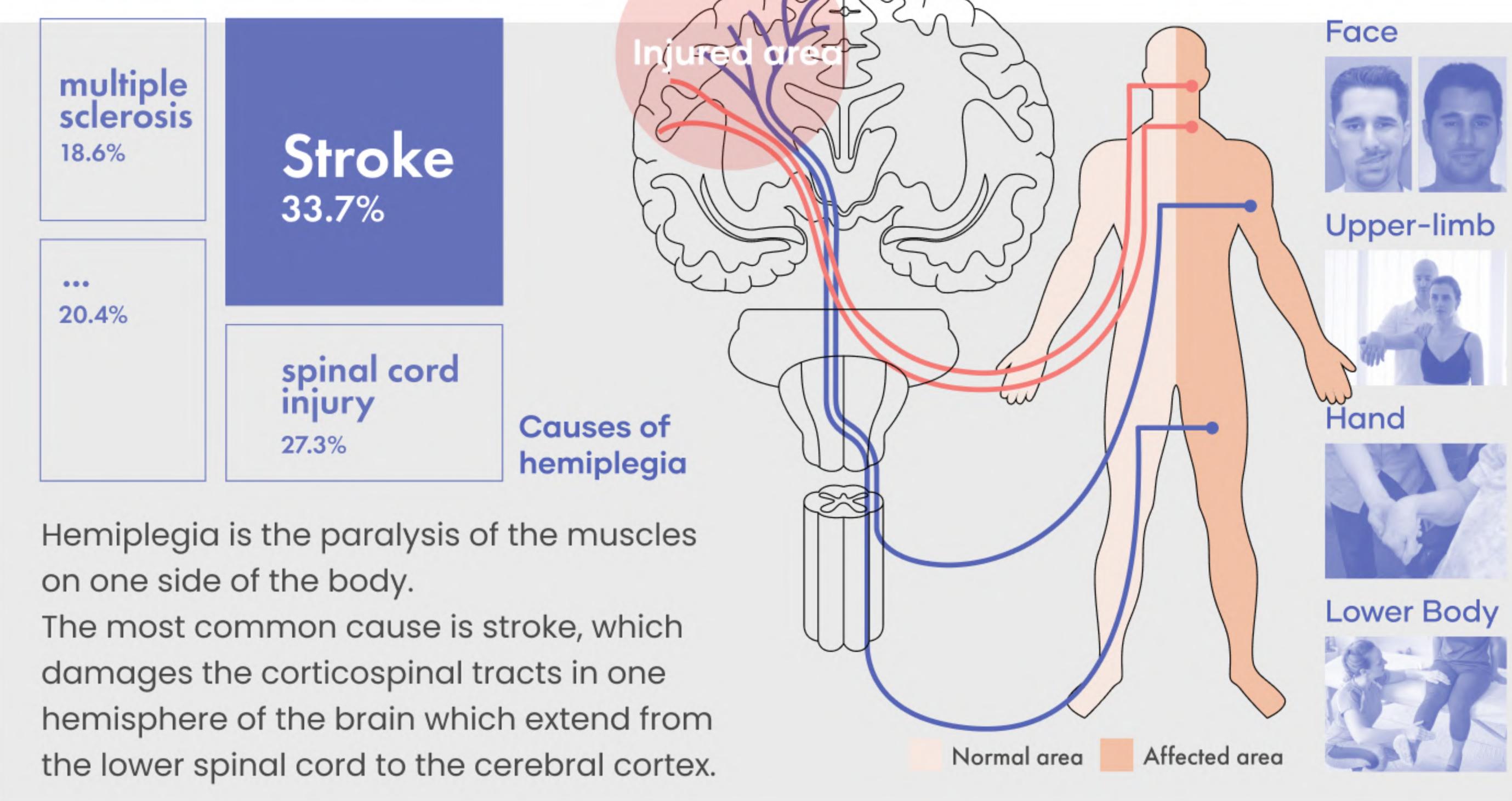
Smarthand®

Intelligent Hemiplegic Rehabilitation Assistant



Hemiplegia - A Chronic Disease

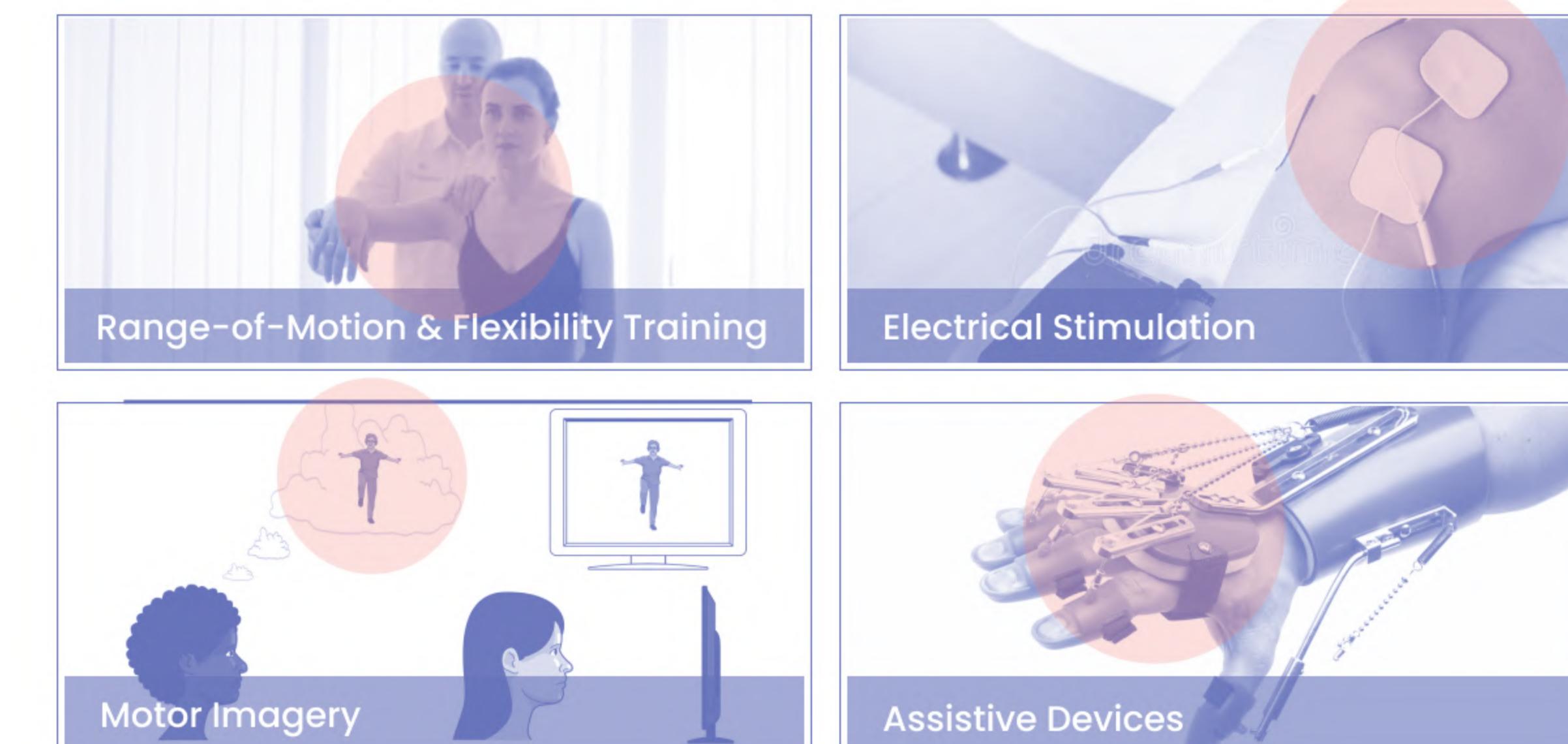
Hemiplegia mechanism



Symptoms



How to treat Hemiplegia?

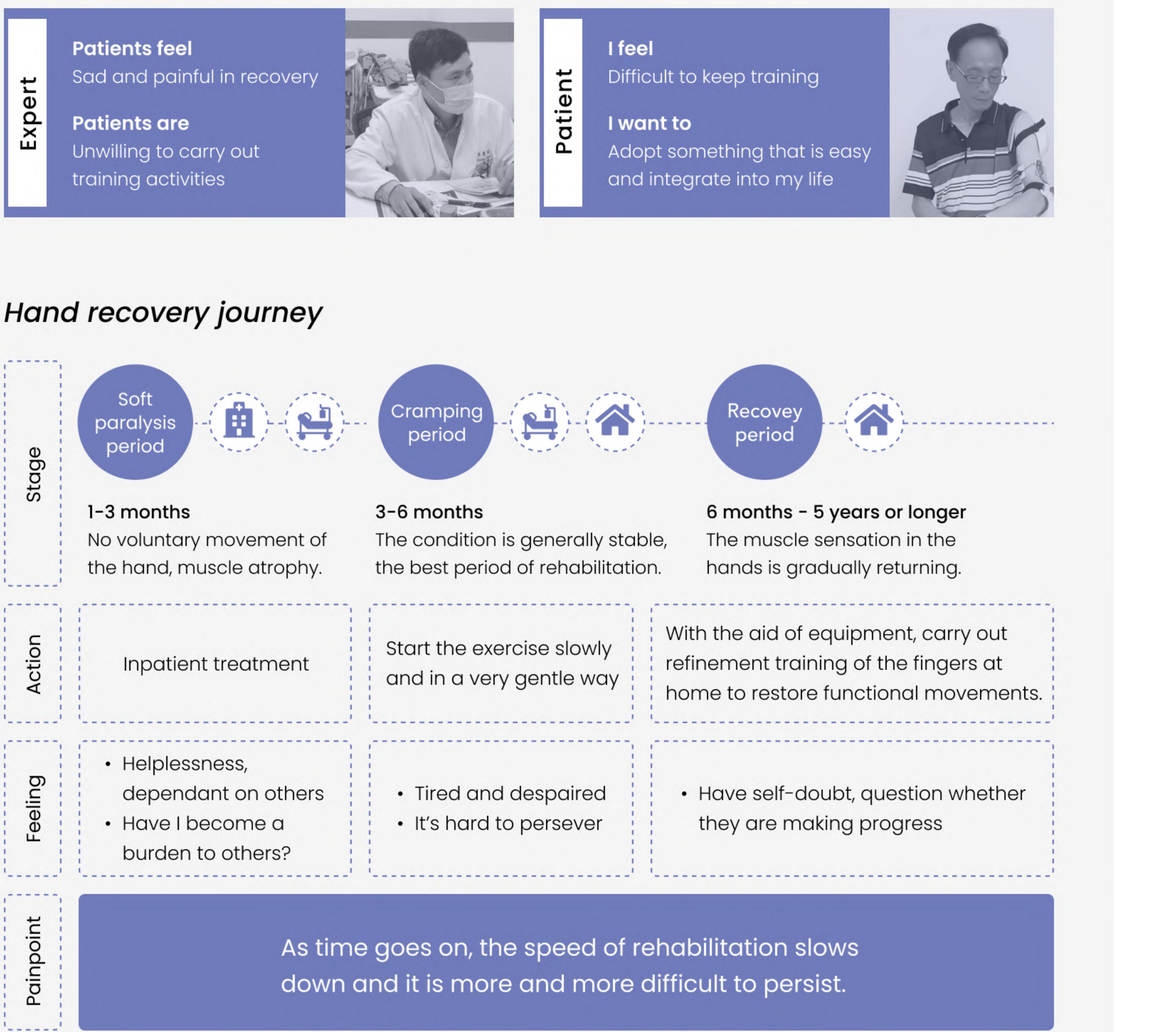


Statistics



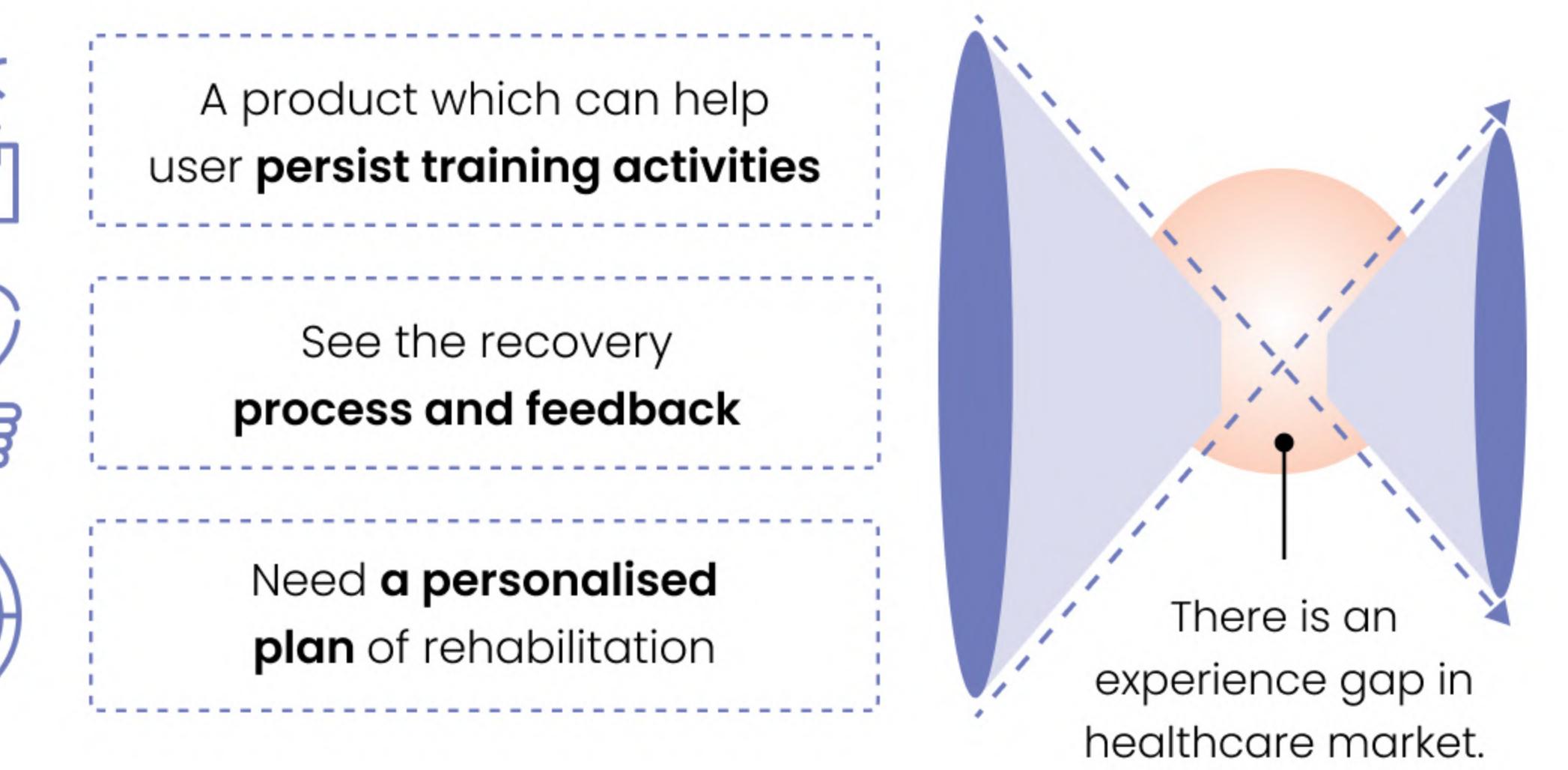
User research

Interview - Top insights



Define

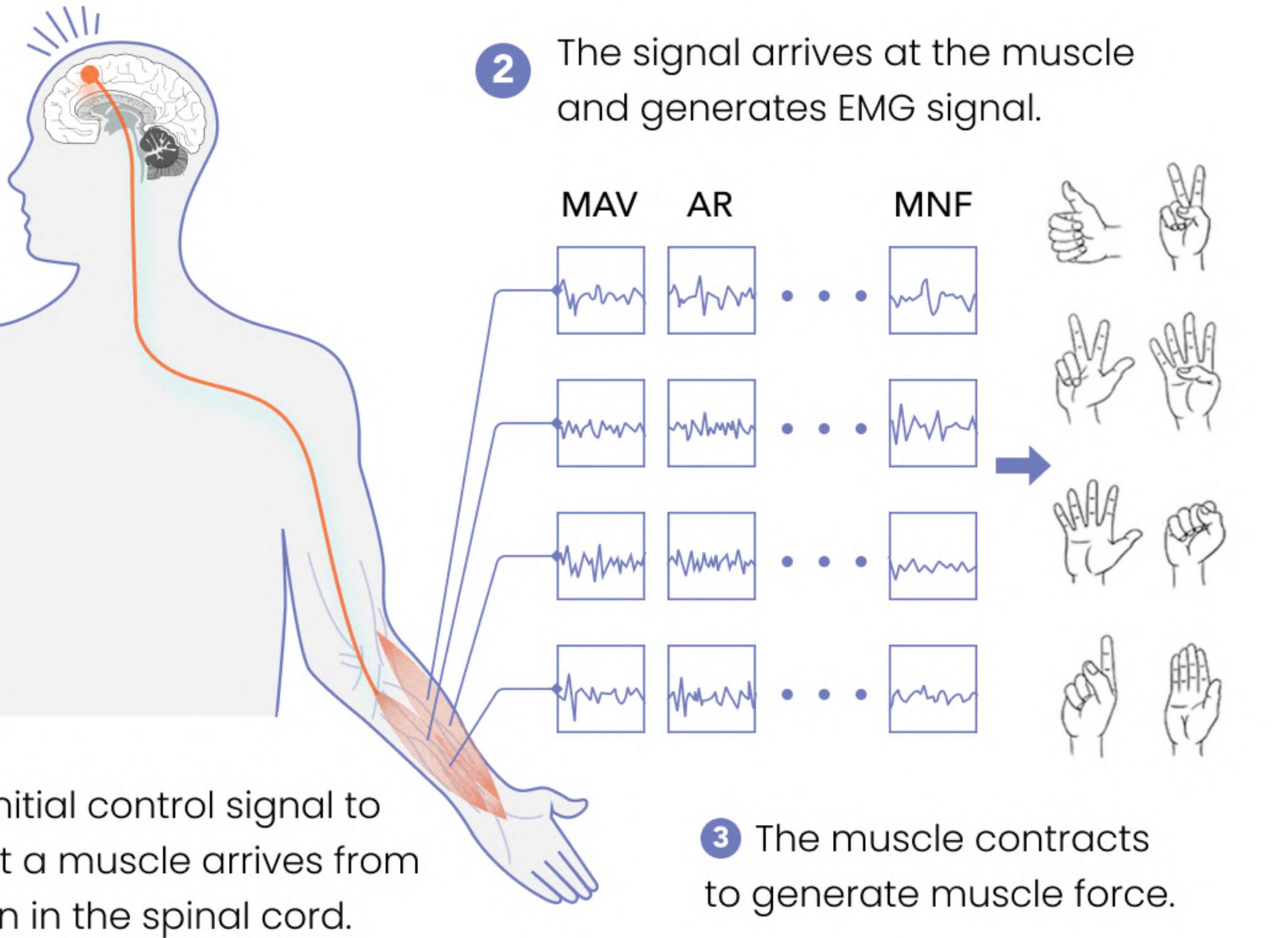
User needs



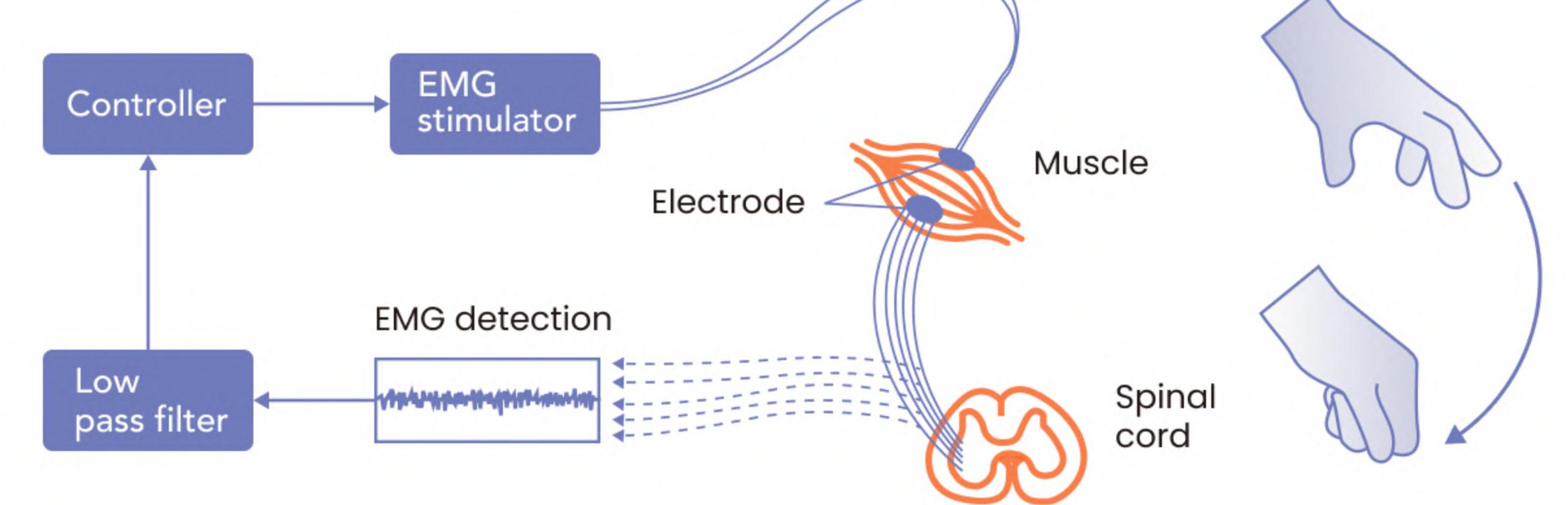
Existing products analysis

Products	Rehabilitator assistance	Robotic arm equipment	Mechanical exoskeleton	Gamification equipment
Features	Personalized training plan	Good effect	Good effect	Interesting Improve motivation
Pros	Insufficient resources for professionals	High price	Heavy and bulk	High costs Uneven effects
Cons				

Principle of hand movement



Concept formation

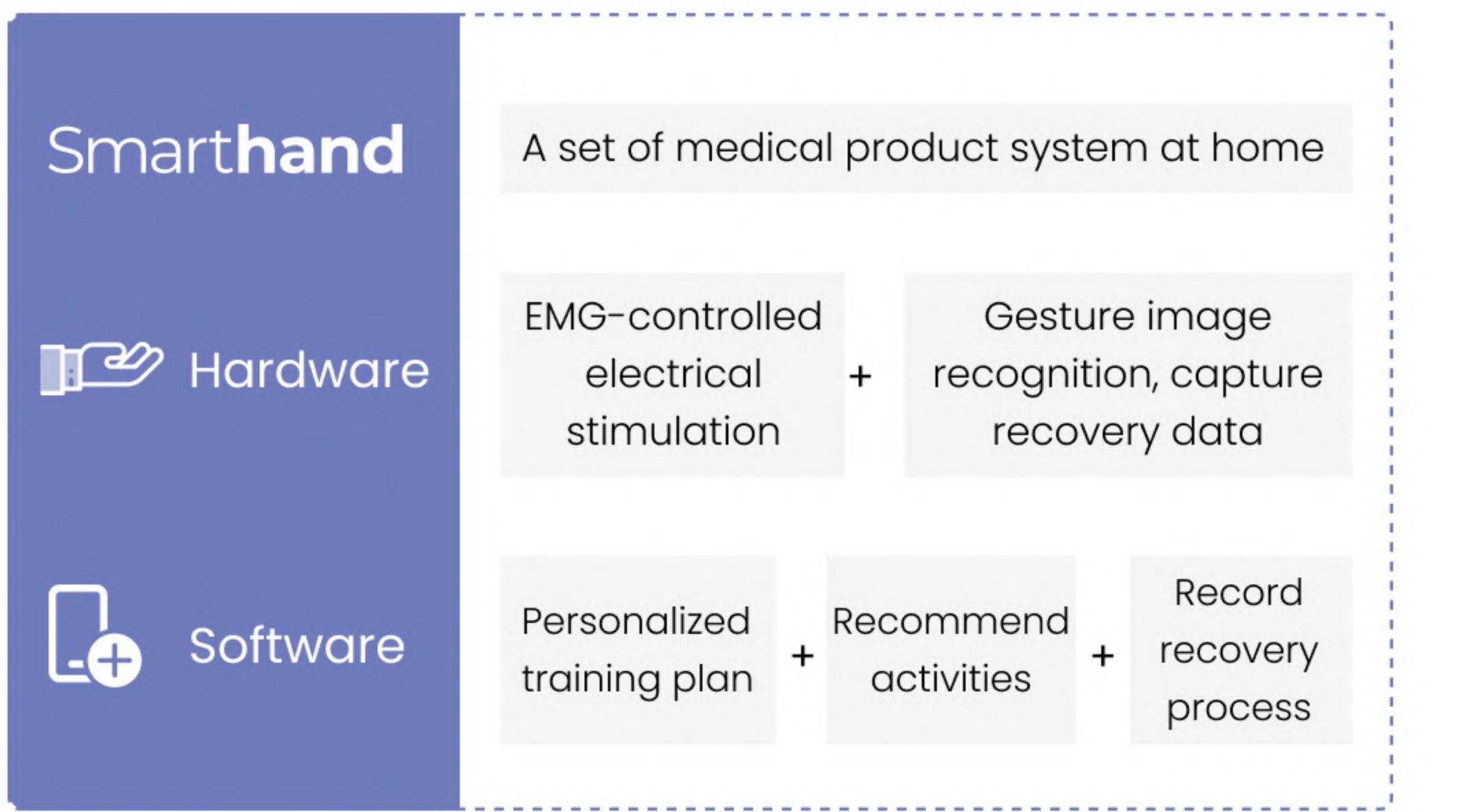


Wearable device:

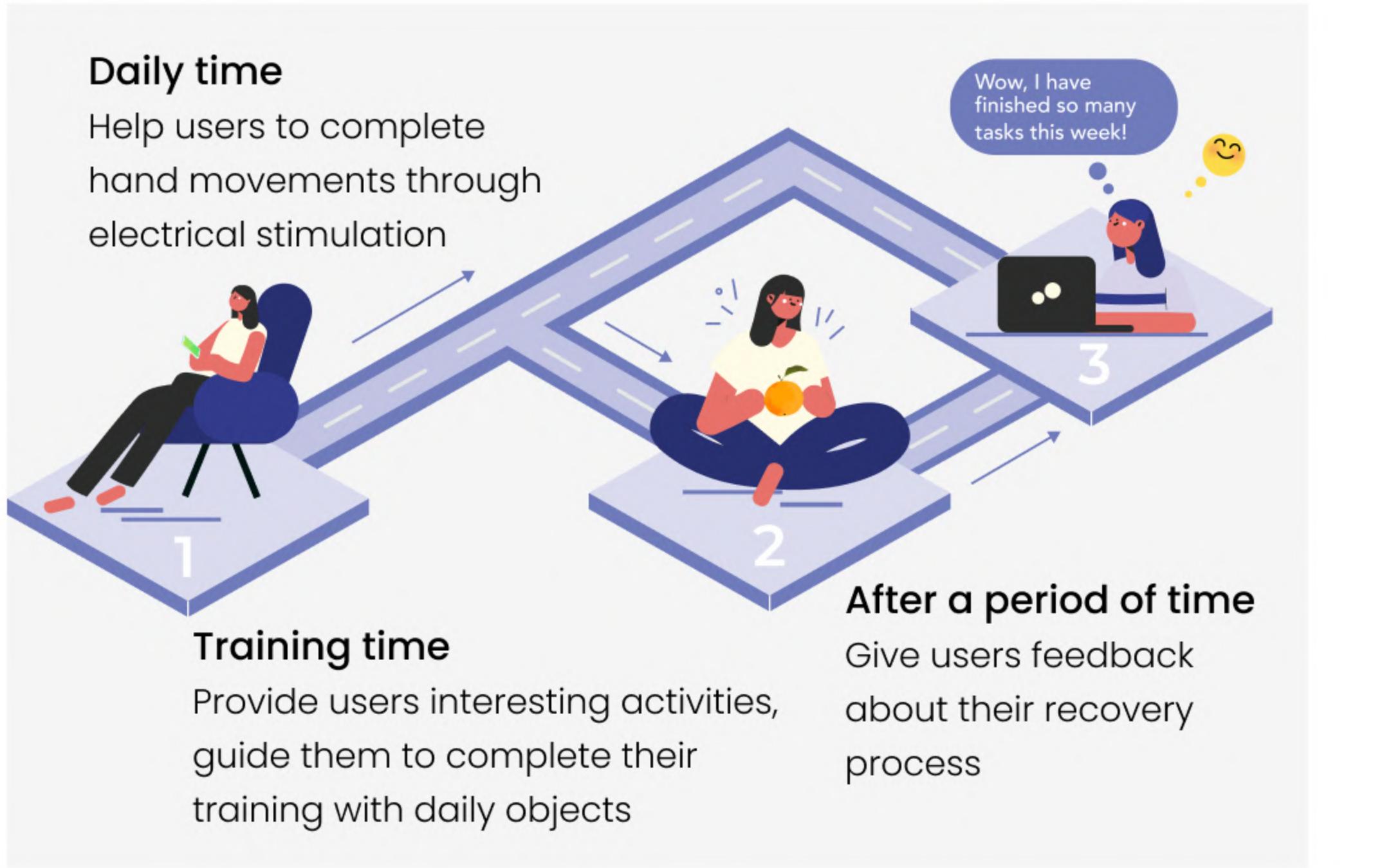
Empower user to complete daily movements, collect user data

Ideation

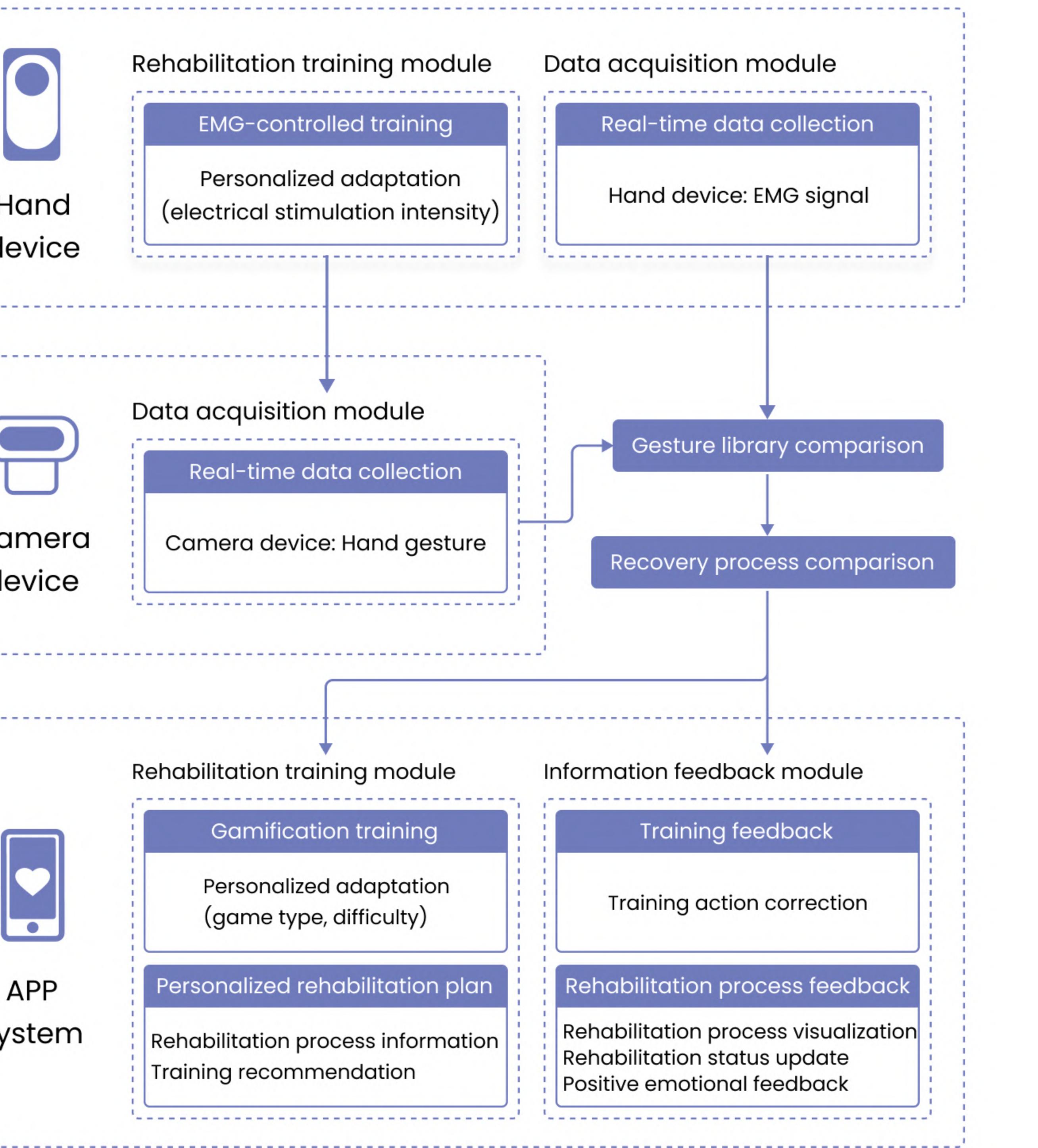
Concept



Storyboard

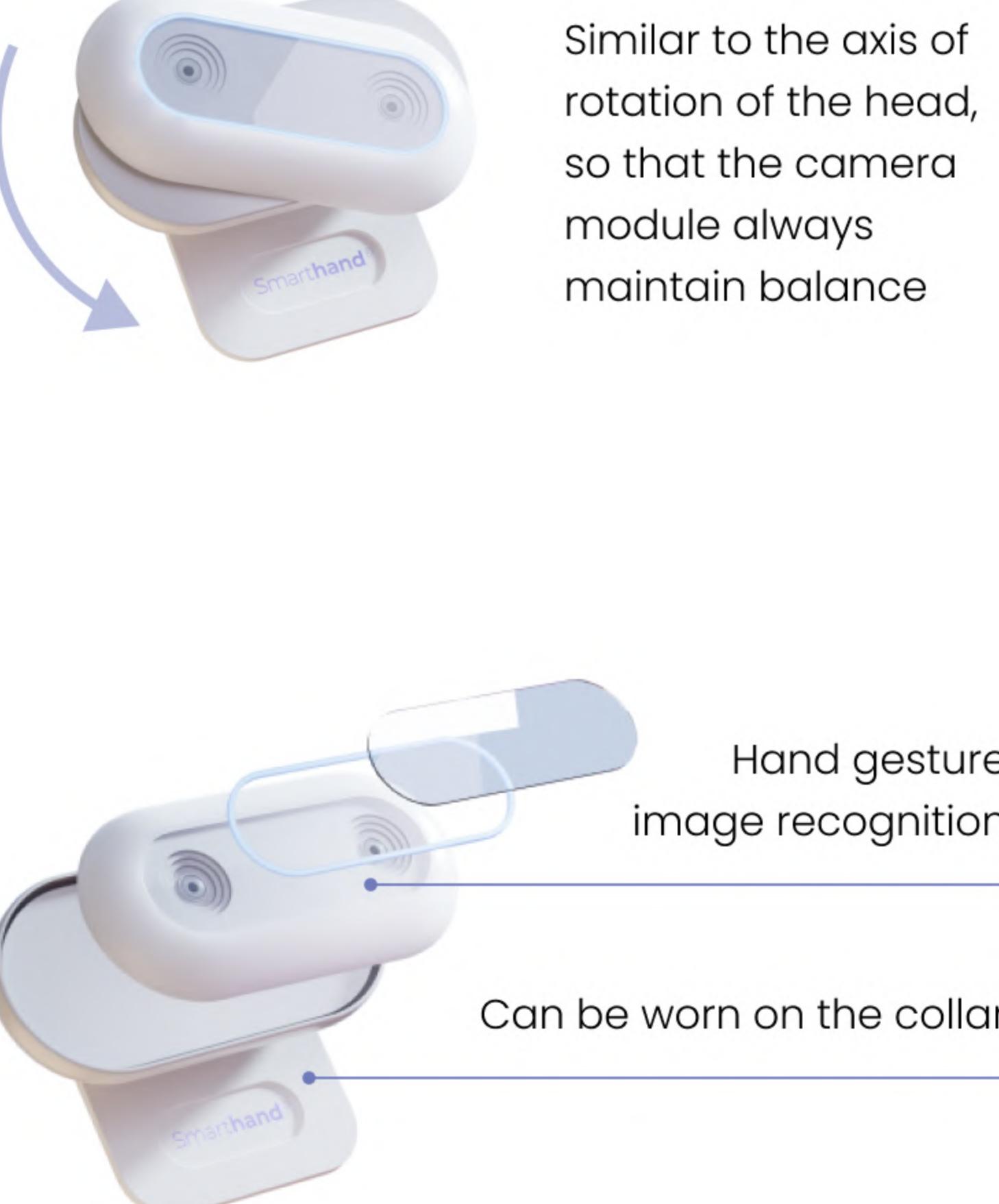
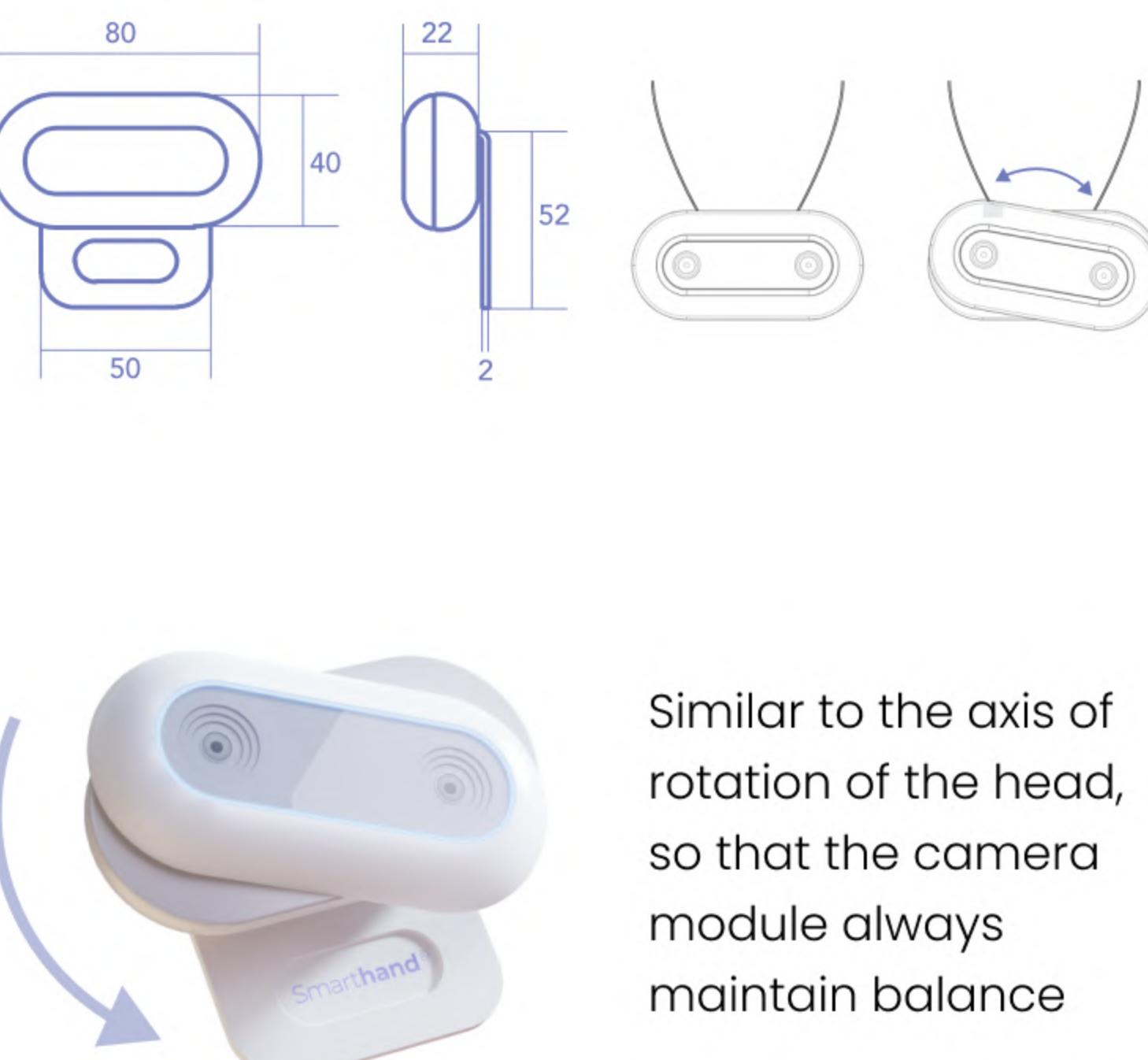


General structure

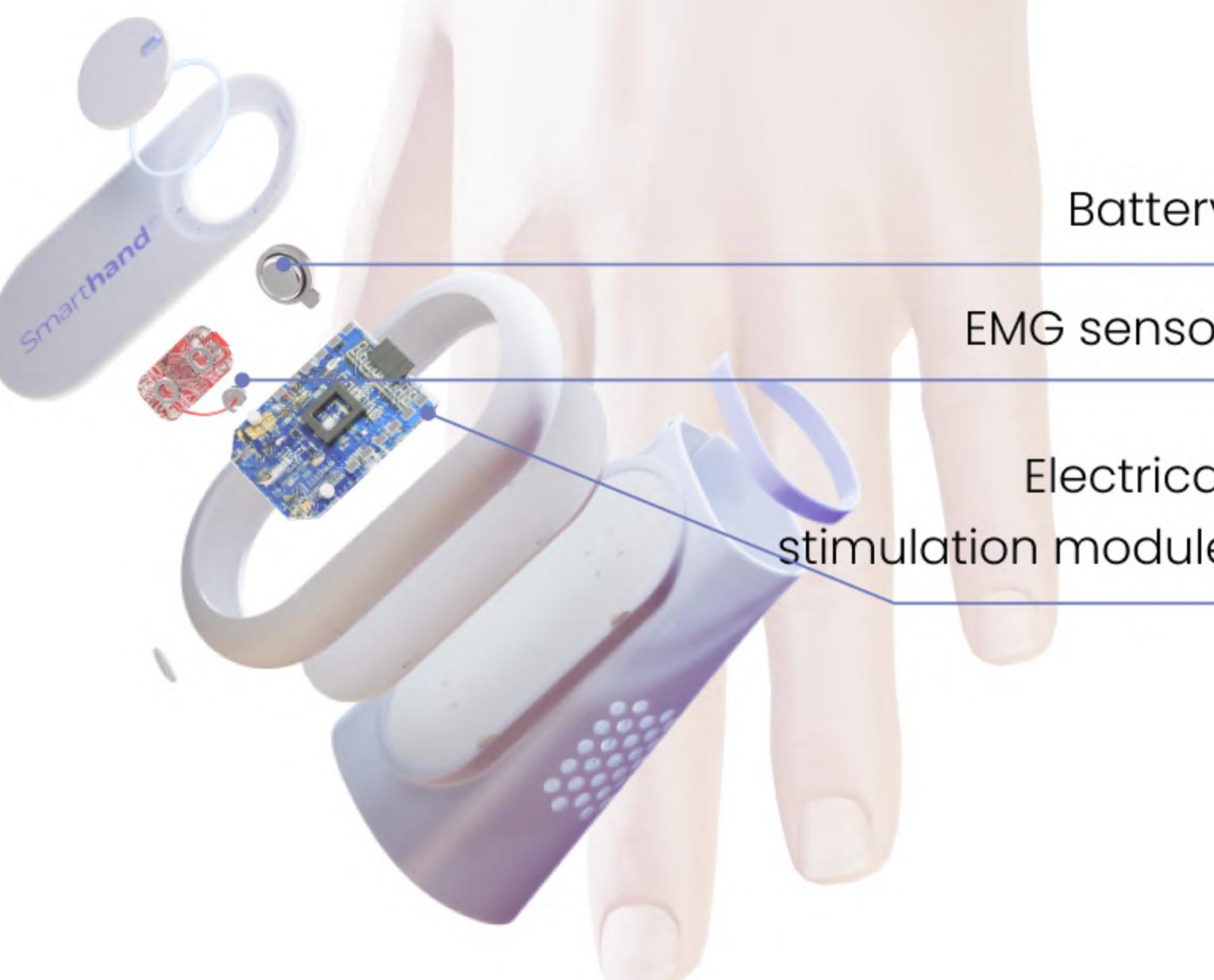
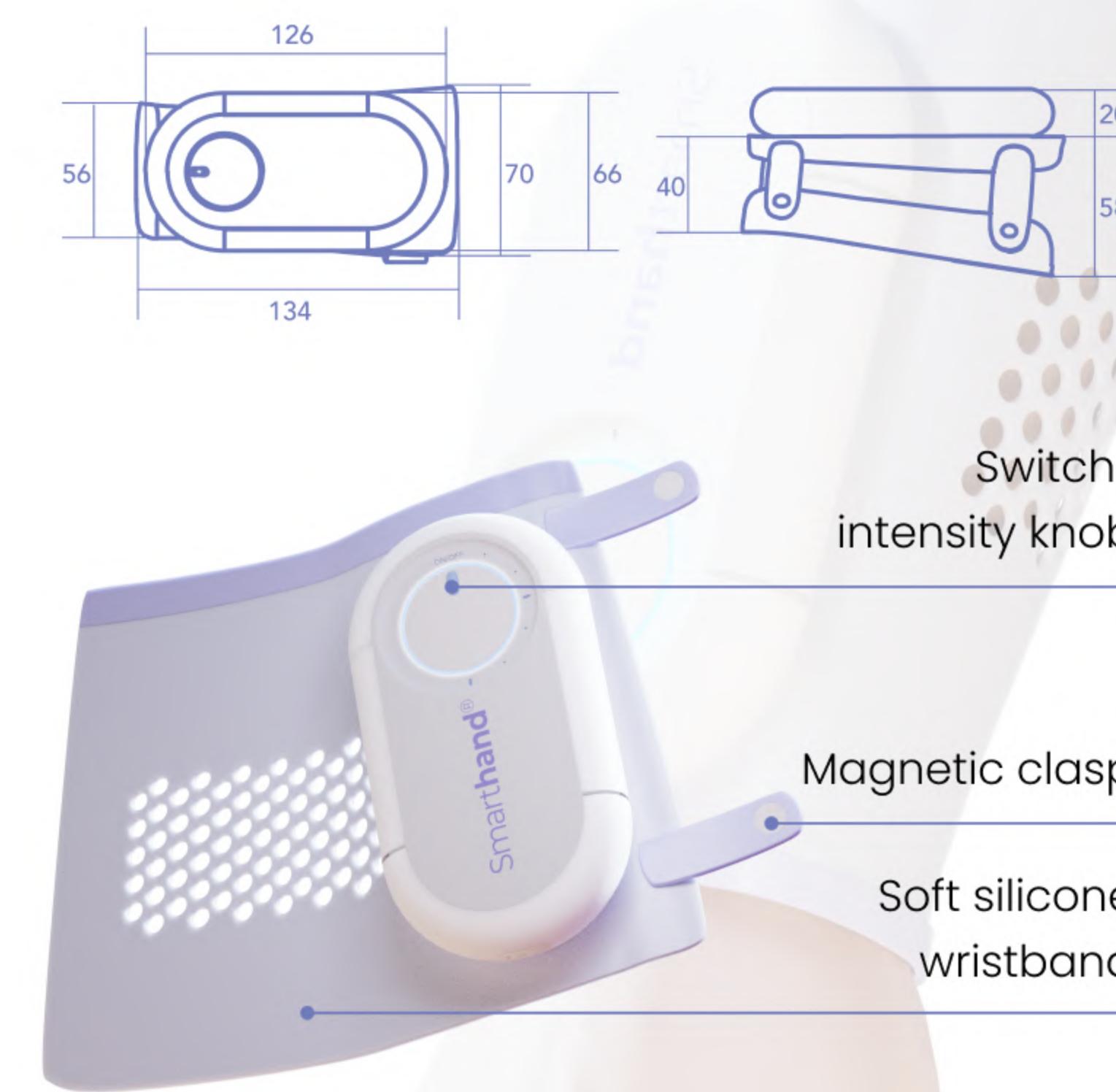


Rendering

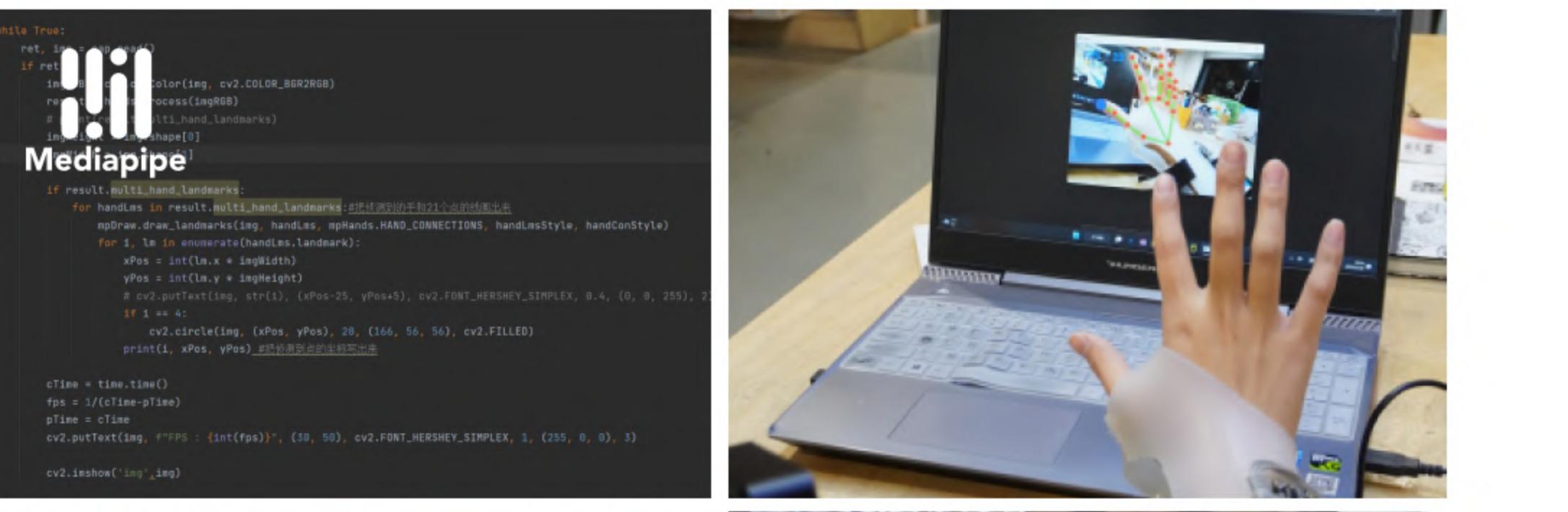
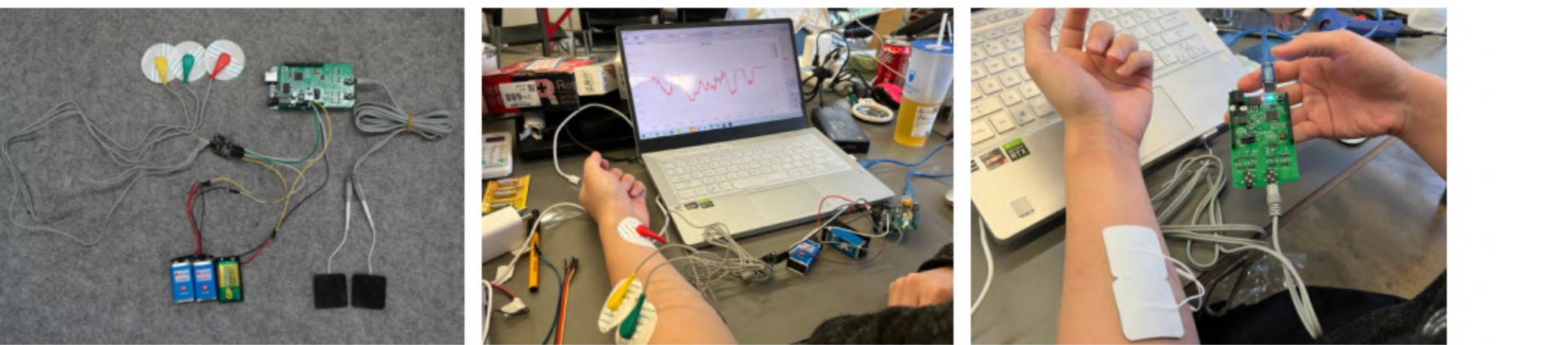
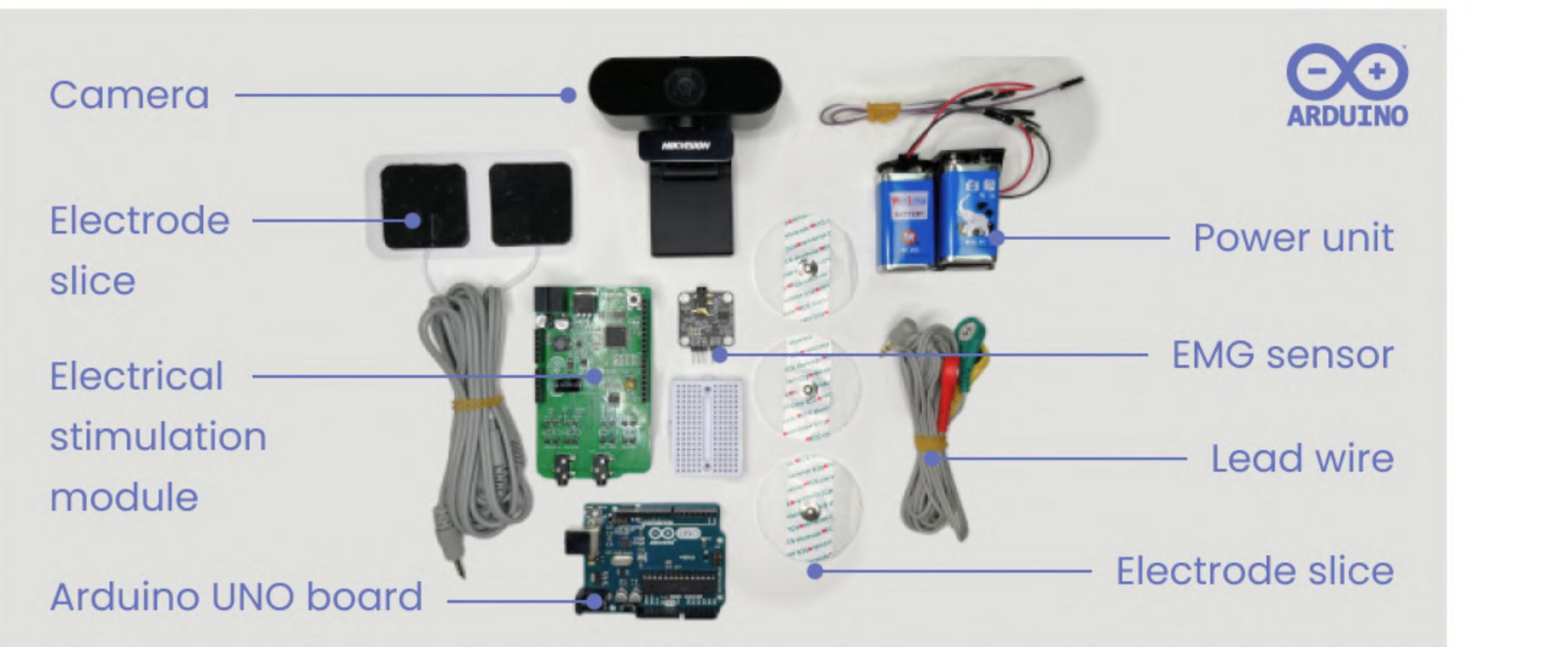
Camera device



Hand device



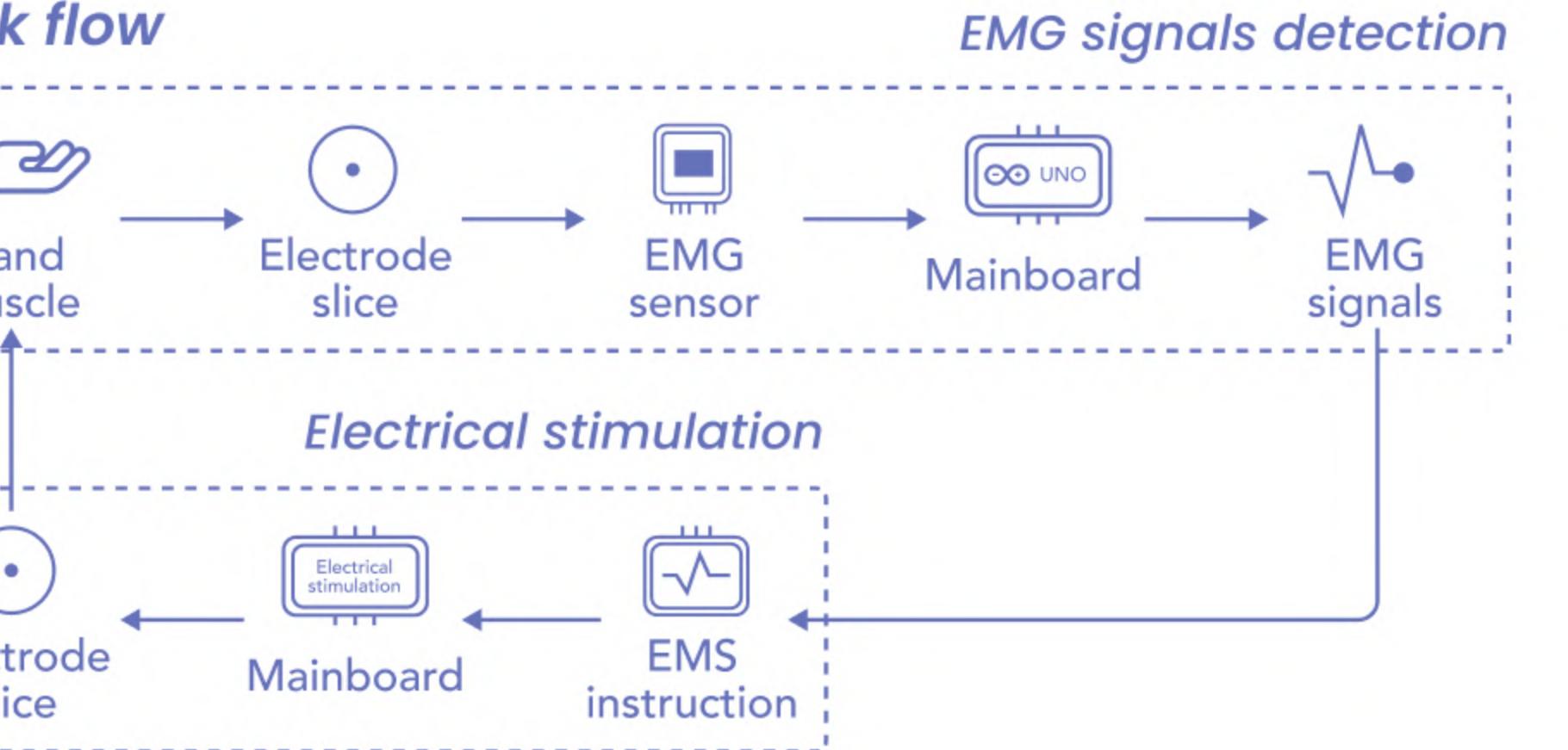
Technical experiment



EMG-controlled electrical stimulation

The EMG sensor detects the myoelectric signal, and outputs EMS to promote the muscle contraction. With the use of UNO board, EMG sensors and electrical stimulation module, we simulated the functionality of the EMG detection and electrical stimulation.

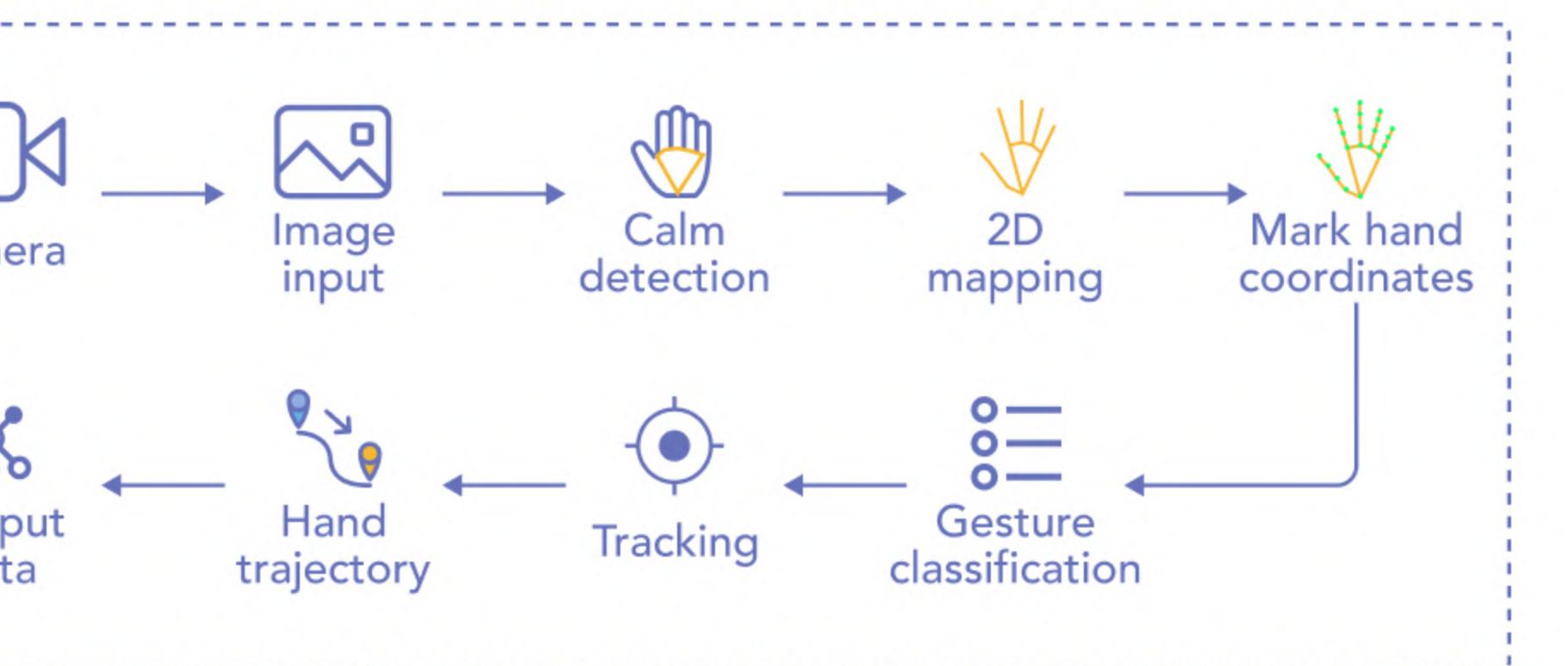
Work flow



Hand gesture recognition

We used the Python-based Mediapipe to recognize gestures and compare them with standard gestures in the gesture library. It is converted into data by an algorithm, and the data is transmitted to the host.

Work flow



Prototyping

Fabrication process



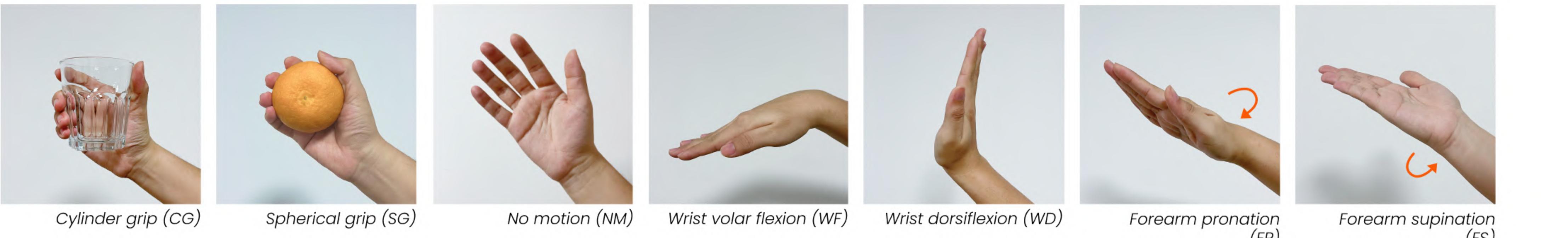
Testing



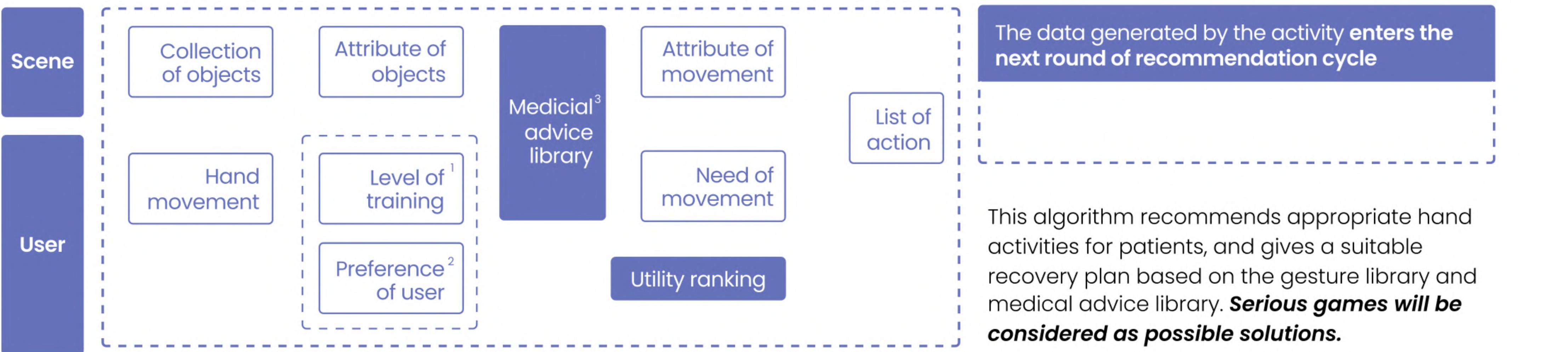
Interaction

Gesture library

The FMA is an effective and detailed evaluation tool for assessing motor function after stroke. 11 upper extremity fine movements are selected from the FMA and are suitable for motor function rehabilitation. The movements include hand, wrist and forearm movements.



Movements Generation Algorithm Framework



¹ Level of training

Assessed in the number of hand movements obtained by the vision module

² Preference of user

Calculation of clicks from user training records and activity recommendation lists

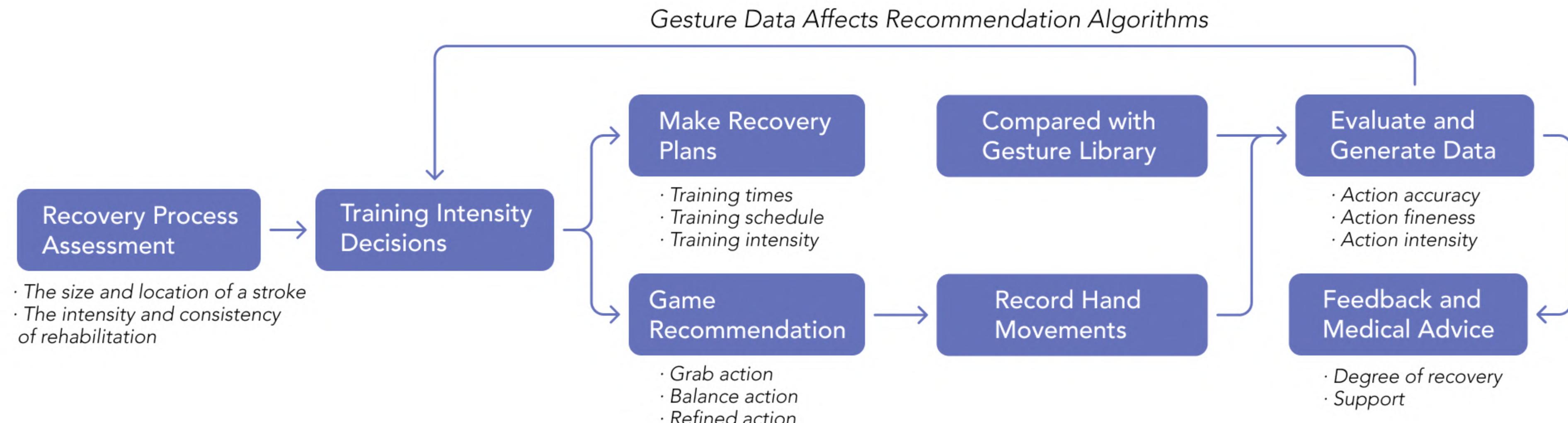
³ Medicinal advice library

Define the action requirements such as muscle training and action intensity corresponding to the training level

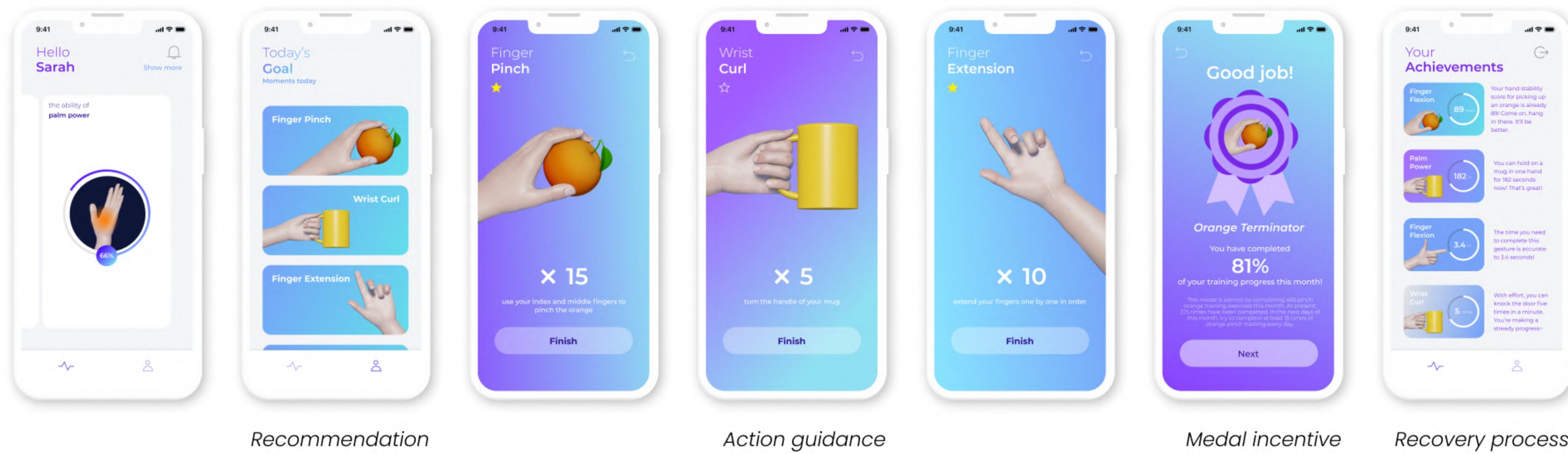
How smarthand helps people recover from hemiplegia?

Patients select the correct target in the serious game and perform the corresponding movement.

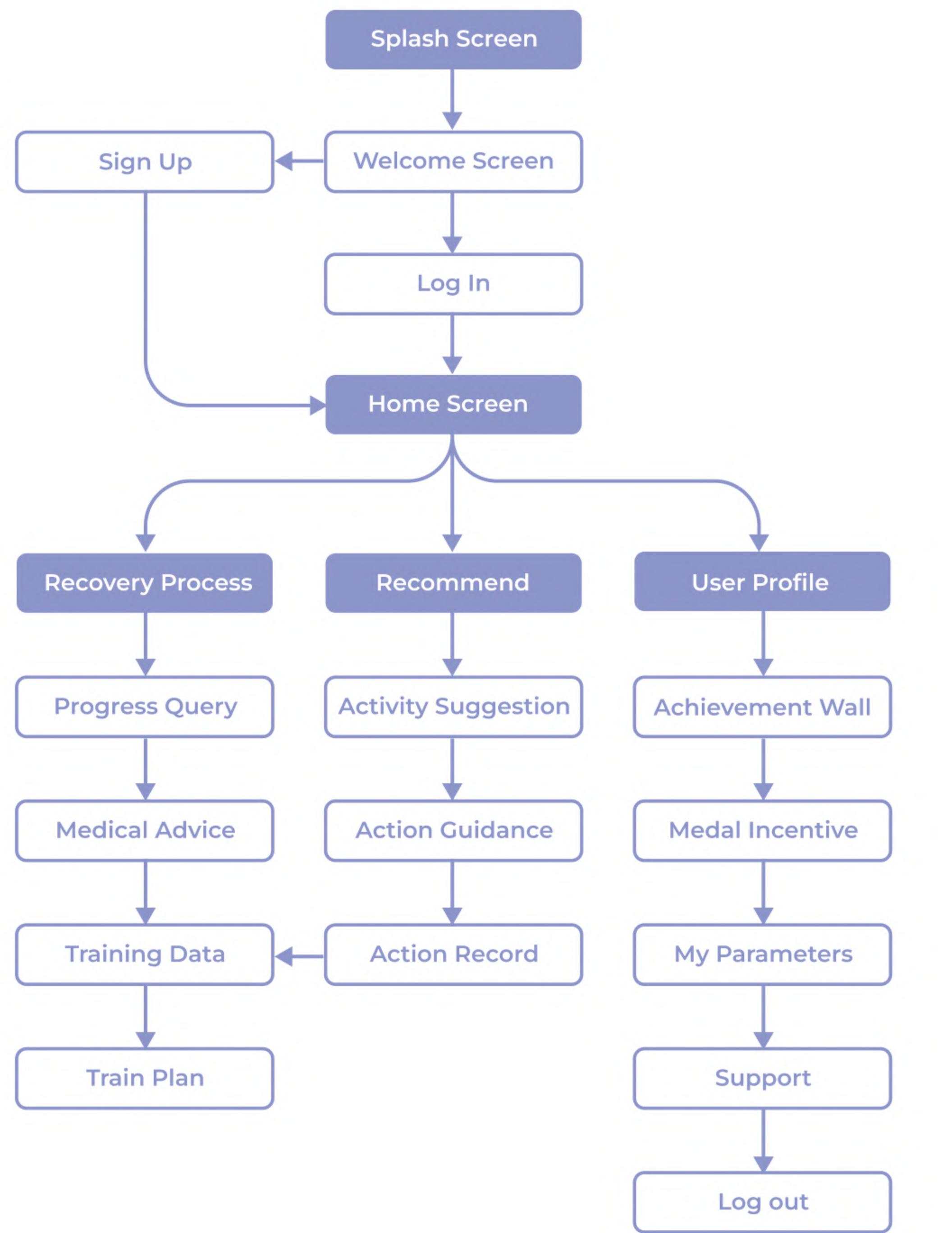
The game "A" was designed for both motor and cognitive function training. The game "B" was designed to train motor function and improve performance in ADLs.



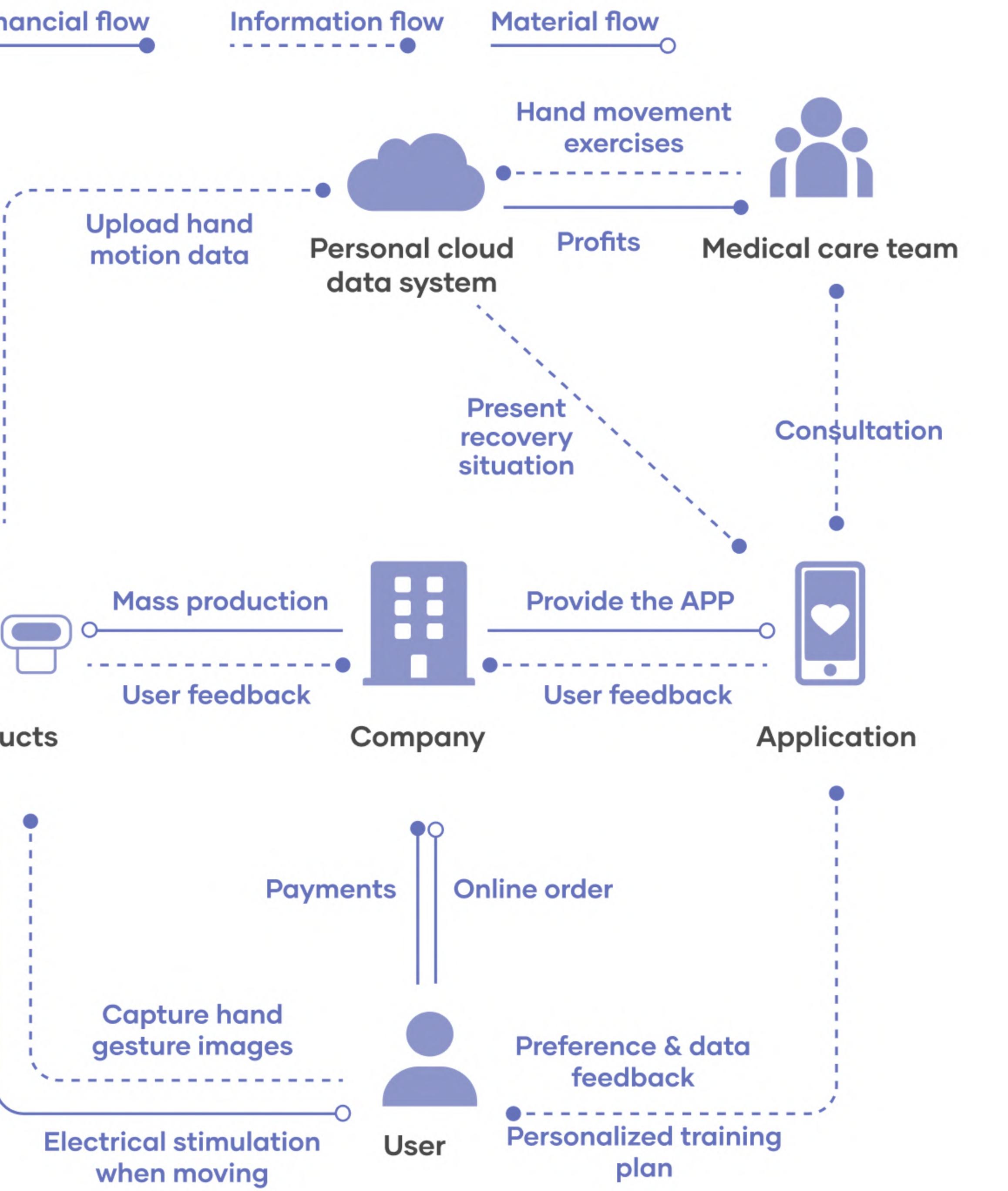
Interaction Prototype



Information architecture



Service system



User scene



Project 02

Intelligent home tracking
system for the elderly

Xiaoxun

Xiaoxun is a smart home item management system for the elderly based on the combination of virtual and real and continuous learning. It includes two parts: smart hardware in the space and mobile APP. It can help the elderly find lost items, carry out intelligent item labeling management, and provide suitable Aging Life presents a series of recommendations.

Video: <https://youtu.be/JWb9DnjEJRU>

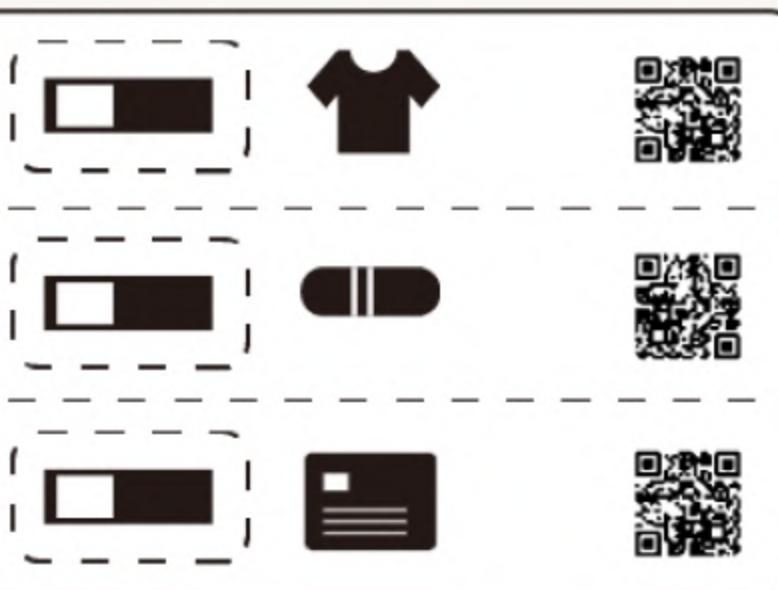
2022.04 - 2022.06

Team Project (3 people)

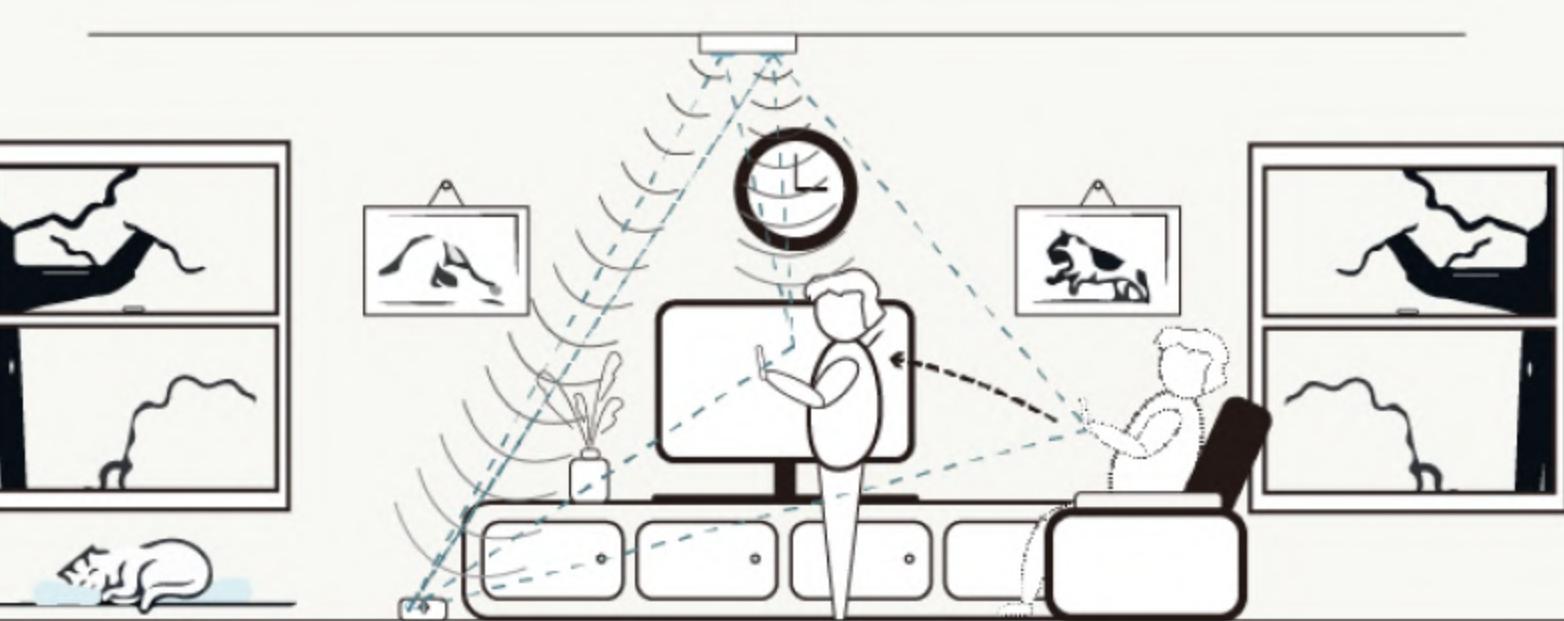
My work: User interview, Product rendering, UX design, Create AR in Unity



Step1: Choose the tag and get them from package sending



Step2: Toggle RFID tag to the target

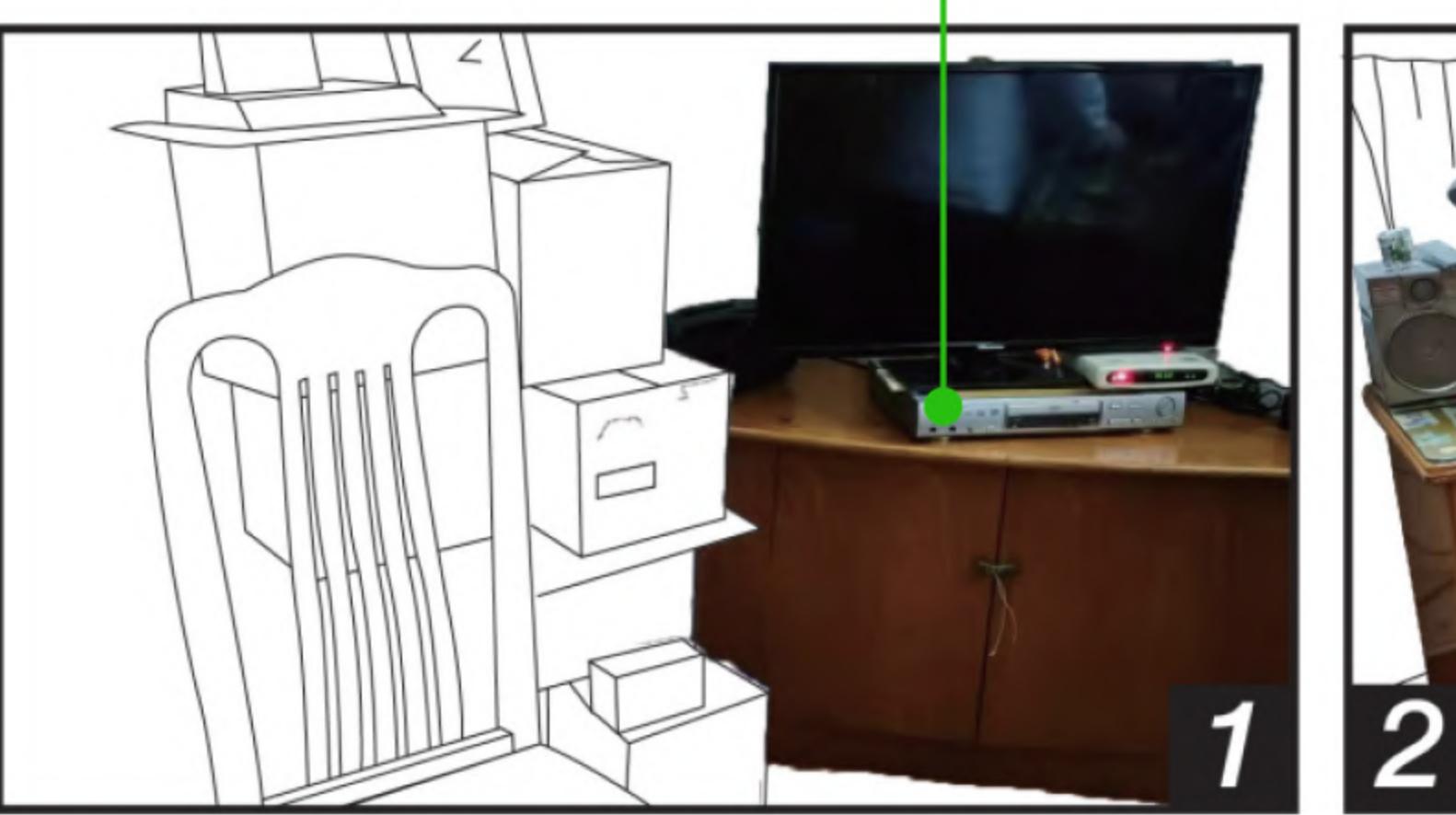


Step3: Use the AR navigation APP when looking for items

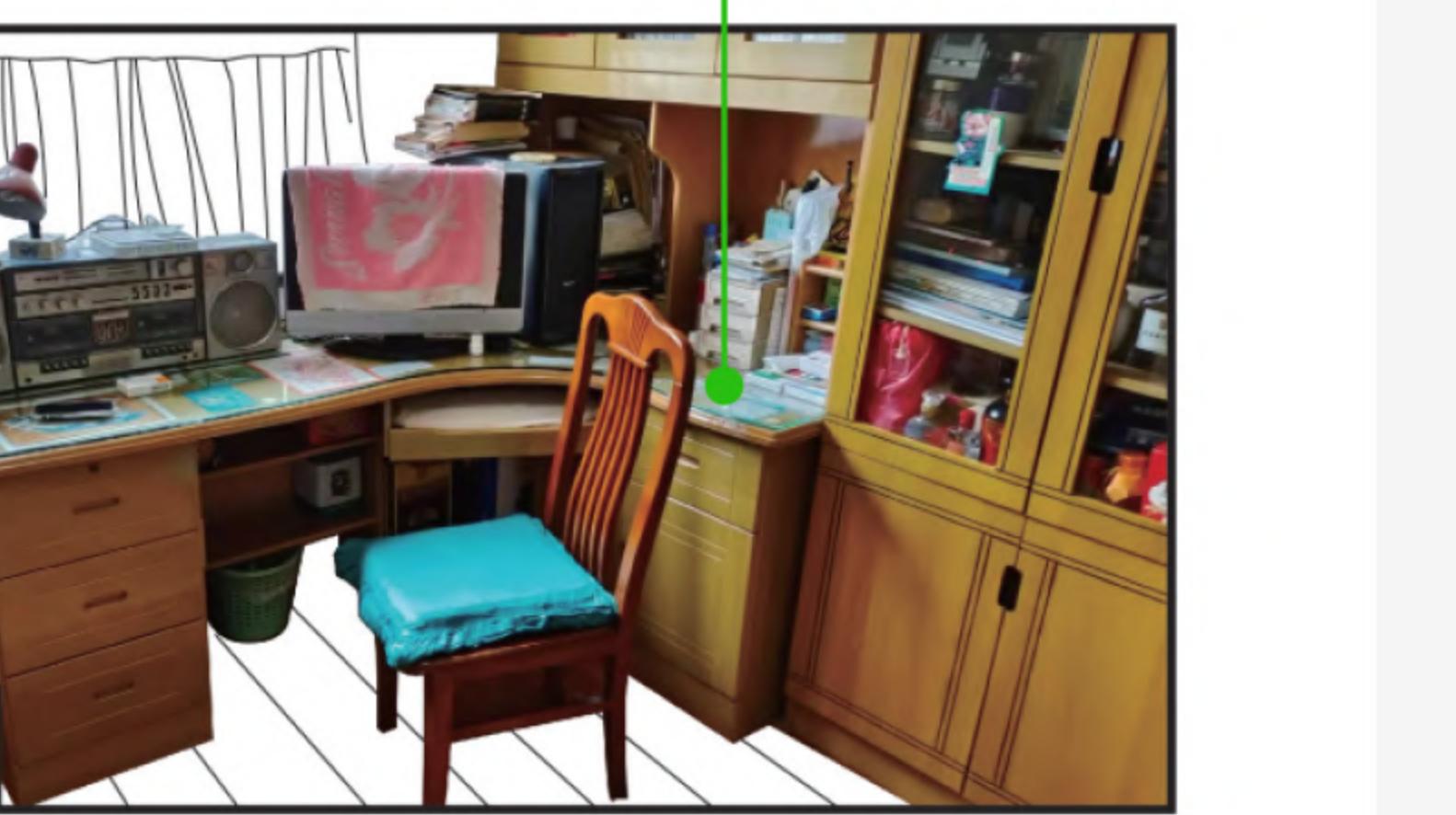
Research

Field study

The electrical equipment in the home is usually outdated, numerous and disorderly, and there are certain safety hazards at the same time.



The furniture is usually old-fashioned furniture that does not have a suitable aging function.



4



Usually have a hobby of collecting, and are reluctant to discard old things, further compressing the storage space in the home.

Many elderly people have **a hobby of collecting objects**, and their living environment is crowded with a lot of clutter accumulated over the years. With the decline of physical function and memory ability, their **need to organize and classify their items** is gradually obvious.

User interview

We interviewed **6 older adults**, all of whom were over the age of 65, had no major health impairments, and were capable of independent living. Below are a few of **the items they looked for more frequently in their lives**.

Interviewee 01
Interviewee 02
Interviewee 03
Interviewee 04
Interviewee 05
Interviewee 06

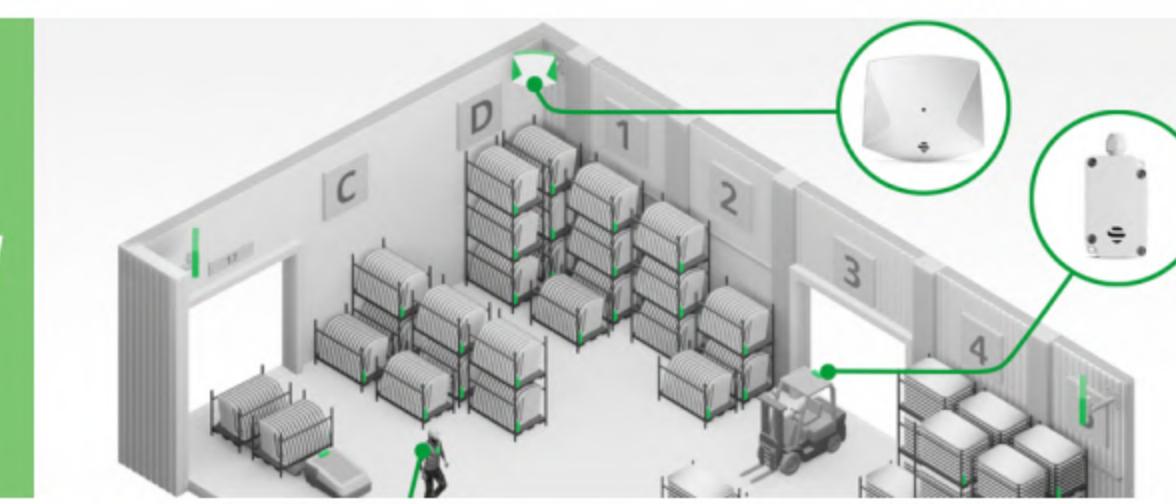


The items older adults frequently look for in their daily lives.

Design goals

1

Indoor Positioning System



Help the elderly find lost items.

2

RFID Tags



Help the elderly with item labeling management.

3

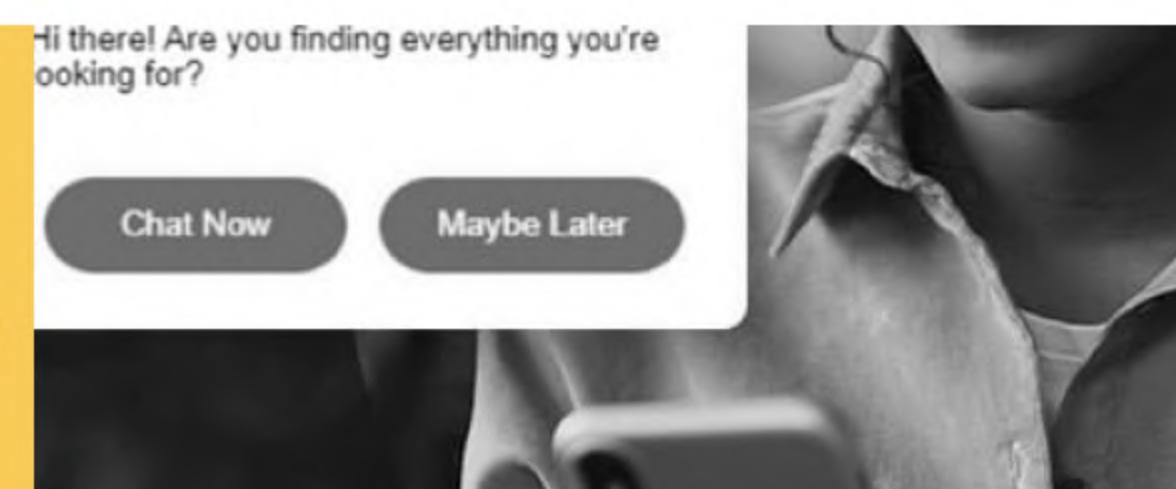
Continuous Learning Technology



Propose suggestions for improving living habits of home-based elderly care.

4

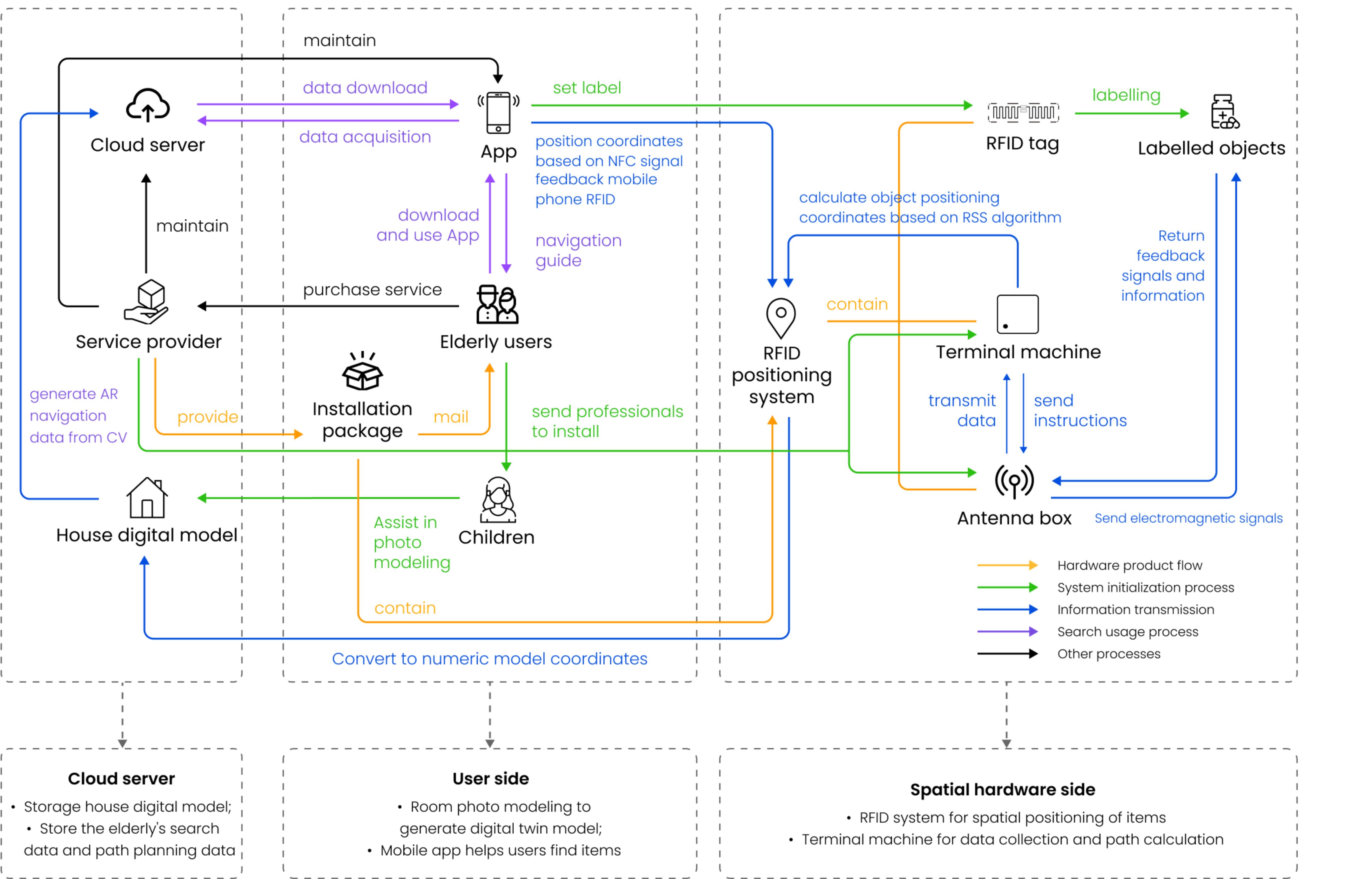
Proactive Interaction



Improve the quality of life of the elderly living alone.

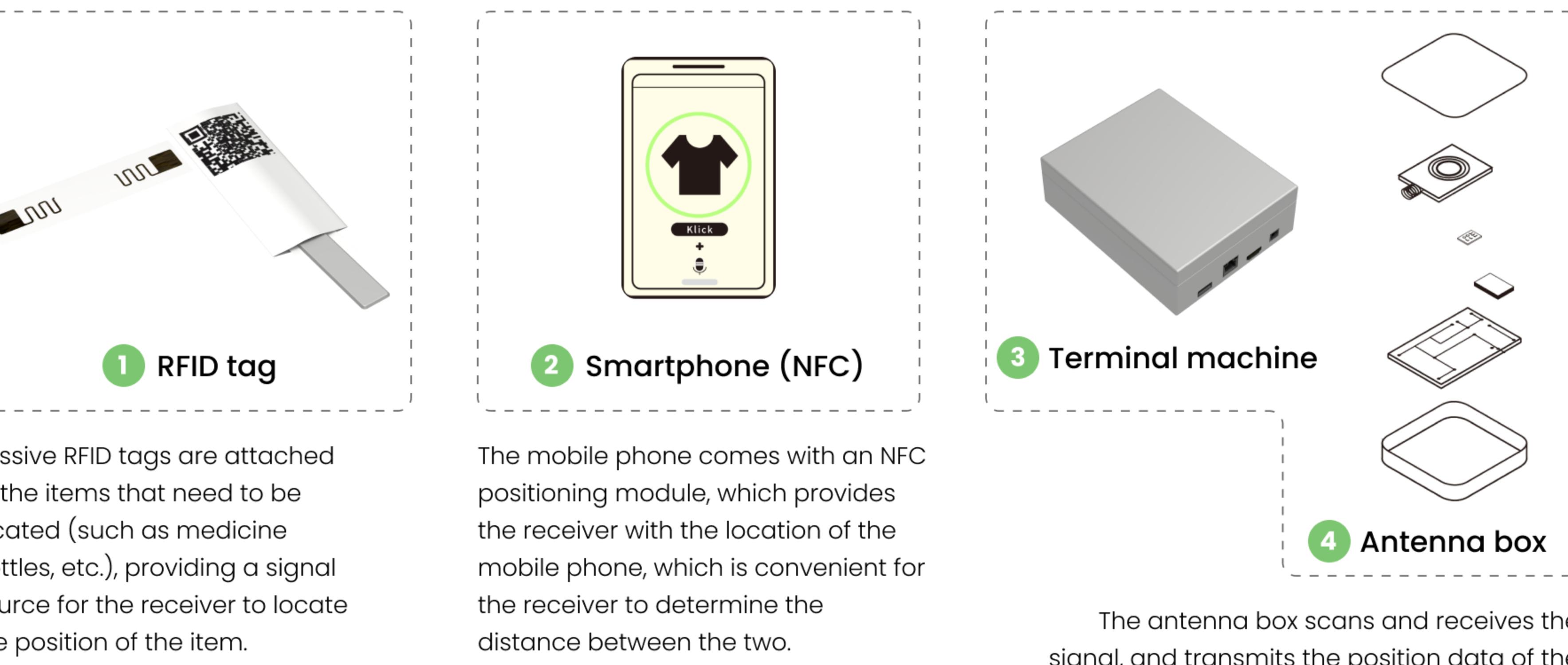
Ideation

System architecture



Deliver

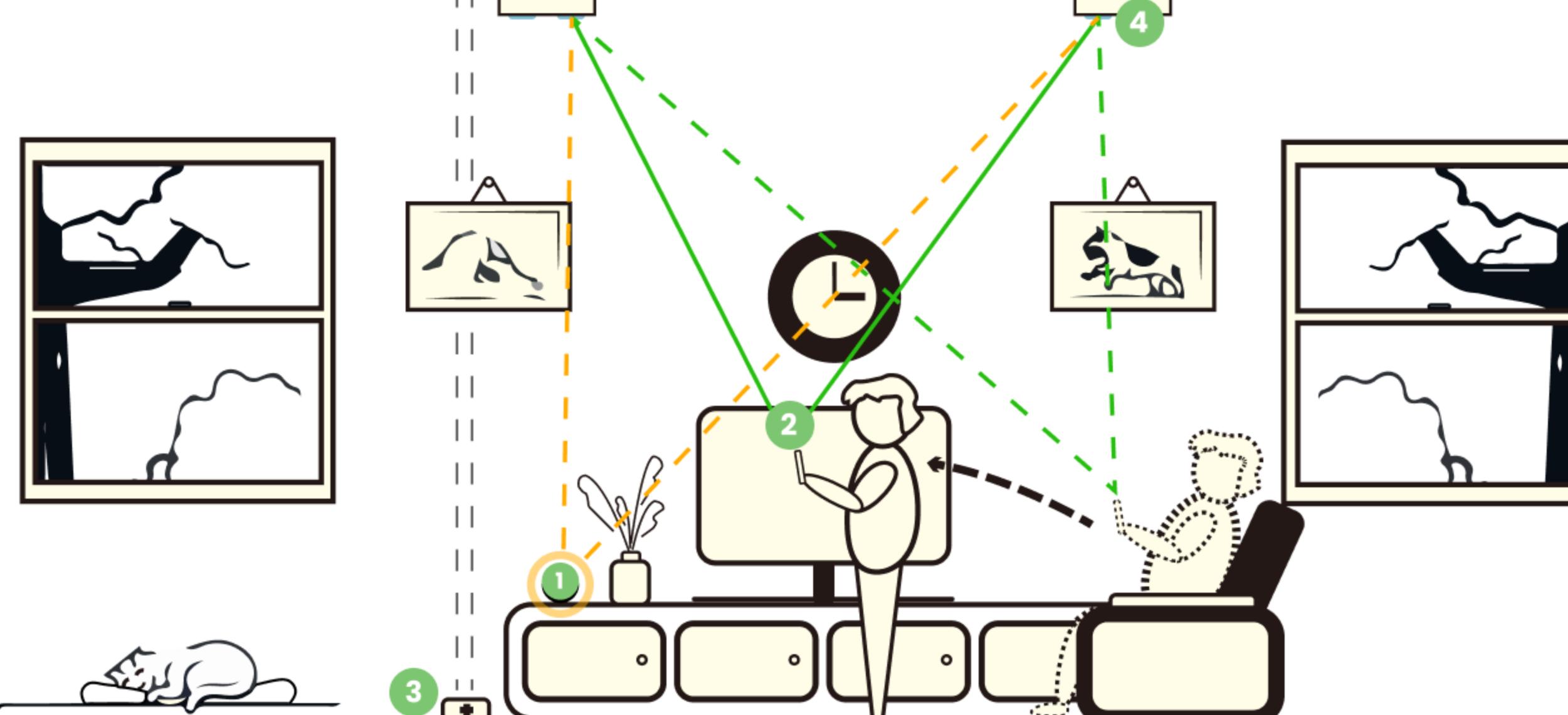
Hardware -- RFID indoor positioning system



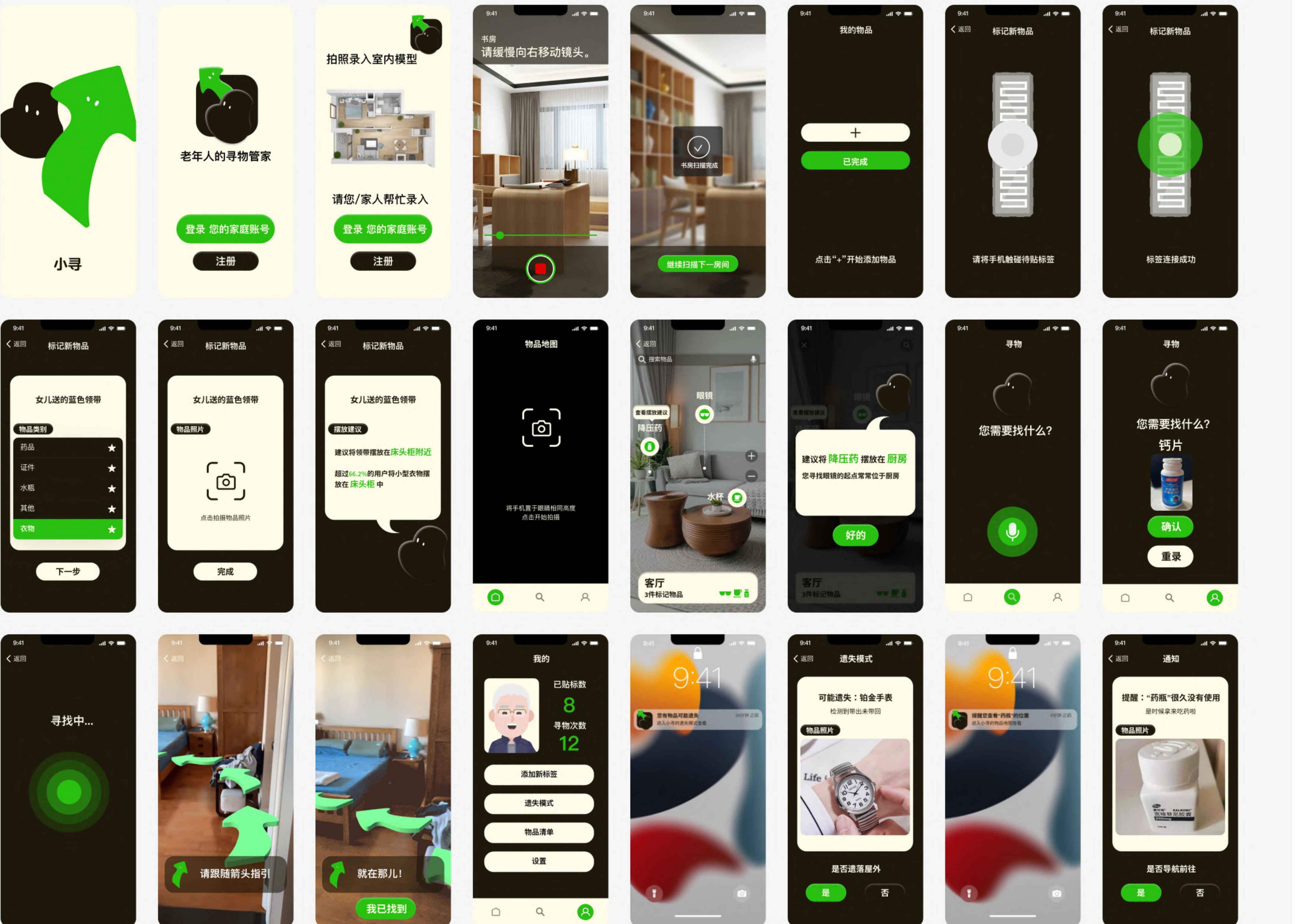
Spatial digital modeling

We use Immersal Mapper for spatial photography modeling, and upload the model to the mobile APP. The space model is built into the Unity mobile APP through the Immersal SDK.

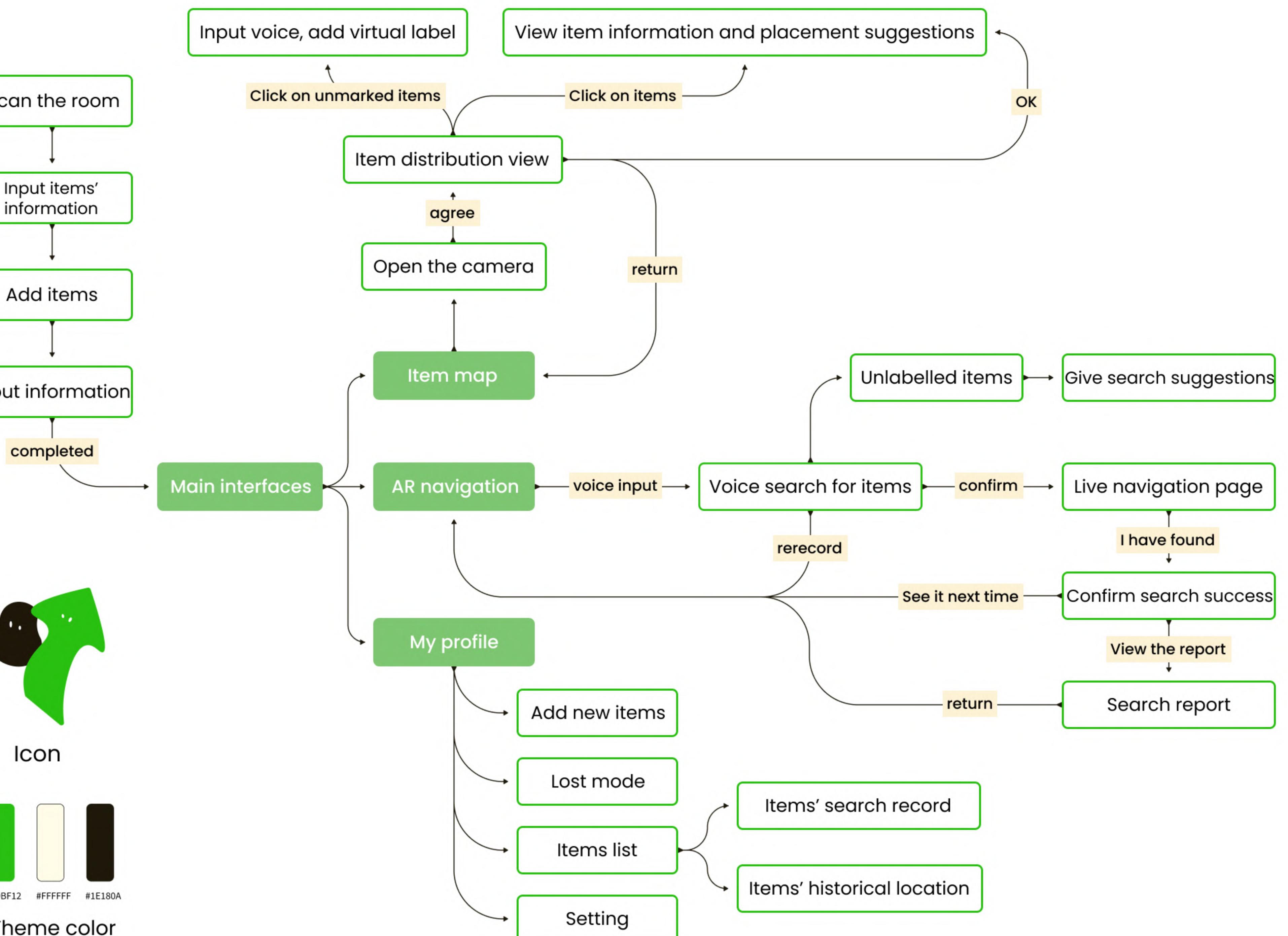
IMMERSAL
SDK



Software -- AR navigation App



Interaction flow





Arduino Design
Interaction Design

Project 03

Interaction devices to present
the hidden details in nature

Nature Sensor

Inspired by the hidden interaction in nature, I make the installation Nature Sensor. It is triggered by abstract factors and sheds rhythmic light reflecting the hidden details of nature.

This installation is to encourage people to open their senses to observe and listen, thus reconnecting with nature.

Video: <https://youtu.be/c0hwSwnQVDg>

2021.09 - 2021.10
Personal Project

Inspiration

The unseen nature

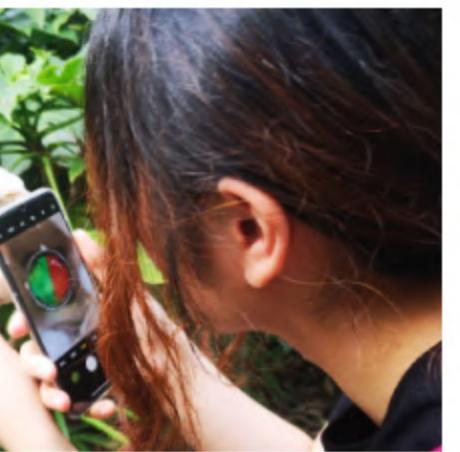


Interview

Curious about what other city dwellers think, I did an interview. Aim: To understand people's observations and attitudes towards nature.



Name: Hana
Age: 23
Gender: Female
Occupation: Student
Education: Undergraduate



Name: Cario
Age: 19
Gender: Female
Occupation: Student
Education: Undergraduate



Name: Chill
Age: 26
Gender: Male
Occupation: Human resource
Education: Master

"The unseen nature is interesting and makes me think deeper about life. I never pay attention to this before."

"I am a nature lover since spending time in nature has many benefits, such as increasing cardio-protective function, reducing stress, and so on."

"Because of my busy schedule, I have little outdoor time. Nature is dangerous. To ensure hygiene, I never touch the soil or insects."

Problem statement

City dwellers are spending less and less time in nature, thus lack perception of the natural world.

Design challenge

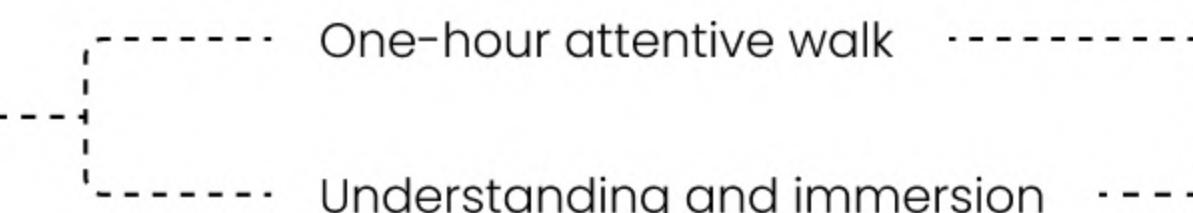
How might we encourage people to open their senses to observe, listen, and reconnect with nature?

Participatory design

A workshop of observing urban nature

Step1 Discovery

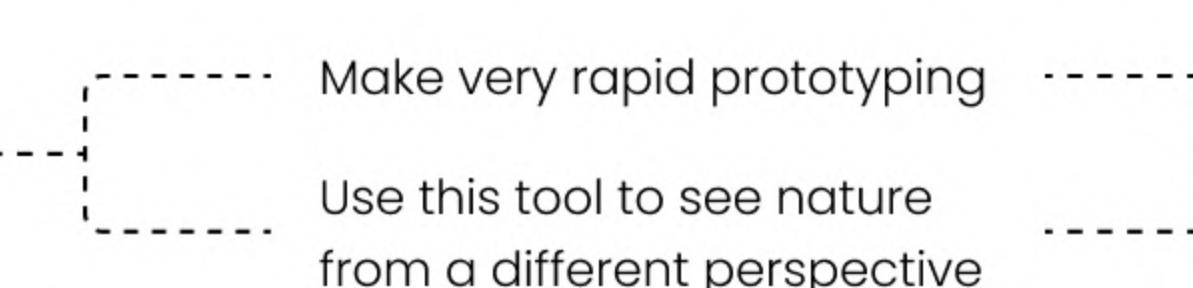
Search with new eyes and interest



Engaged in the nature observation

Step2 Reflection

Questions or difficulties they had encountered during the observation



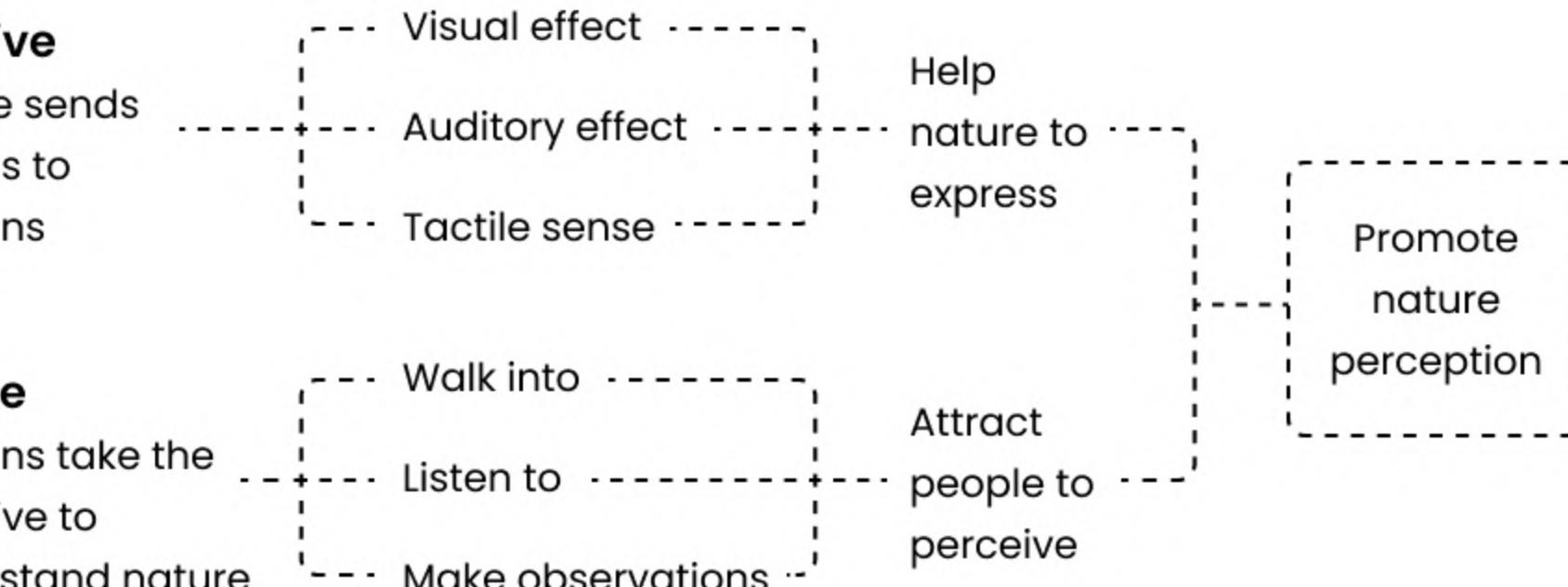
Make your own toolkit



#Redefine Nature Perception

After the workshop, I redefined 2 basic concepts, which re-explains the nature perception from both active and passive aspects, and clarifies that the core of the problem is the absence of a perceived bridge. Through this interpretation, the design direction is established.

Nature Perception
Awareness of the connection between other things in nature



Ideation

Mind map



Create some bionic creatures

Visualize the hidden details of nature

Encourage people to perceive

Reconnect with nature

Artist reference

Bioluminescent Forest

Project by 3hund, Friedrich van Schoor and Tarek Mawad, Germany 2015

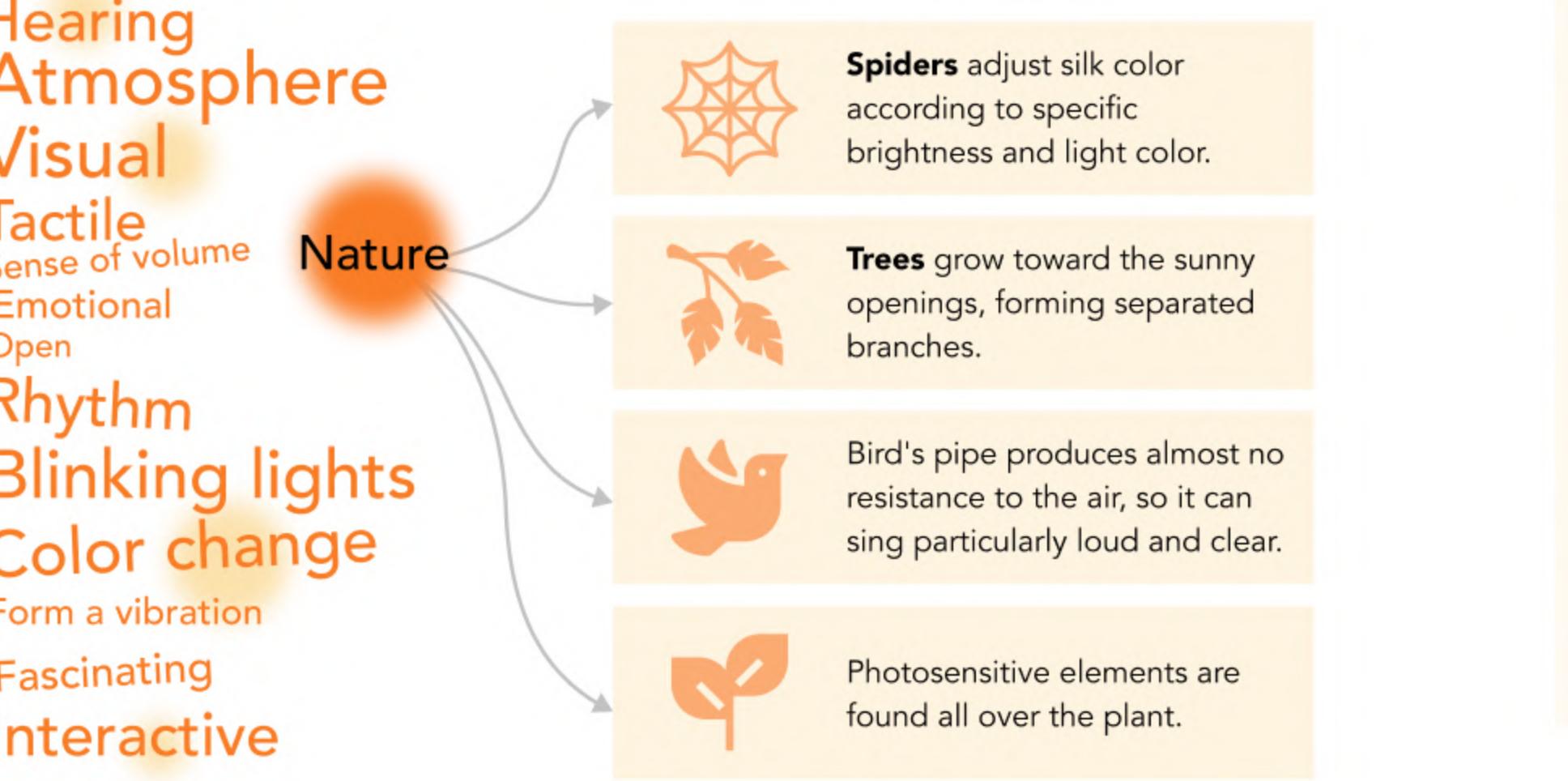


Inspired by the phenomenon "bioluminescence", the artists personified the forest to accentuate the natural beauty by creating luring luminescent plants and glowing magical mushrooms.

Concept development

Hidden details

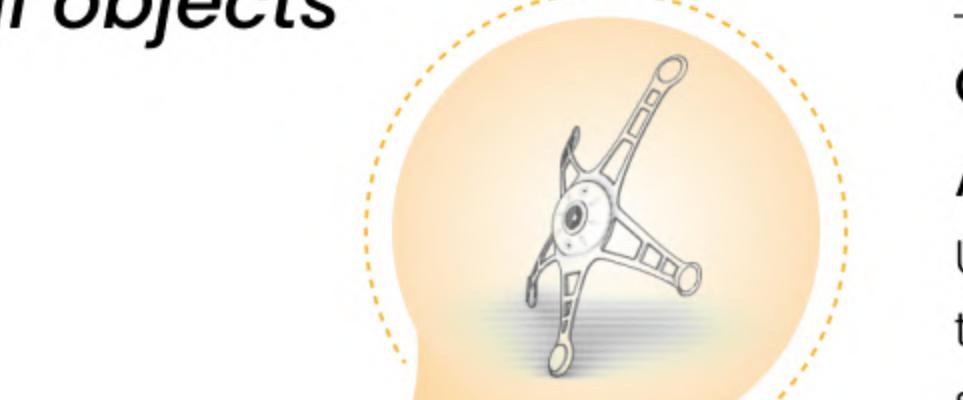
A complex and subtle relationship of flora and fauna exists in every square meter of territory.



Sketch



Final objects



Object 01

Attached to a tree

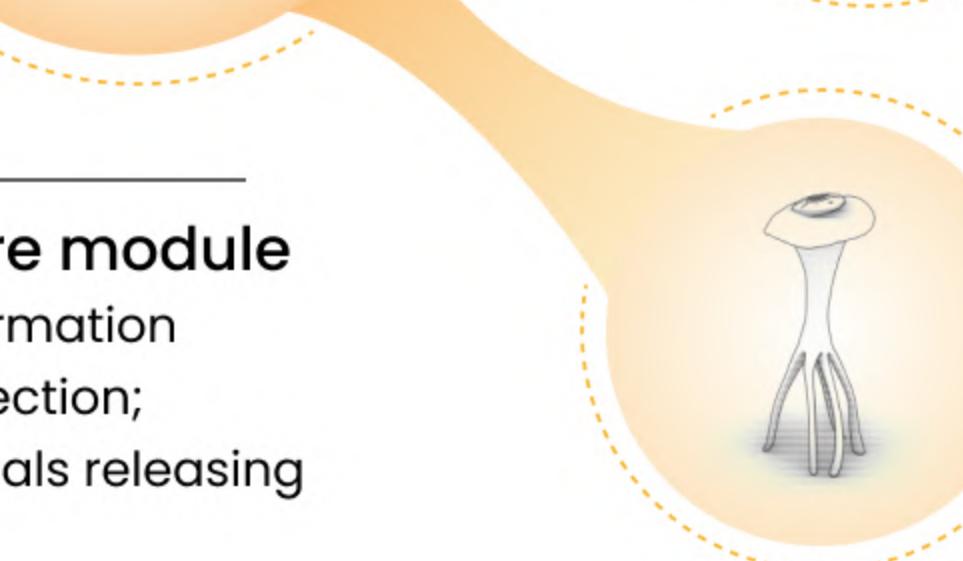
Use ultrasonic sensors to transform how trees feel to we humans can understand, such as the light effect.



Object 02

Spread on a stone

Transform the growth state of moss to light signals to show the tight connection between moss and water.



Object 03

Inserted in the soil

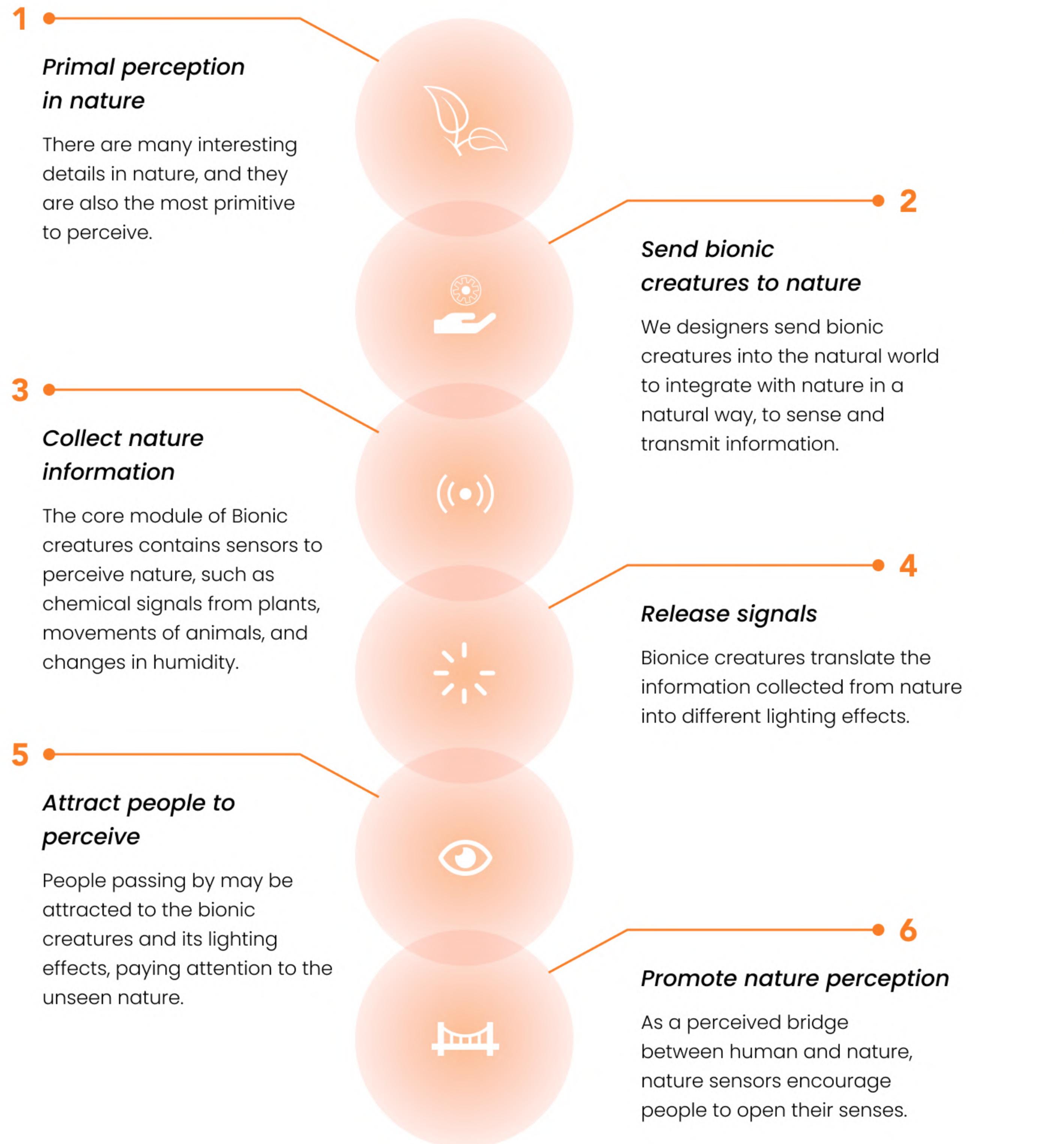
Turn the activity of the microbiota into a visual game that people can see.

Rendering

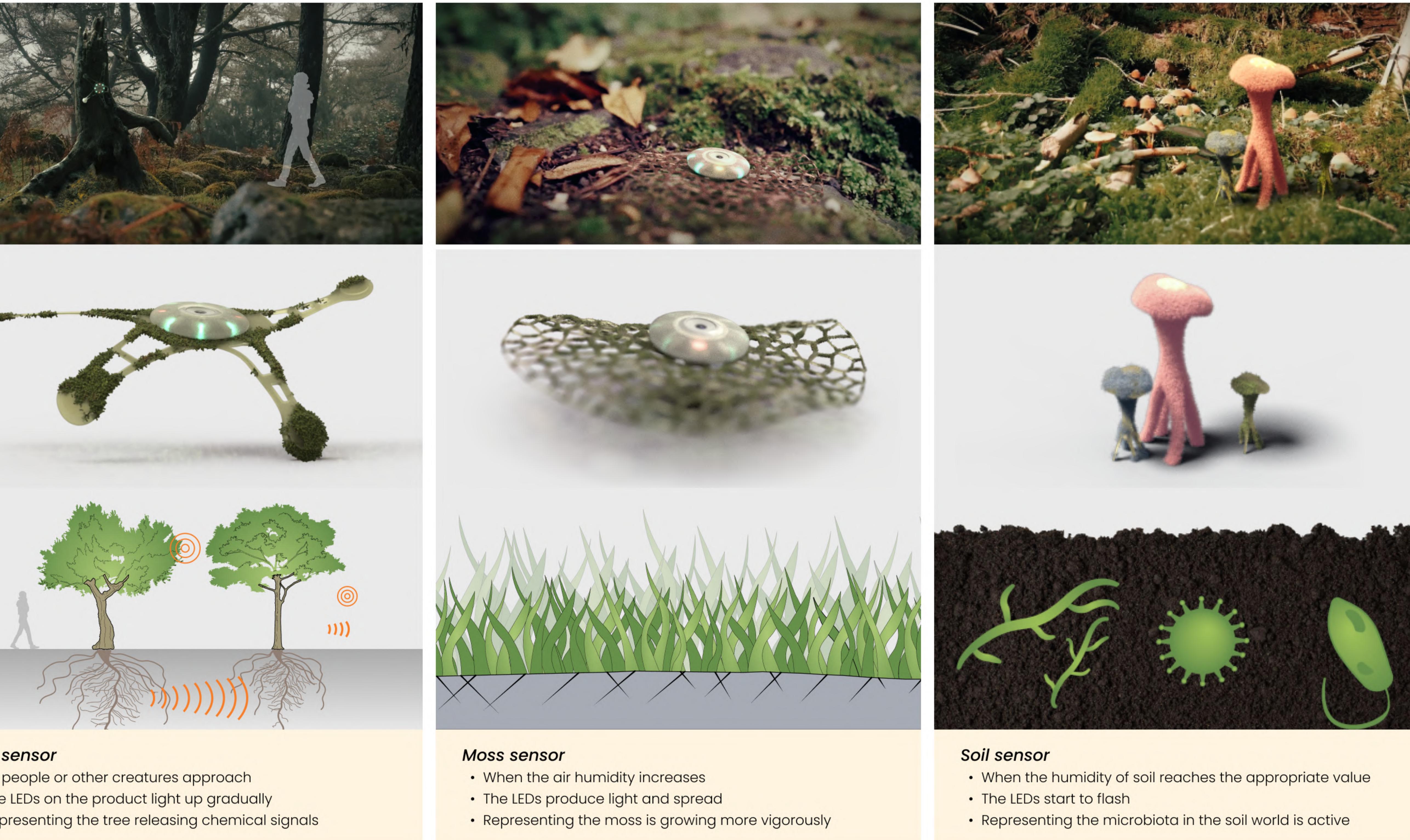
Based on nature-centered concept, I designed **some bionic creatures**. They are **integrated with nature in a natural way**, perceiving and transmitting information.



Function frame



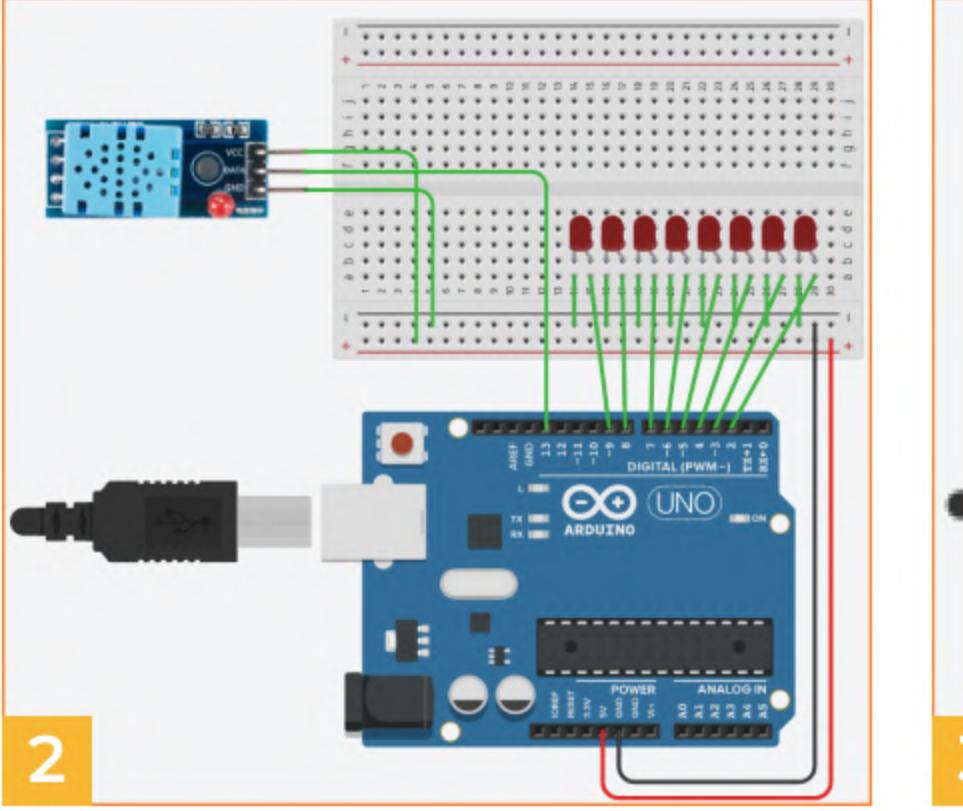
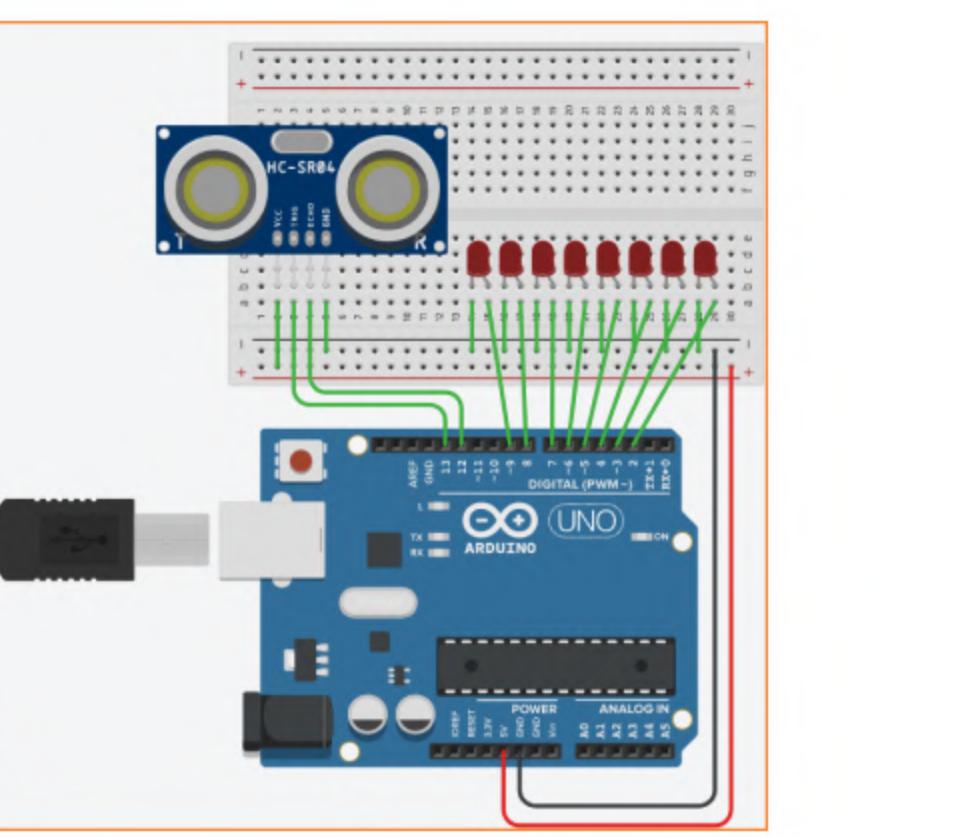
Interaction flow



Prototyping

Circuit diagram

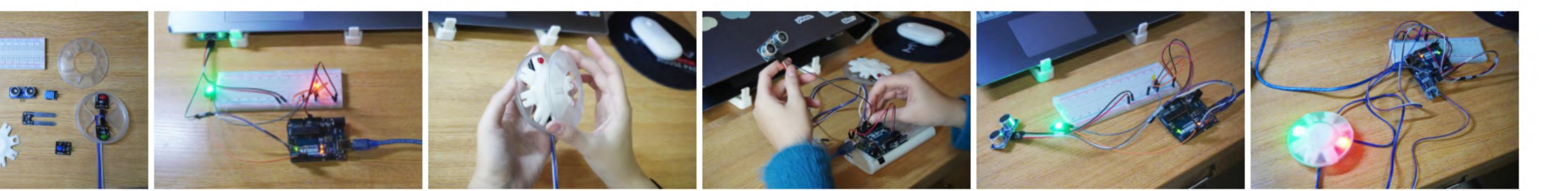
I chose Arduino Uno, ultrasonic sensor, soil moisture sensor, digital temperature-humidity sensor, and LEDs to realize the environmental factors trigger and light spreading.



Coding

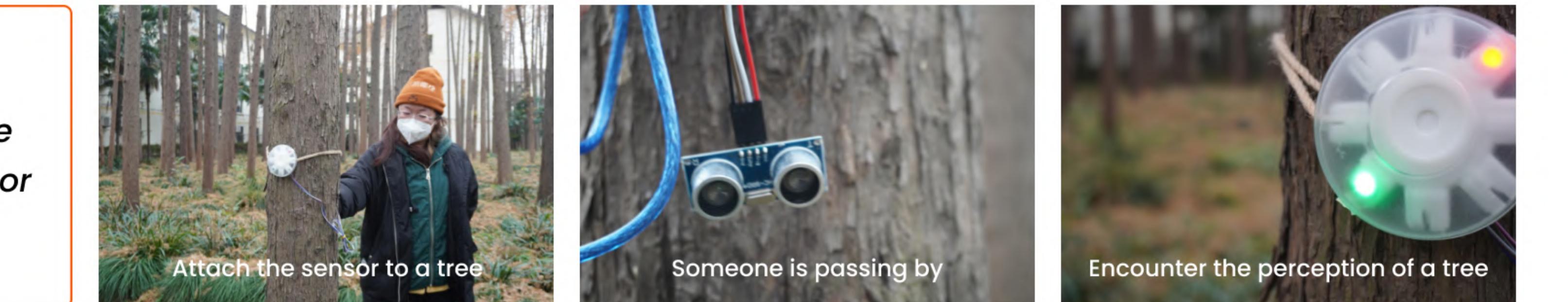
<p>1</p> <p>sensor</p> <pre>int TrigPin = 7; int EchoPin = 6; int LedPin1 = 3; int LedPin2 = 4; int val; void setup() { Serial.begin(9600); pinMode(TrigPin, OUTPUT); pinMode(EchoPin, INPUT); pinMode(LedPin1, OUTPUT); pinMode(LedPin2, OUTPUT); } void loop() { digitalWrite(TrigPin, LOW); //低高低电平发一个短时间脉冲去TrigPin delayMicroseconds(2); digitalWrite(TrigPin, HIGH); delayMicroseconds(10); int cm = pulseIn(EchoPin, HIGH) / 20.0; //将回波时间换算成cm cm = (int(cm * 100.0)) / 100.0; //保留两位小数 Serial.println(cm); //输出距离值 Serial.println("cm"); delay(50); if (cm>=232) { digitalWrite(LedPin1, LOW); digitalWrite(LedPin2, LOW); } if (cm<232 & cm>116) { digitalWrite(LedPin1, HIGH); digitalWrite(LedPin2, LOW); } if (cm<=116) { digitalWrite(LedPin1, HIGH); digitalWrite(LedPin2, HIGH); } } </pre>	<p>2</p> <p>sensor</p> <pre>* 温湿度传感器: -接GND-中间接5V, 数字引脚接8 * Led灯: 负极GND (串联一个电阻), 正极数字引脚3和4 */ #include <DHT.h> //引入温湿度传感器库 #define D 8 //定义传感器的数据引脚 DHT dht(D,DHT11); //实例化对象 int LedPin1 = 3; //定义Led灯的数字引脚 int LedPin2 = 4; //定义Led灯的数字引脚 void setup() { Serial.begin(9600); pinMode(D,OUTPUT); //引脚模式 pinMode(LedPin1,OUTPUT); pinMode(LedPin2,OUTPUT); dht.begin(); //开始读取 } void loop() { // put your main code here, to run repeatedly: // int ch=dht.read(D); //读取所有的数据 float hum=dht.readHumidity(); //读取湿度 if(hum >= 25.00) //判断湿度是否超过45%RH { digitalWrite(LedPin1,HIGH); //满足条件给Led一个高电平 digitalWrite(LedPin2,HIGH); //满足条件给Led一个高电平 Serial.print("湿度大于45%RH, 灯亮了!!! 当前湿度值为:"); delay(3000); //亮灯三秒 } else { digitalWrite(LedPin1,LOW); digitalWrite(LedPin2,LOW); } Serial.print("tem:"); Serial.println("当前温度"); delay(2000); } </pre>	<p>3</p> <p>sensor</p> <pre>int TrigPin = 7; int EchoPin = 6; int LedPin1 = 3; int LedPin2 = 4; int val; void setup() { Serial.begin(9600); pinMode(TrigPin, OUTPUT); pinMode(EchoPin, INPUT); pinMode(LedPin1, OUTPUT); pinMode(LedPin2, OUTPUT); } void loop() { digitalWrite(TrigPin, LOW); //低高低电平发一个短时间脉冲去TrigPin delayMicroseconds(2); digitalWrite(TrigPin, HIGH); delayMicroseconds(10); int cm = pulseIn(EchoPin, HIGH) / 20.0; //将回波时间换算成cm cm = (int(cm * 100.0)) / 100.0; //保留两位小数 Serial.println(cm); //输出距离值 Serial.println("cm"); delay(50); if (cm>=232) { digitalWrite(LedPin1, LOW); digitalWrite(LedPin2, LOW); } if (cm<232 & cm>116) { digitalWrite(LedPin1, HIGH); digitalWrite(LedPin2, LOW); } if (cm<=116) { digitalWrite(LedPin1, HIGH); digitalWrite(LedPin2, HIGH); } } </pre>
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process



Components	Connect LEDs to the board	Assemble the core module	Connect the sensors to the core	Testing effect on different sensors	Lighting effect
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sensor usability test



A horizontal collage of three photographs illustrating the use of sensors on trees. The first image shows a close-up of a sensor device attached to a tree trunk. The second image shows a person's arm reaching towards a tree, with a blue strap or sensor visible. The third image shows a wider view of a tree with several blue and green sensors attached to its branches and trunk.

Moss sensor



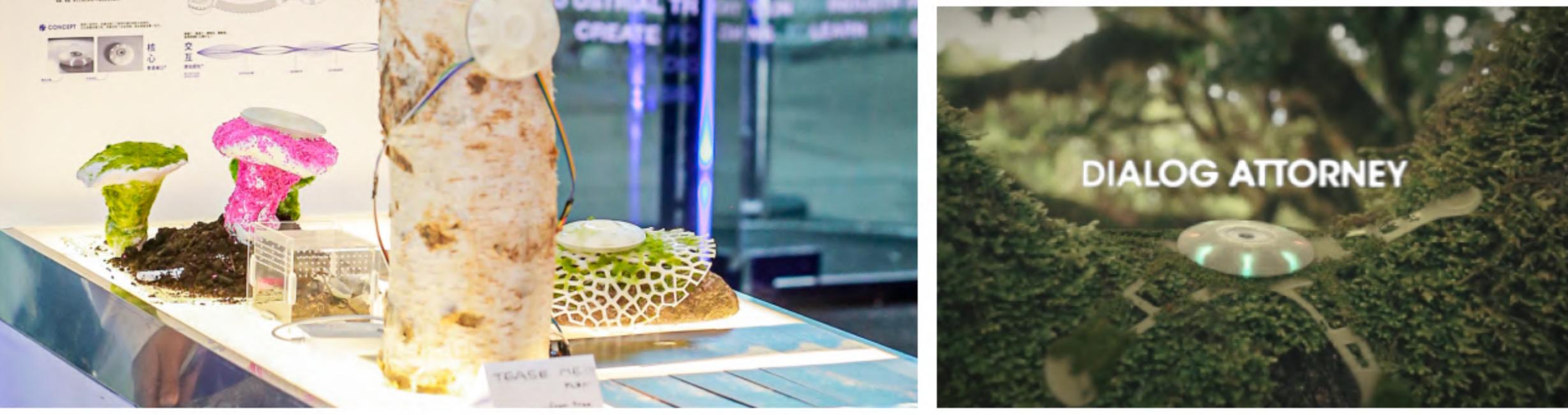
Place the module on the moss Humidity increases, the lights flash Encounter the perception of moss

Soil sensor



Insert the sensor in the soil Temperature and humidity change, light color change Encounter the perception of microbiota

Final prototype





Project 04

A career development platform for construction workers

Craftsman Journey

Craftsman journey is a career platform for construction workers and companies. It integrates site management and personal development, facilitating site work and enhancing workers' awareness of career development. By splitting daily tasks and accumulating corresponding skill cards, workers can perceive their career development process, obtain career evaluation, and achieve career advancement.

Video: https://youtu.be/XK0pVt4j_5Q

2022.5 - 2022.7

Team Project (4 people)

My work: User interview, Ideation, UX/UI design

Mobility is the basic living condition of the new generation of migrant workers.

Territory

They move back and forth between industries like migratory birds, moving back and forth between urban and rural areas.

I don't feel at home here, and I don't want to stay here in the future.

Anyway, it is not long to stay in any place, and I feel a bit bored after staying for a long time. I want to live in the city of my hometown after I have a family.

I'll stay here for now, but won't come out next year and will find something to do at home.



济州特别自治道。

Whichever factory has a high salary, go there.

I've been through many career changes.

In a state of intermittent employment and non-employment.

Occupation

They change jobs in different cities and between different factories in the same city.

Persona

- // Higher level of culture and pursuit
- // Lower levels of mental health
- // Occupational identity swaying and blurring
- // Difficulty in social integration



Problems

The key word for the workers is "taking things as they come", with too little focus on their own development and reflective review.

Workers have difficulty holding on.

Workers lack the motivation to self-flagellate.

Workers are not good at thinking systematically.

Solution

Help workers slowly build awareness of planning.

Build learning squares with short, quick interaction patterns.

Through the supervision of the enterprise, use the site management to guide and cultivate habits.

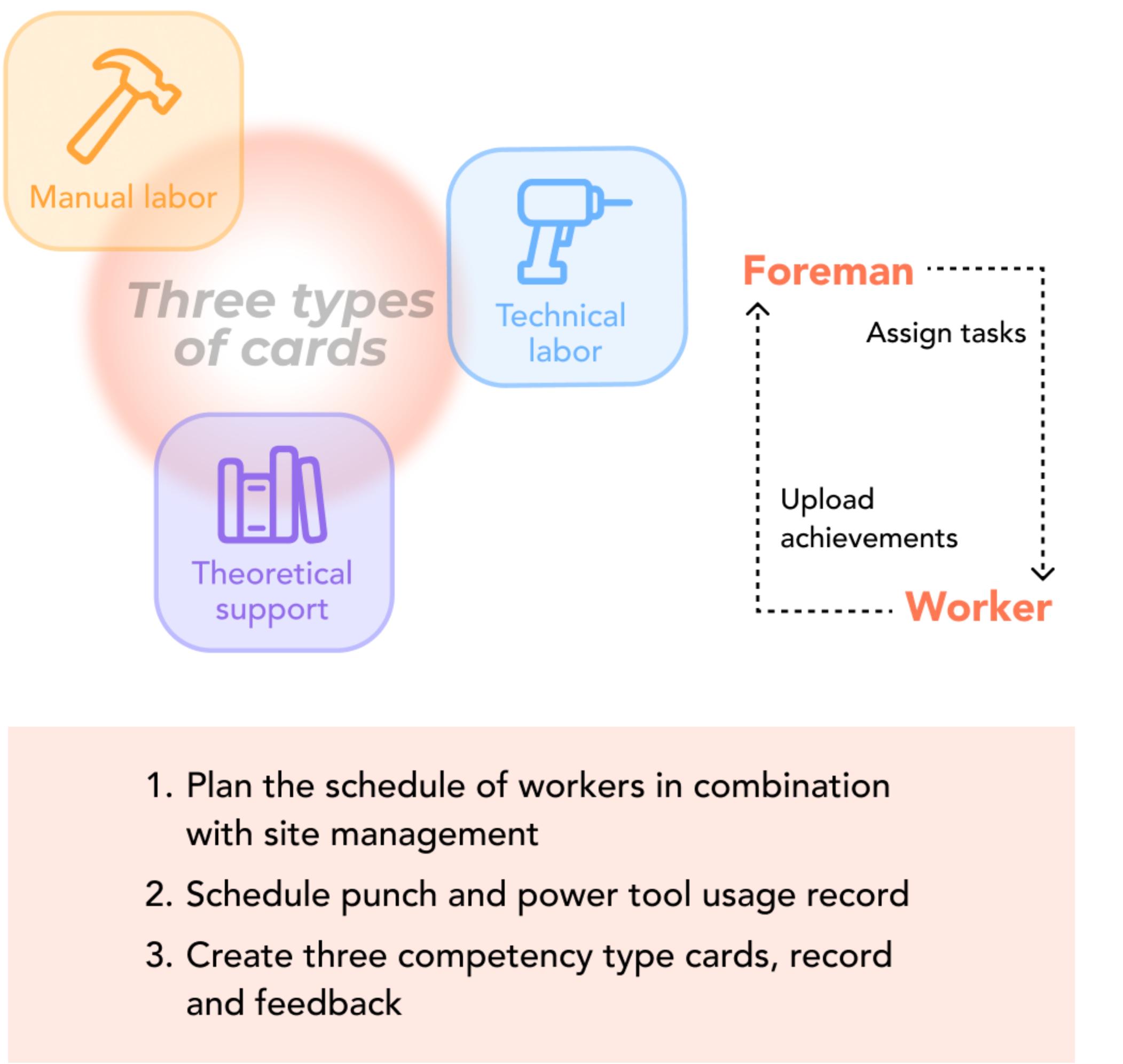
Establish a feedback mechanism for visual recording.

Concept overview

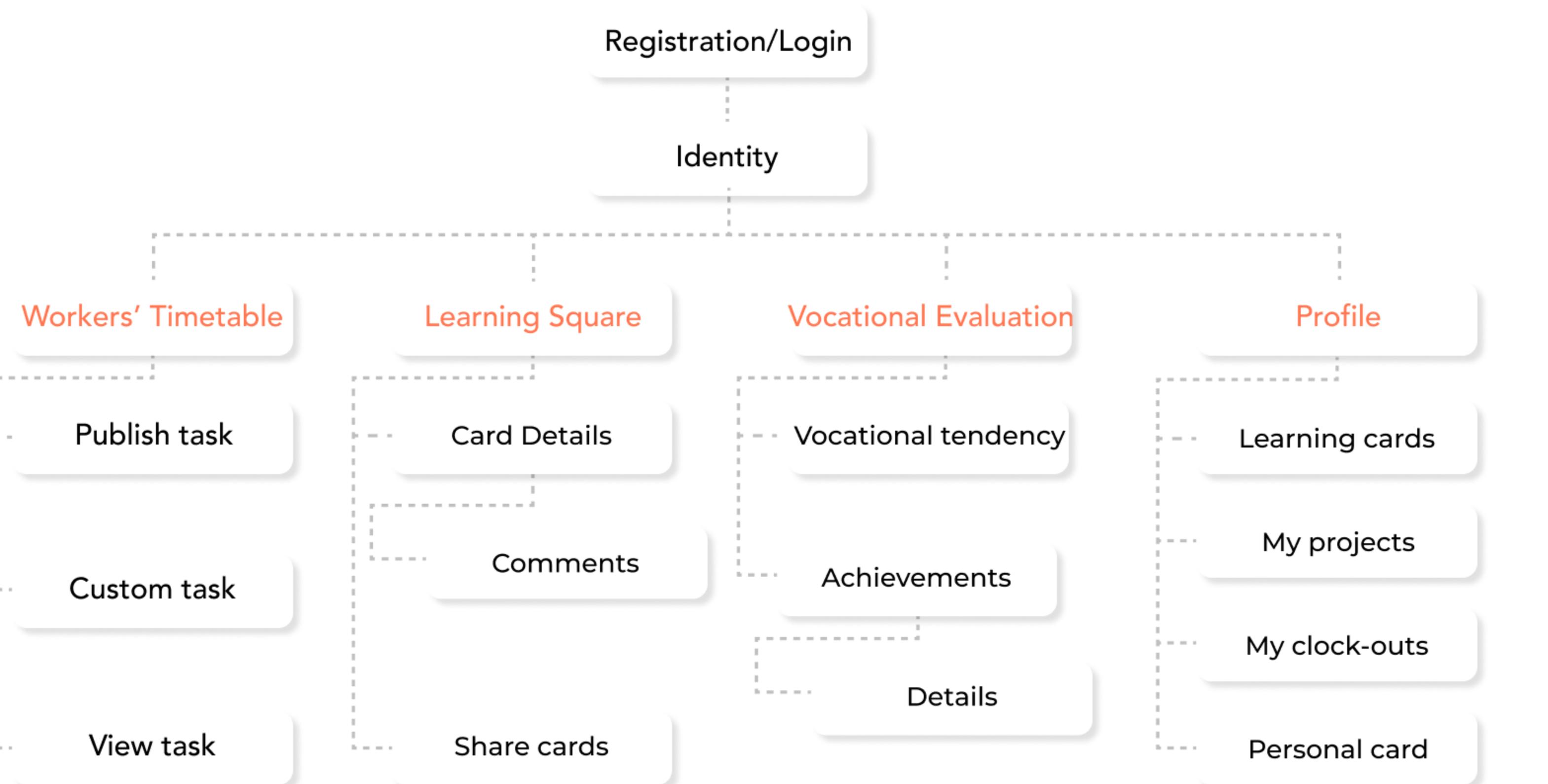
Craftsman journey is a career platform for construction workers and companies. It integrates site management and personal development, facilitating site work and enhancing workers' awareness of career development. By splitting daily tasks and accumulating corresponding skill cards, workers can perceive their career development process, obtain career evaluation, and achieve career advancement.

Three types of cards

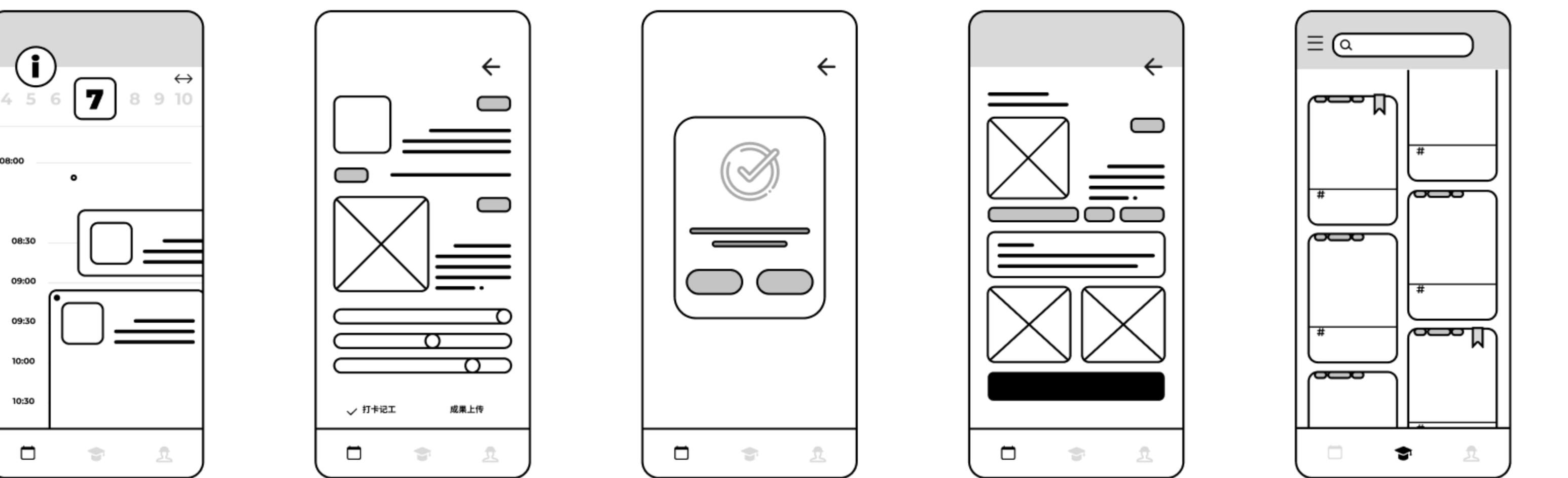
In the APP, we correspond the job content of construction workers into three types of skills: physical labor, technical labor and theoretical support, and represent them with three colors and icons.



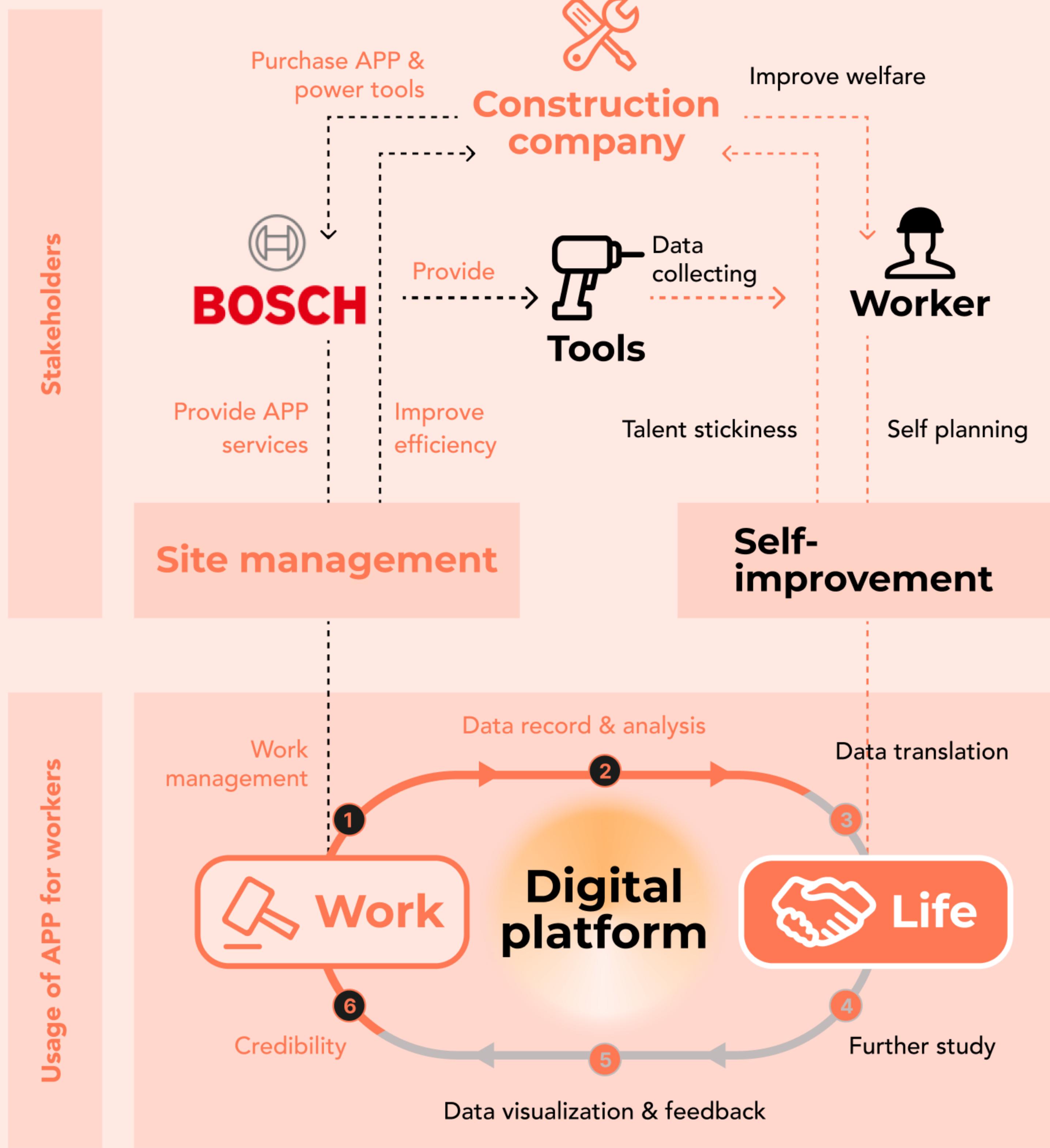
Information architecture



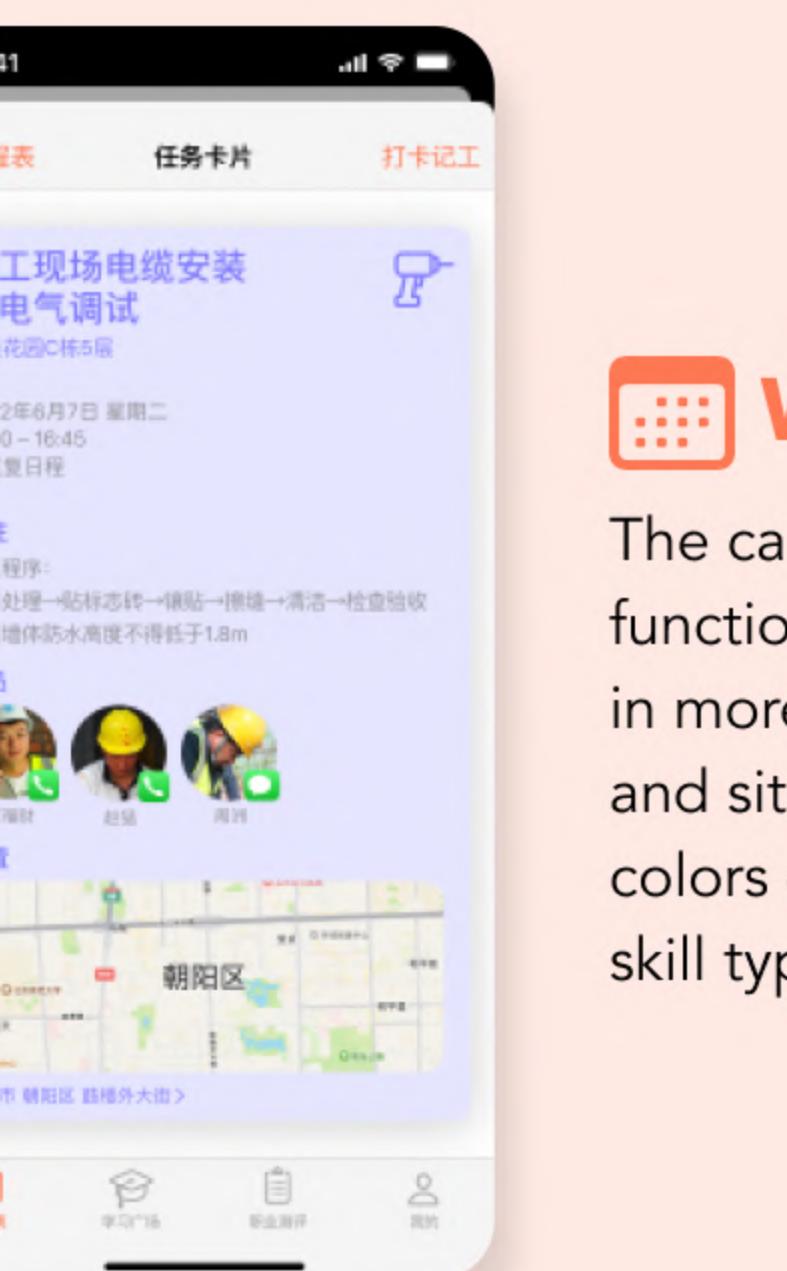
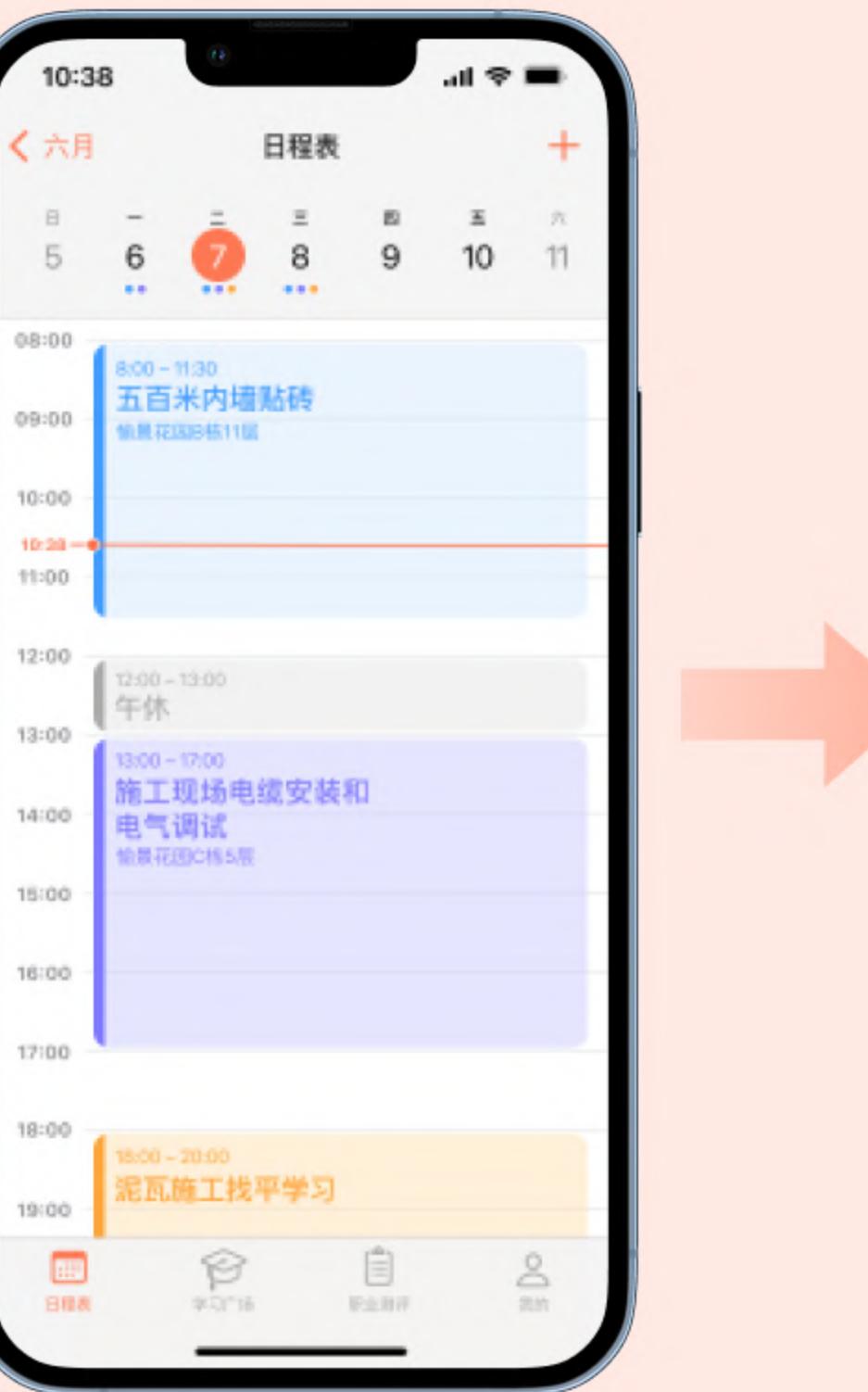
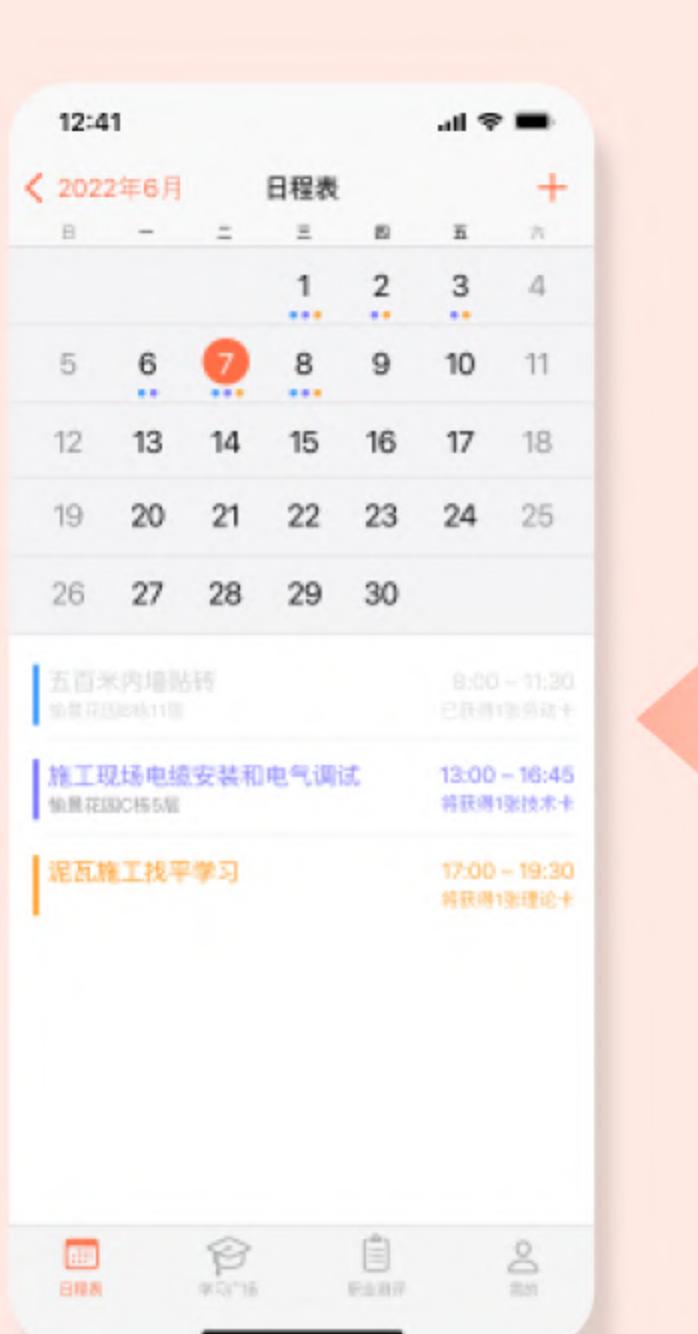
High-fidelity wireframes



Ecosystem map



Interfaces



Workers' timetable

The calendar is the main function of the APP, which helps in more efficient task distribution and site management. The three colors correspond to the three skill types.



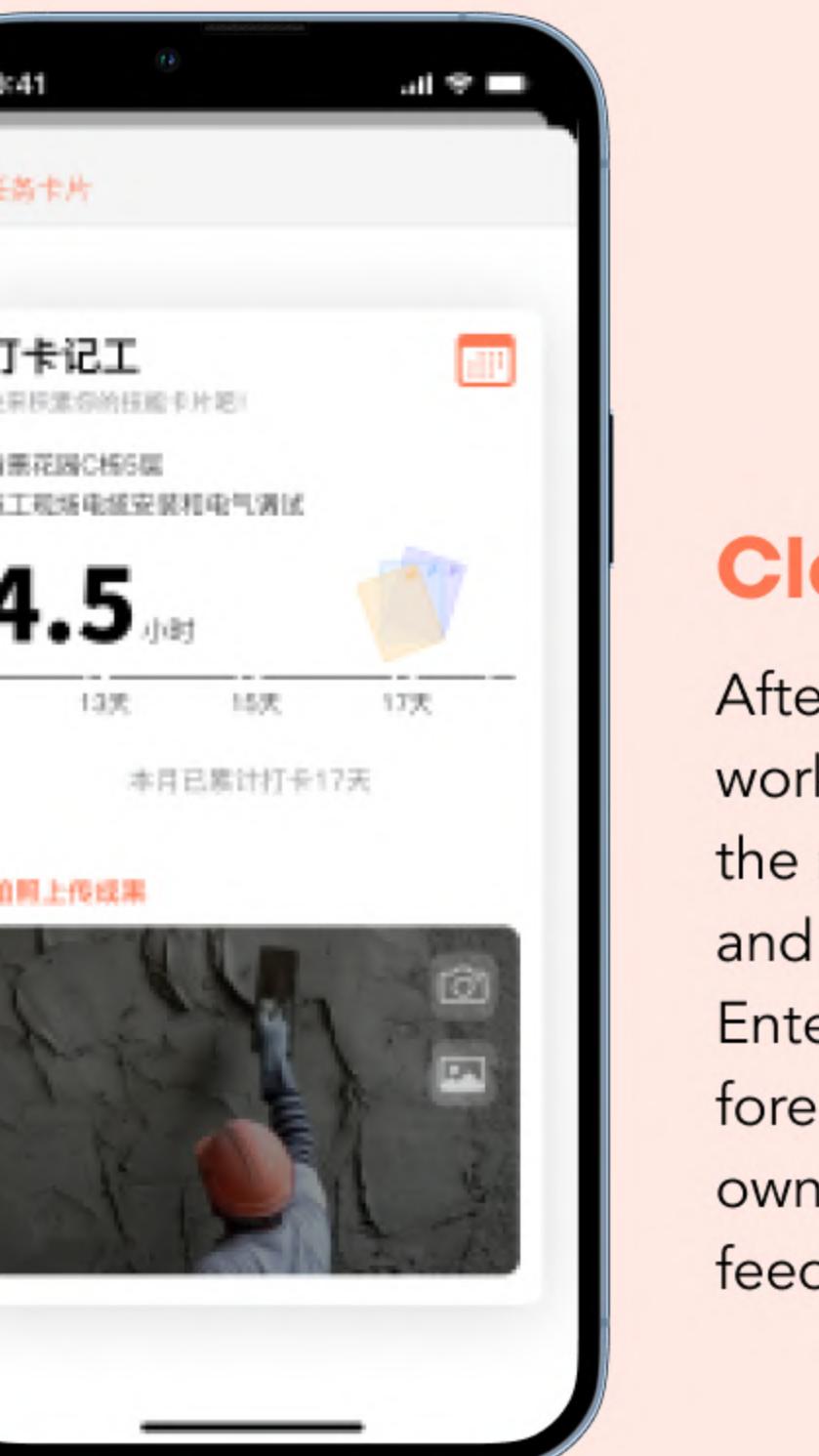
Profile

Work records and study records will be fed back in the form of personal business cards and project highlights on the personal homepage, bringing a recognition enhancement.



Attain a card!

After the card is punched successfully, the worker can get a card of the corresponding skill type. This will be the record of the craftsman's journey and the display of achievements.



Clock out

After completing a task, the worker clicks "Pick-In" to go to the results upload page to upload and publish the work results. Enterprise quality inspectors, foremen or co-workers, and owners can all evaluate and give feedback on the quality of work.



Learning Square

In their spare time, workers can learn construction skills in the three sections of "labor", "technology" and "theory" in the learning square. At the same time, you can also share your own work experience.



Vocational Evaluation

The APP provides card recording and career assessment functions to help workers establish a career development planning awareness, which can be used as a reference for personal planning and some considerations for evaluating abilities at work.

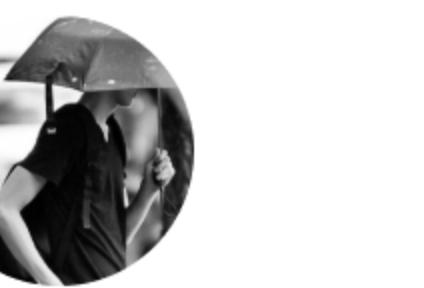
Usability test

Sample size :

- n=3
- Born after 1985
- They all use apps regularly on their phones.
- They are looking forward to seeing their career progress and want upward mobility



Zhang Shifu
Construction worker



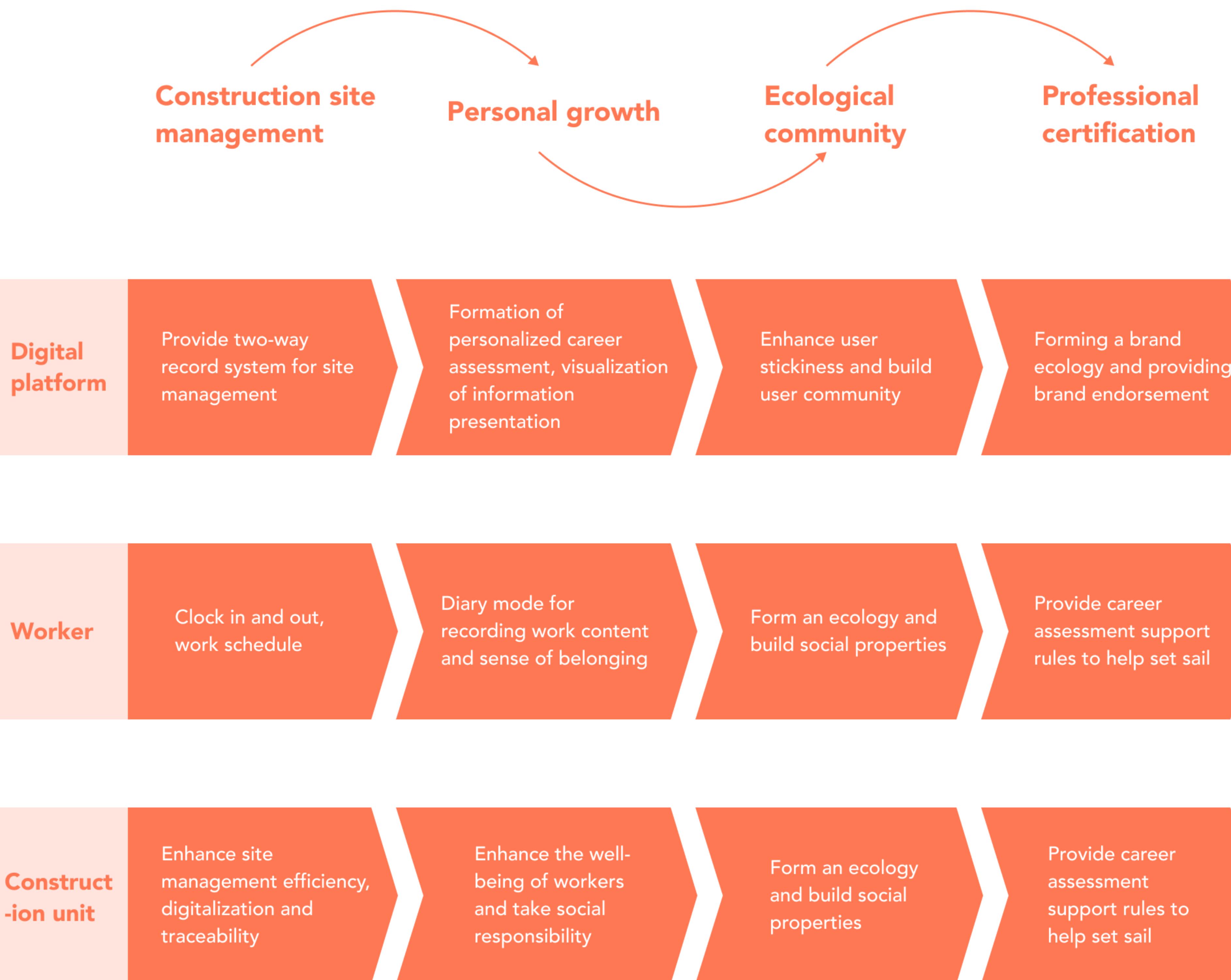
Jin Shifu
Electrician



Yang Shifu
Carpentry manager

Activity	Test users	Average time	User's thoughts	Success/Fail
Opening the application		~1min	"It was a little hard to distinguish the four skill cards at first."	✓
Browsing workers' timetable page		4min	"The duration of the task does not meet the true situation. The button on the mission card is too small. Don't understand the switch button."	✗
Clocking out to record workpoints		3min	"Don't know 'upload results' and 'clock out' who goes first."	✓
Browsing learning square page		2.5min	"Can I choose a more specific category that I want to learn?"	✓
Checking his own career evaluation		4min	"The things I want to see(career evaluation) is too deep in this App. I want to see more feedbacks, like development progress."	✓

Future blueprint



Project 05

Furniture manufacturing system design
based on circular economy

Relab

Relab is a furniture manufacturing studio. We developed two types of furniture, including tables and shelves. All of the materials are recycled. We produce furniture using obsolete panels and recycled plastic. With the power of algorithms, we can generate a variety of possible connections based on the mechanical requirements of the furniture.

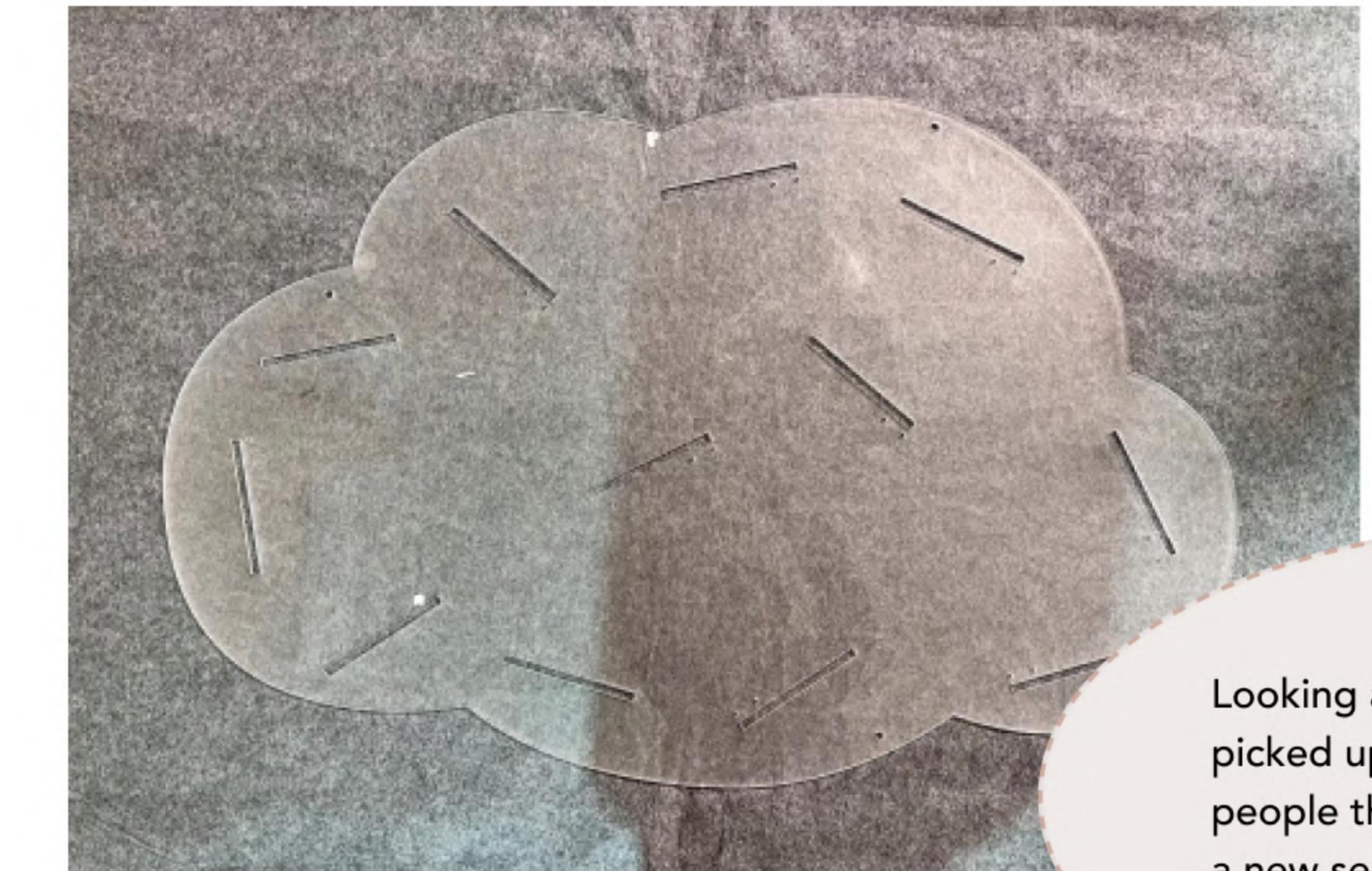
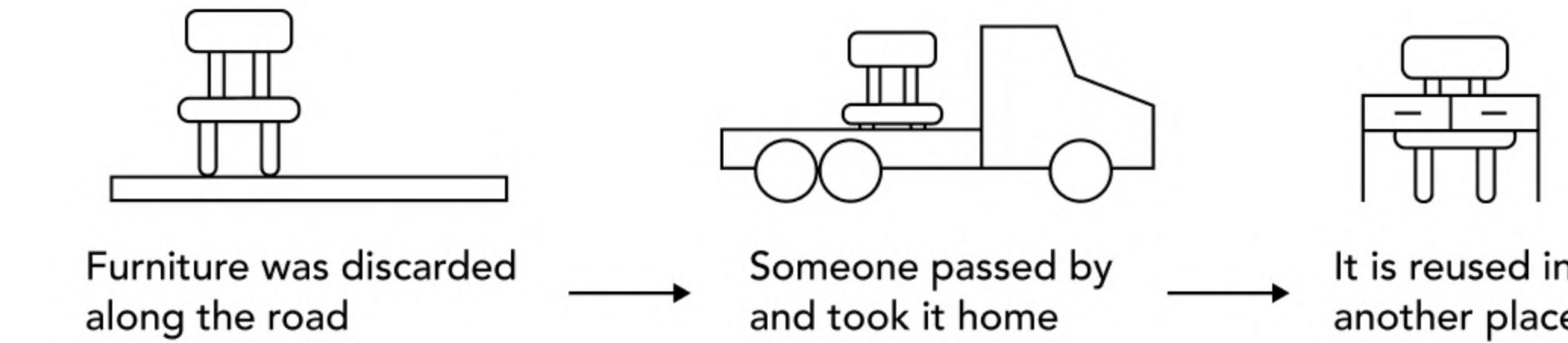
Video: <https://youtu.be/Vuqae9NwHTo>

2021.11 - 2021.12
Team Project (2 people)
My work: Research, Concept, Generative design, Model making, UX/UI design



Inspiration | Stooping

Stooping means picking up and taking home furniture or other waste that someone doesn't need and has left on the side of the road.



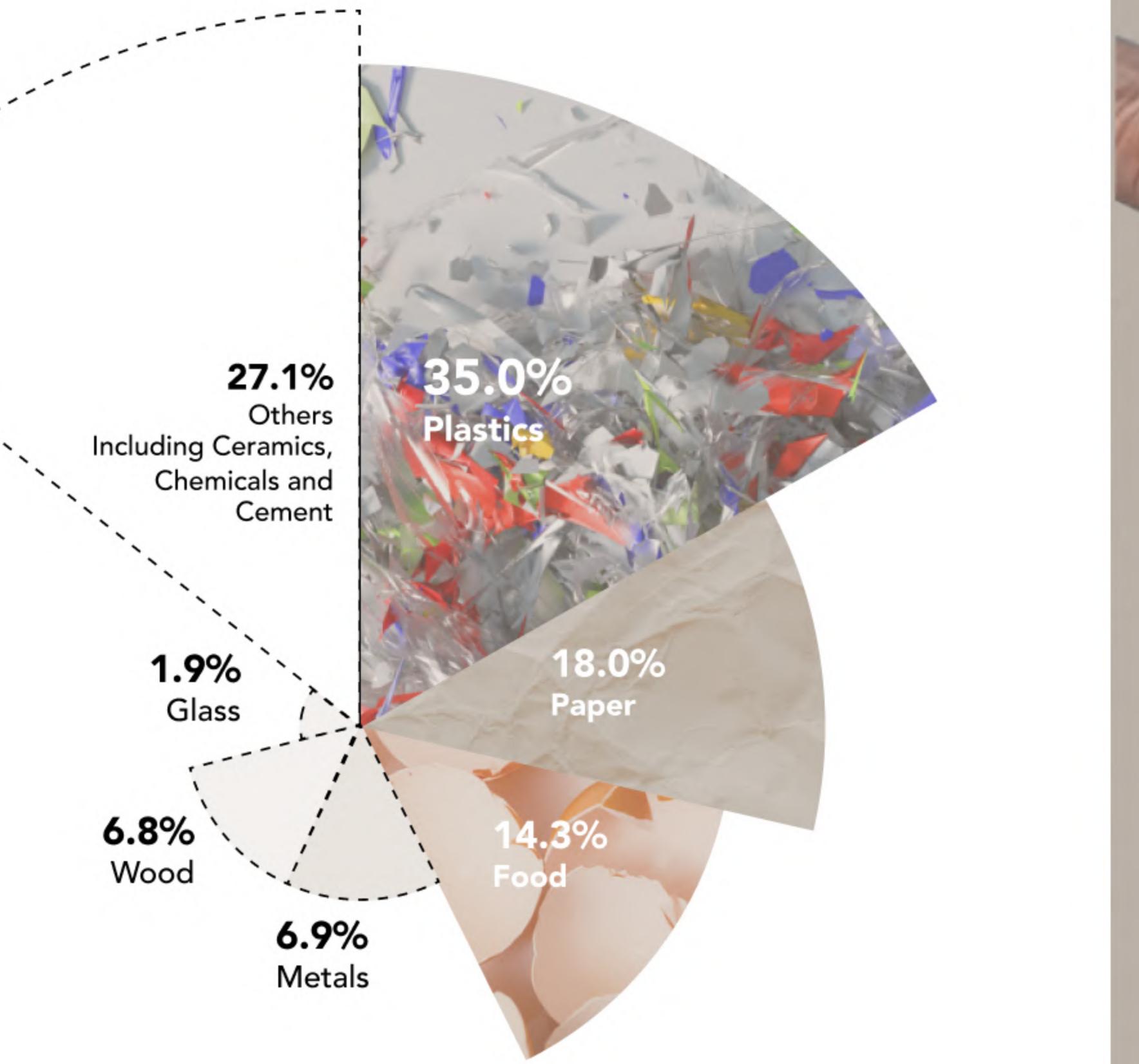
Looking at the two discarded panels I picked up, I hope to change the way people think about waste and create a new service model of furniture to eliminate waste.

Research

City waste material

Major components of municipal solid waste

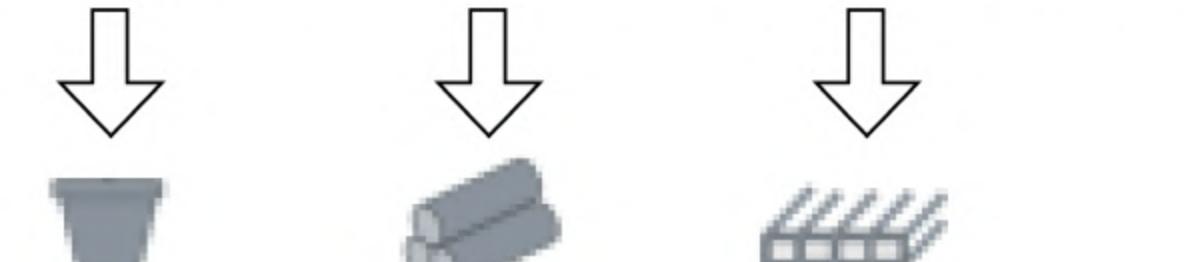
After making some assessments, my partner and I chose the largest group-- **Plastics** to develop. The most common types of plastic products around us are plastic bottles. So we want to use them to do some experiments.



Plastic caps



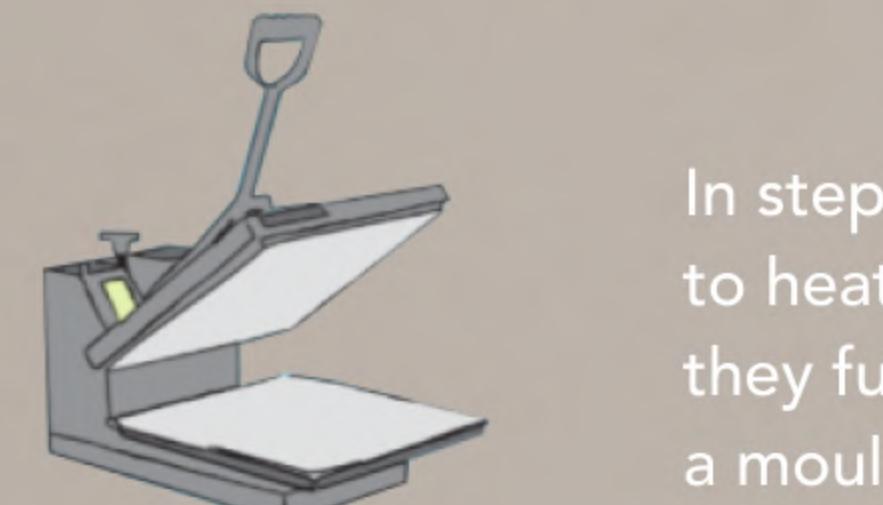
- Usually opaque
- Have high hardness
- Always recycled to be used for rods and panels



Plastic bottles

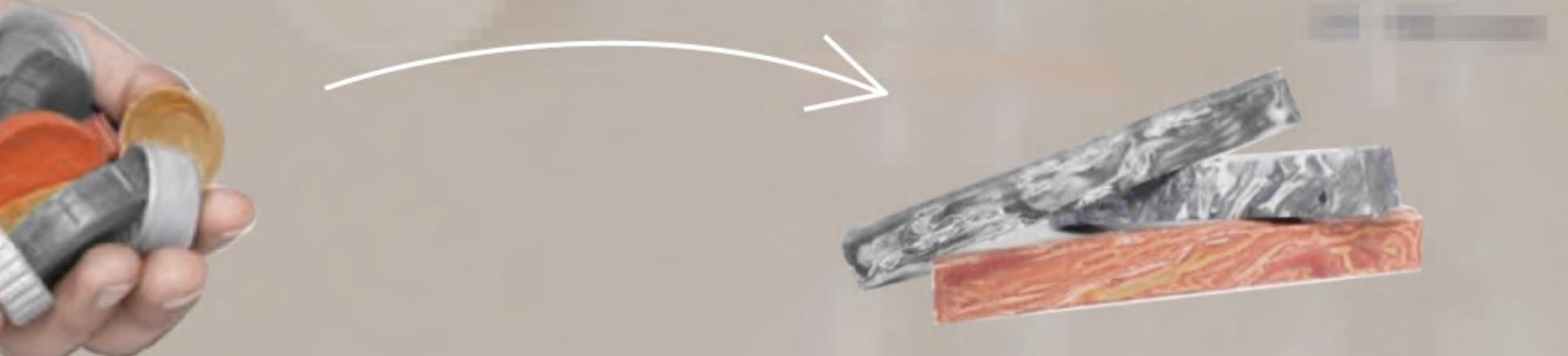


- Can be easily reshaped into plastic pellets
- Can be used as a raw material for 3D printing to produce other products



Material experiment

Plastic caps recycling



Since we didn't have the equipment to do a recycled plastic 3D printing experiment, we recycled some bottle caps and used them for experiments of making rods.

Step1 - Caps shredding



Step2 - Heat the caps



Step3 - Fix plastic in the mould



Thanks to Precious Plastic Studio in Shanghai who helped us shred these caps! We used their shredding machine to cut the bottle caps into pieces.

In step 3, we used an electric pan to heat the plastic pieces so that they fused. Then we put them into a mould and pressed them.



Summary

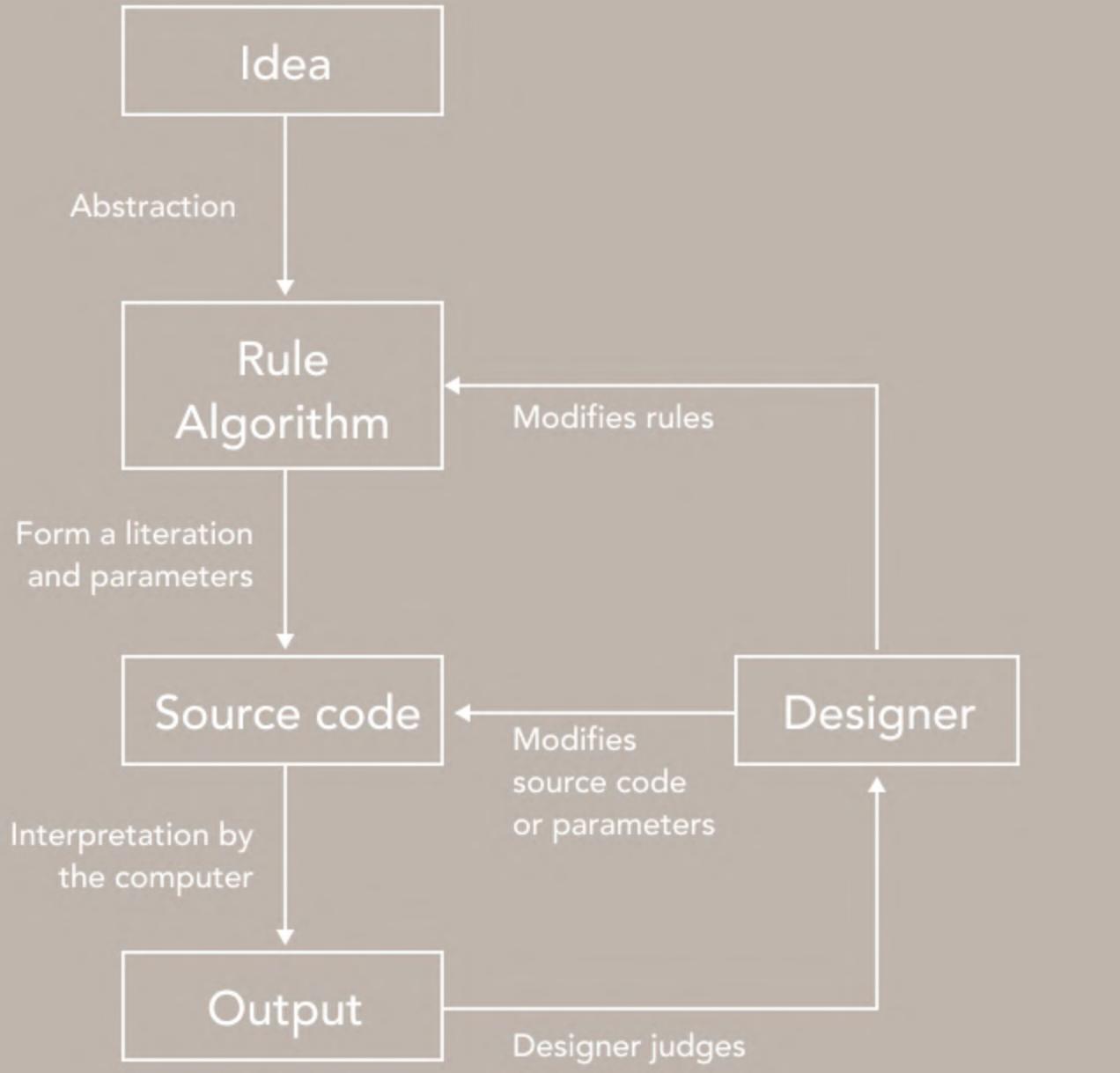
The rod made from recycled plastic bottle caps is hard and perform well. We had a mechanical test and found it could be used as a support piece to combine with wasted panels and form a new furniture.





A brief study in Generative Design

" A Way of Translating Computational Energy into Creative Energy." by Swam Kuah

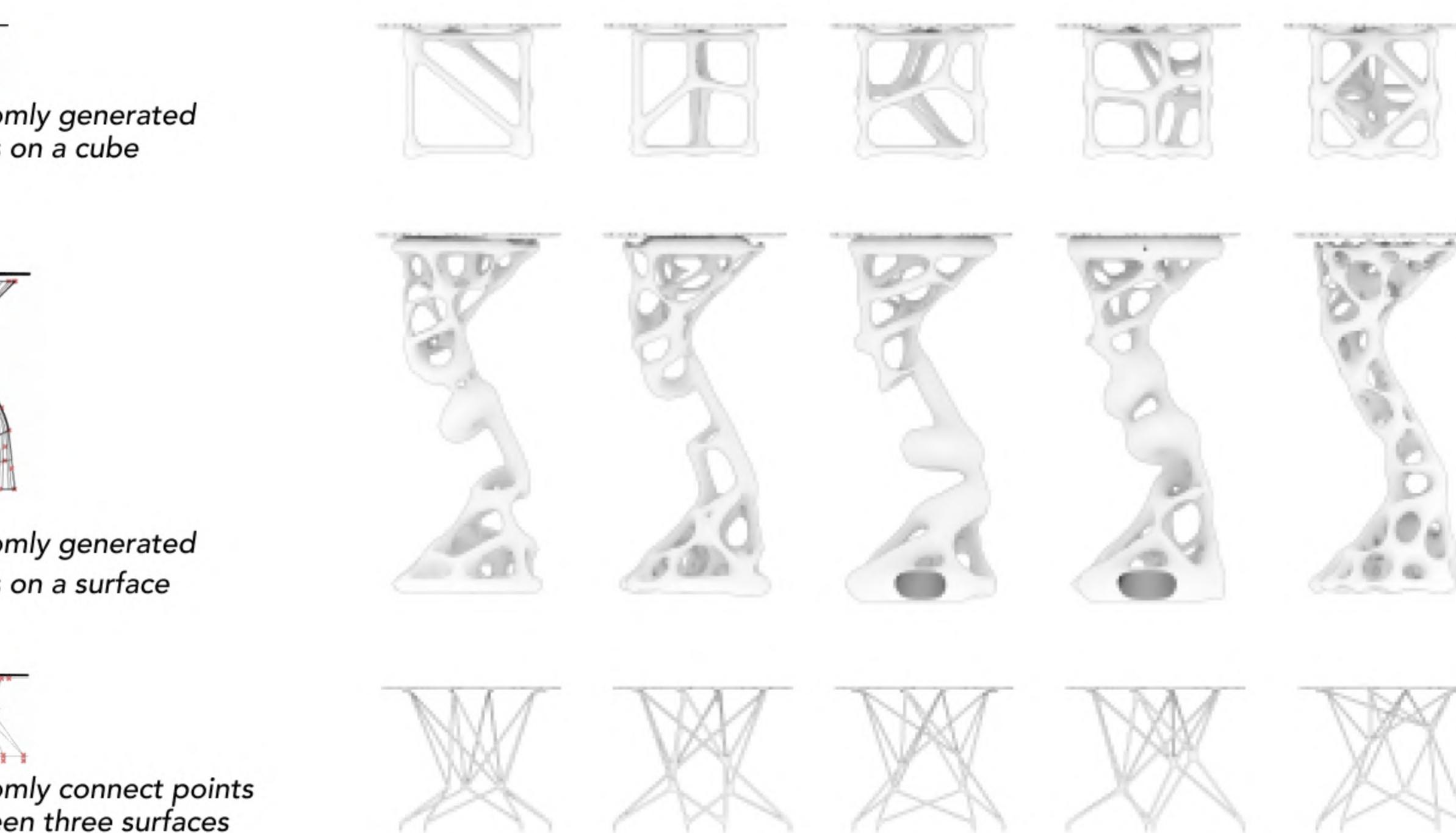


Several options for a single design

I think generative design is a design process that can generate design solutions efficiently. Perhaps it is a good way to give the new service model an appeal and create more furniture forms.

Development

Iteration process



After exploring and testing several forms using grasshopper, we chose the 3rd form because it's the simplest to process and easy to produce on an industrial scale.

Establish constraints

Selected points randomly

Connect these points by using the shortest path

Use Multipipe to generate rods

Front view of the model

Perspective view of the model

Brand design

RELAB

Brand key words:



Resource recycle

Relab produces generative furniture from waste. The logo is derived from concepts of generative design, recycling of panels, and material reconnection.



Material reuse

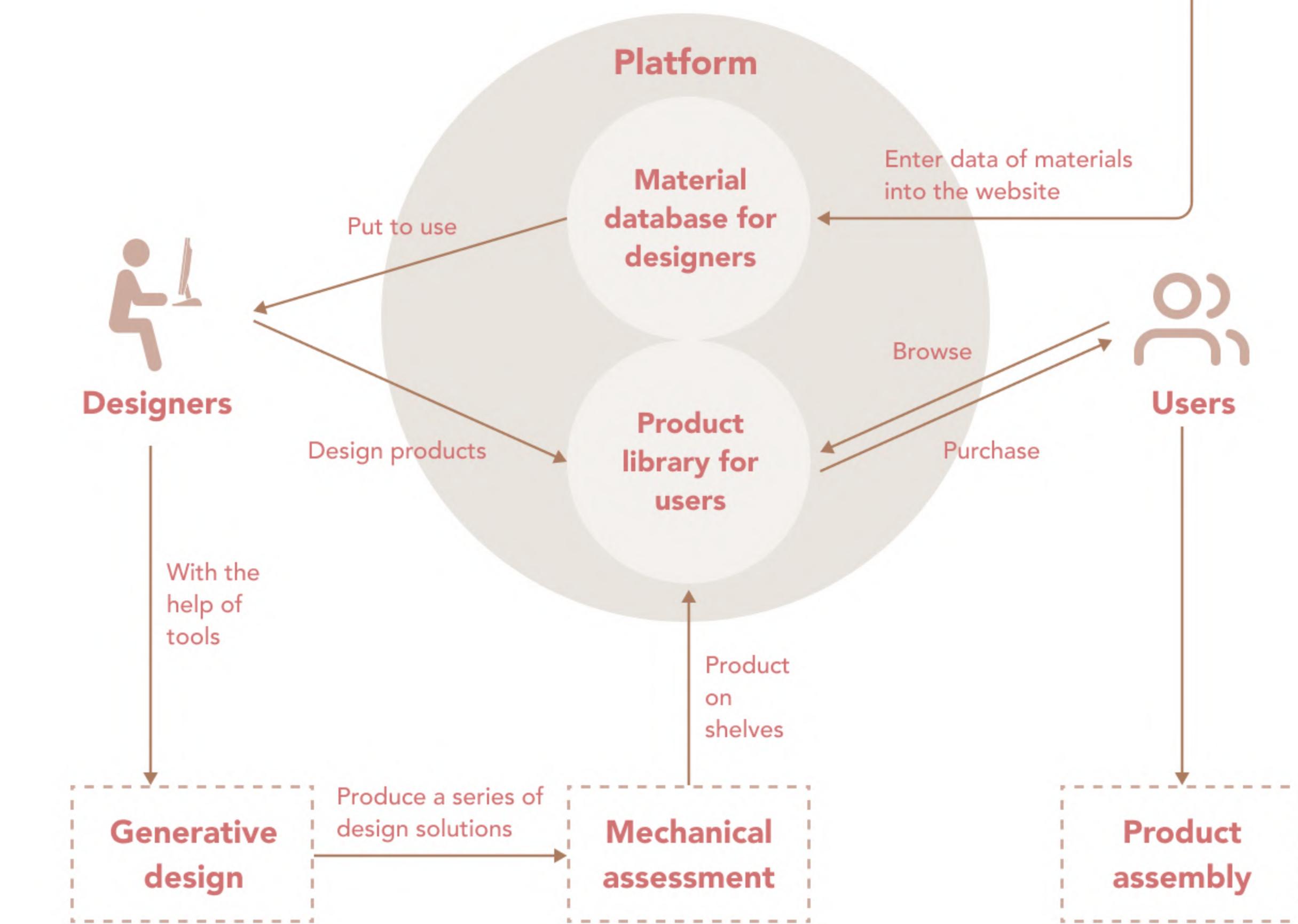
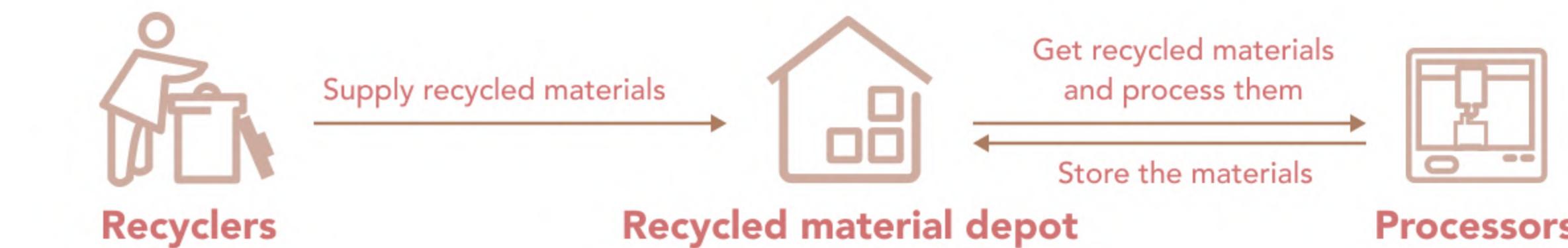


Resources reconnect



Package reduce

System flow



Deliver



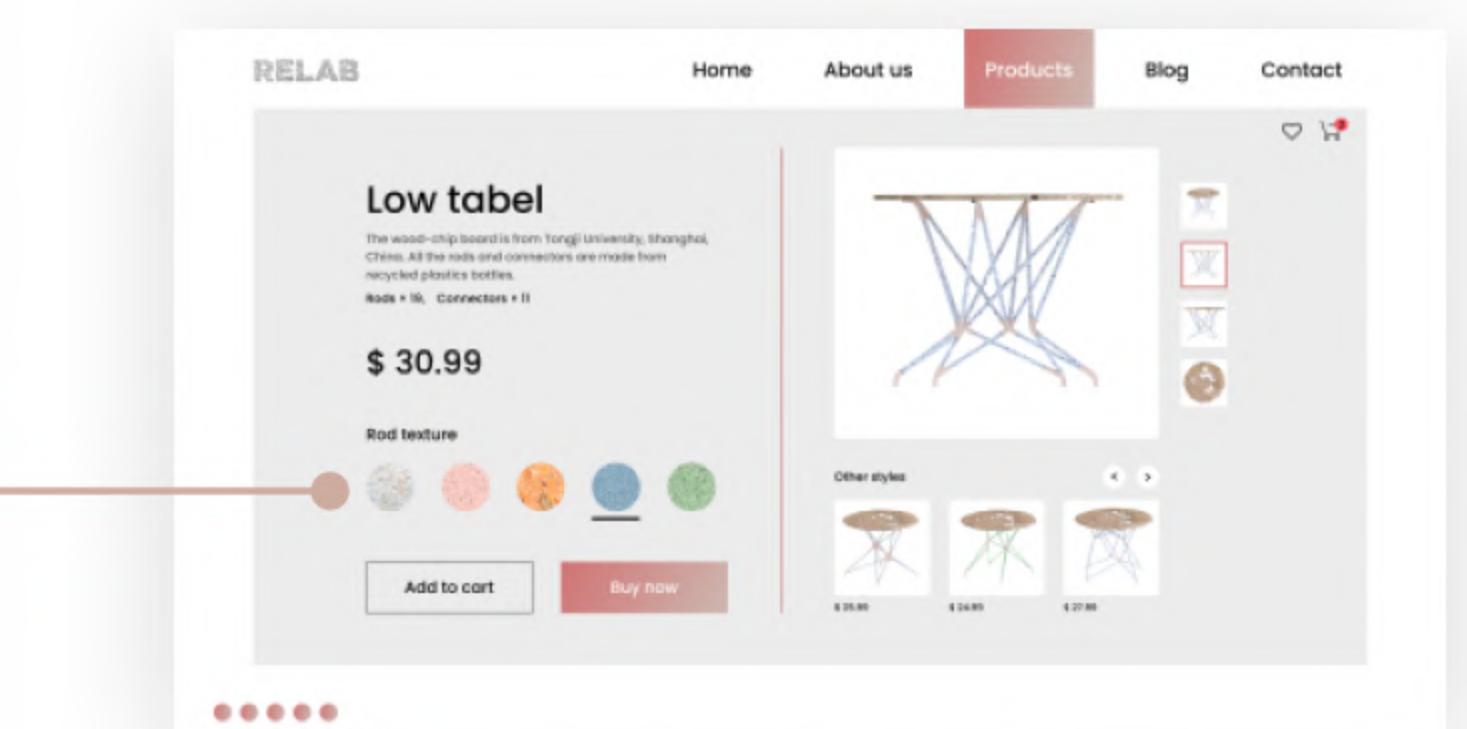
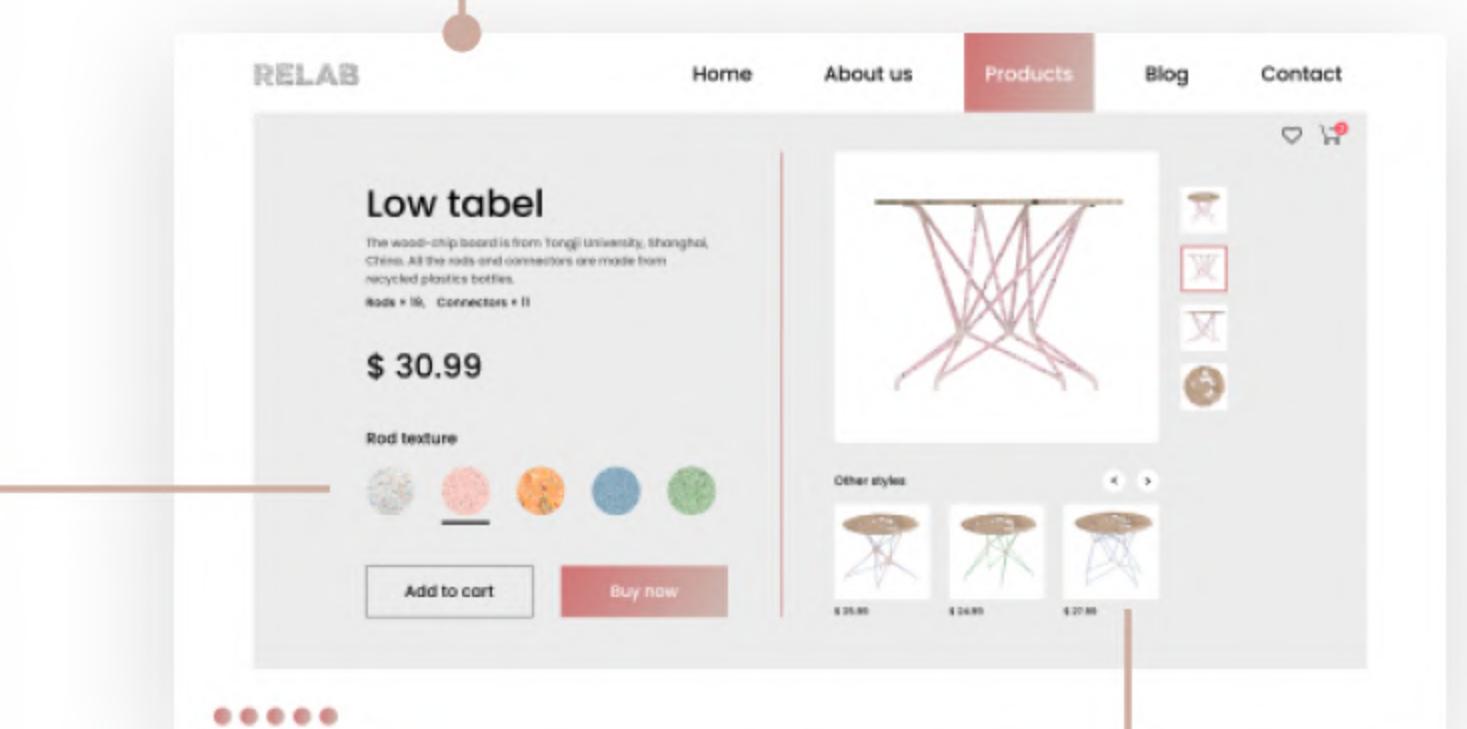
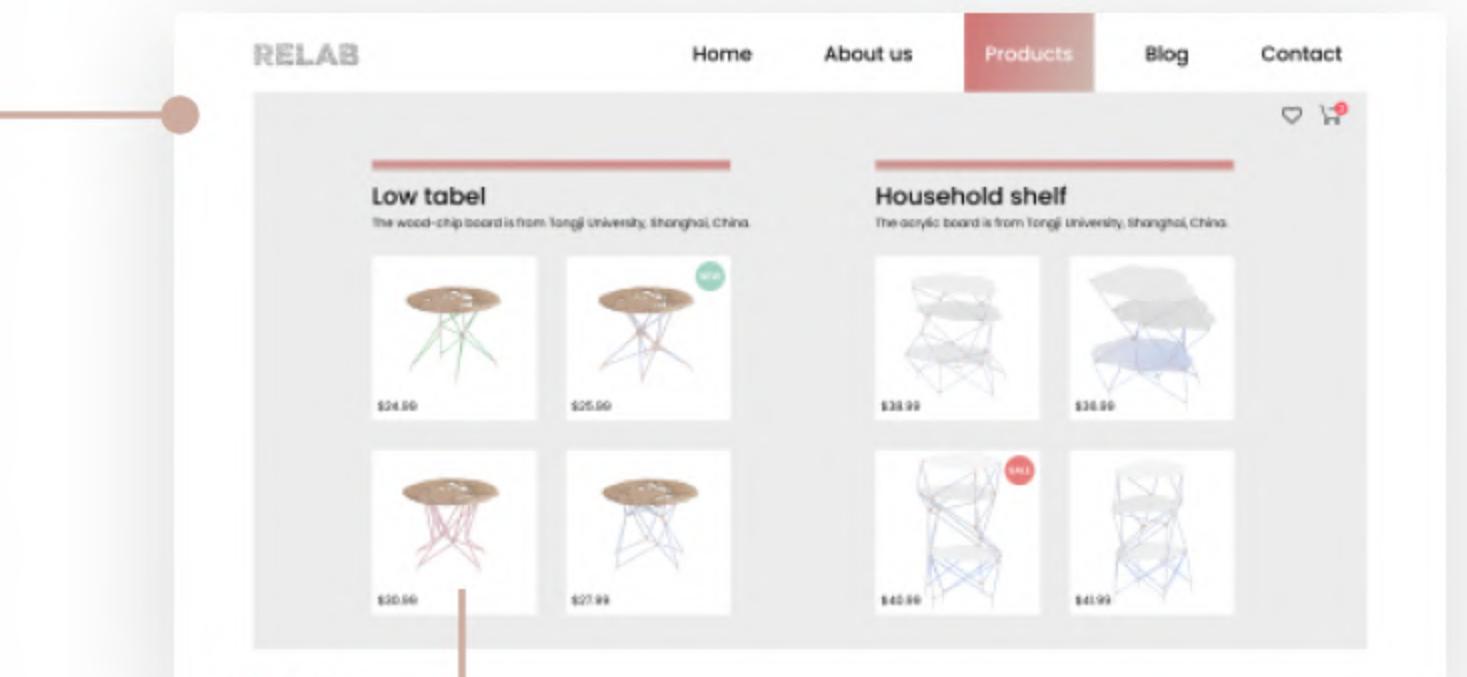
What Relab recycle:

Wasted boards, plastic bottles and caps

Relab introduction:

Relab is a furniture manufacturing studio. People can buy generative furniture on the website. All of the materials are recycled.

What Relab produce



Choose rods texture

Users have a range of bar textures to choose from, which are mixes of plastic caps in different colors.

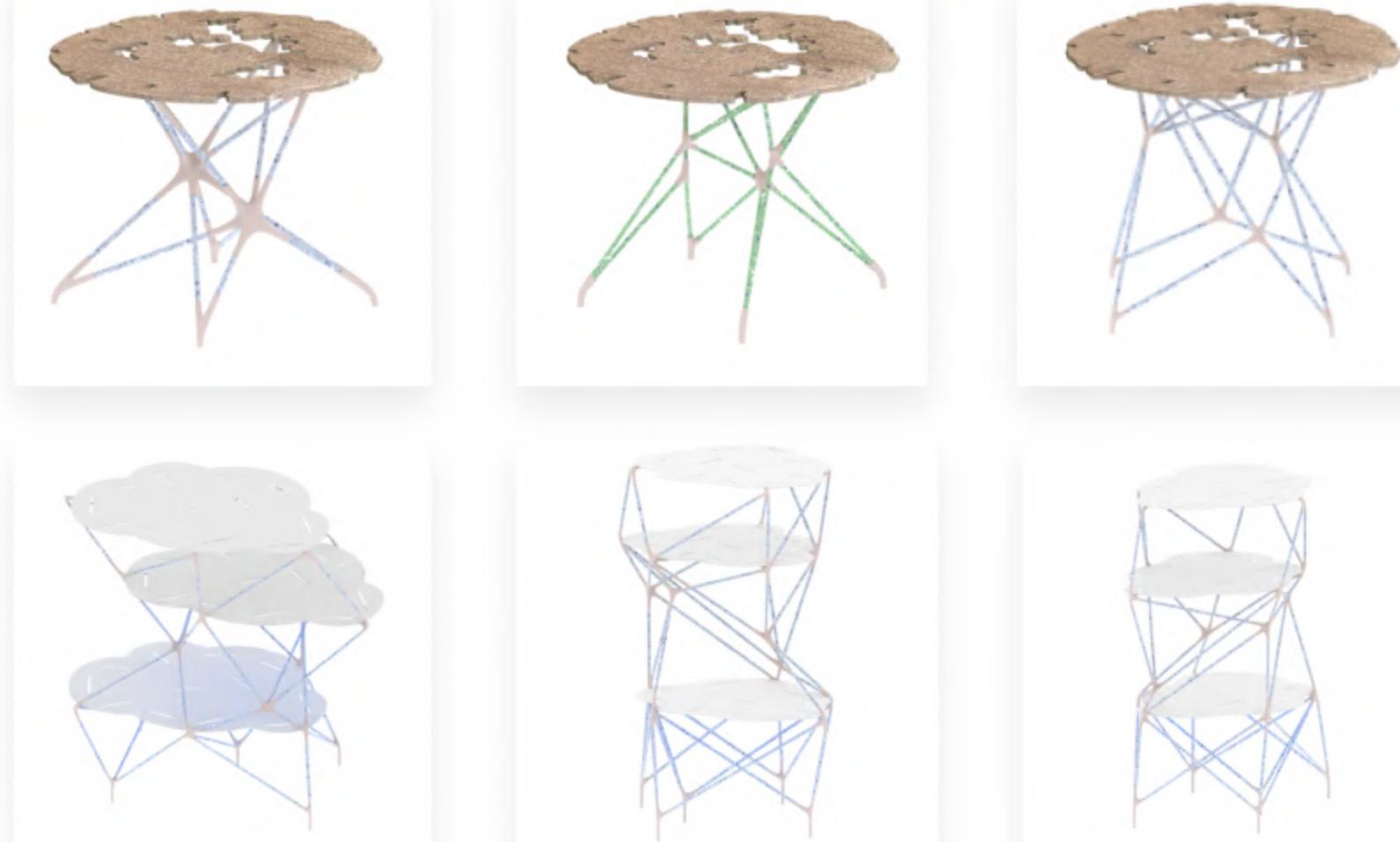
Furniture selling

From one or several recycled panels, a range of furniture forms can be generated. Users can choose their favorite one, customize texture of the rods and then purchase.

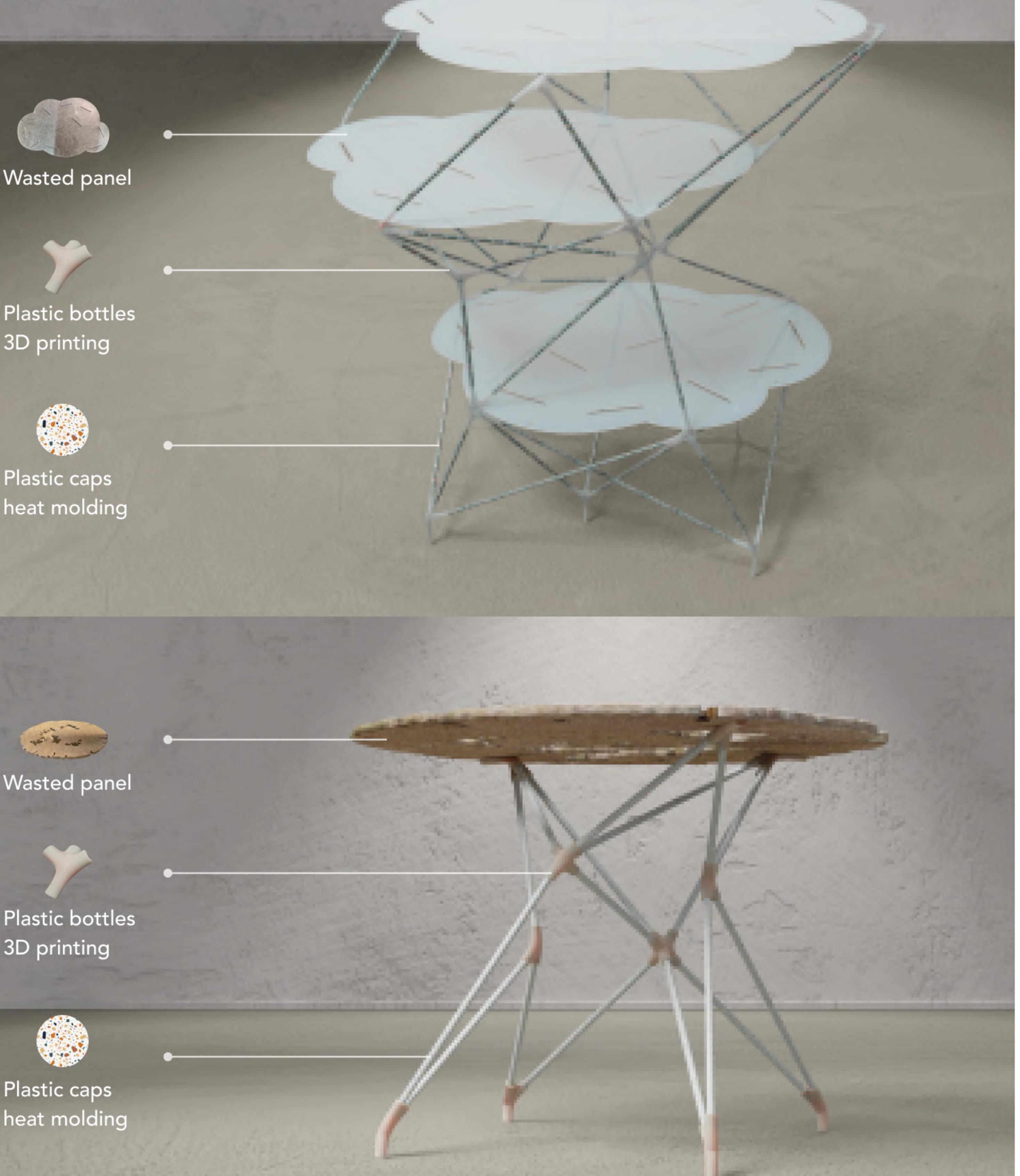
Details of the furniture

In this interface, users can see the price of the furniture, the origin of the panels, different perspectives of the furniture, and so on. Users can also go from here to view other styles of furniture.

Other styles

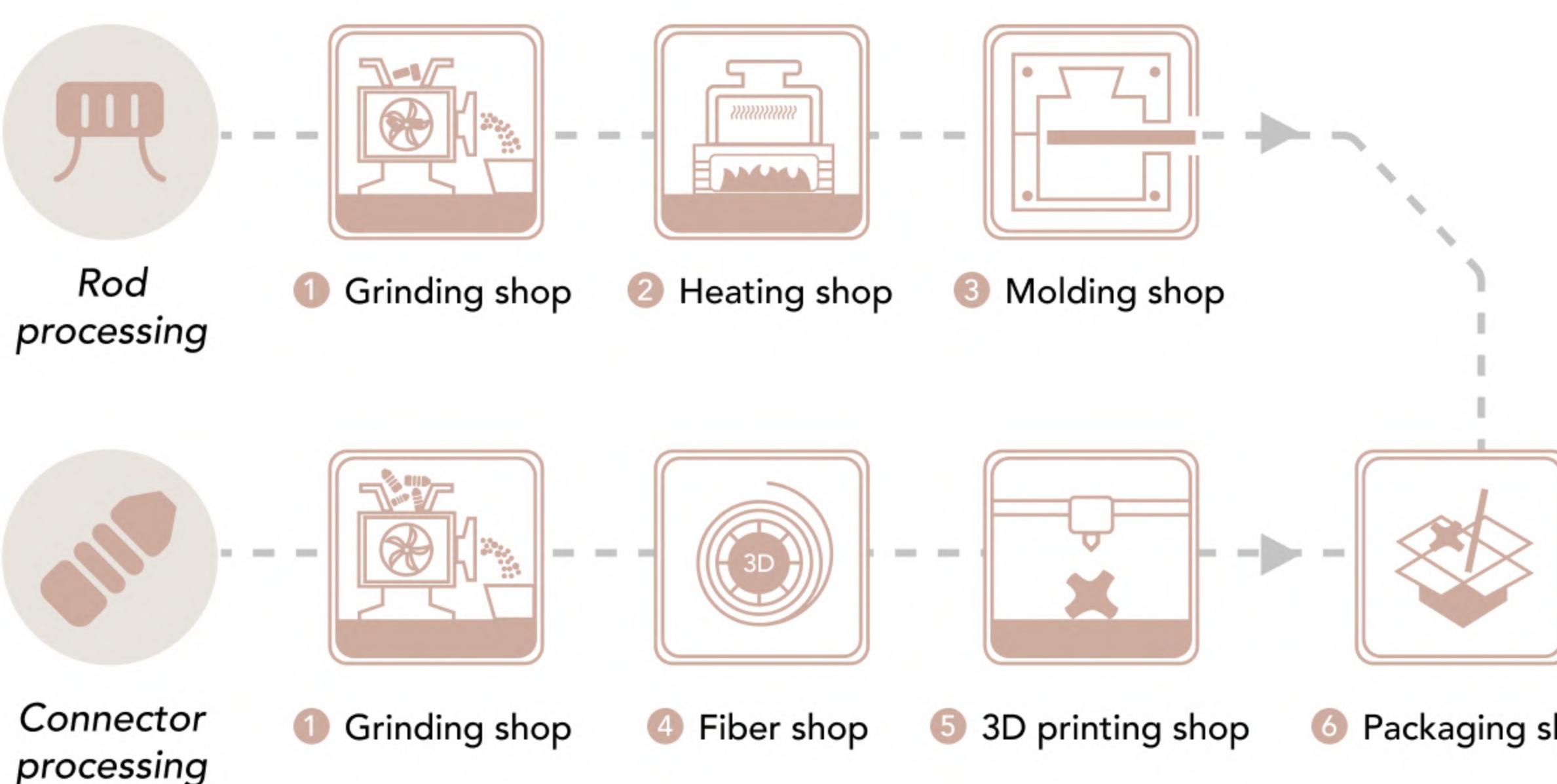


Material source

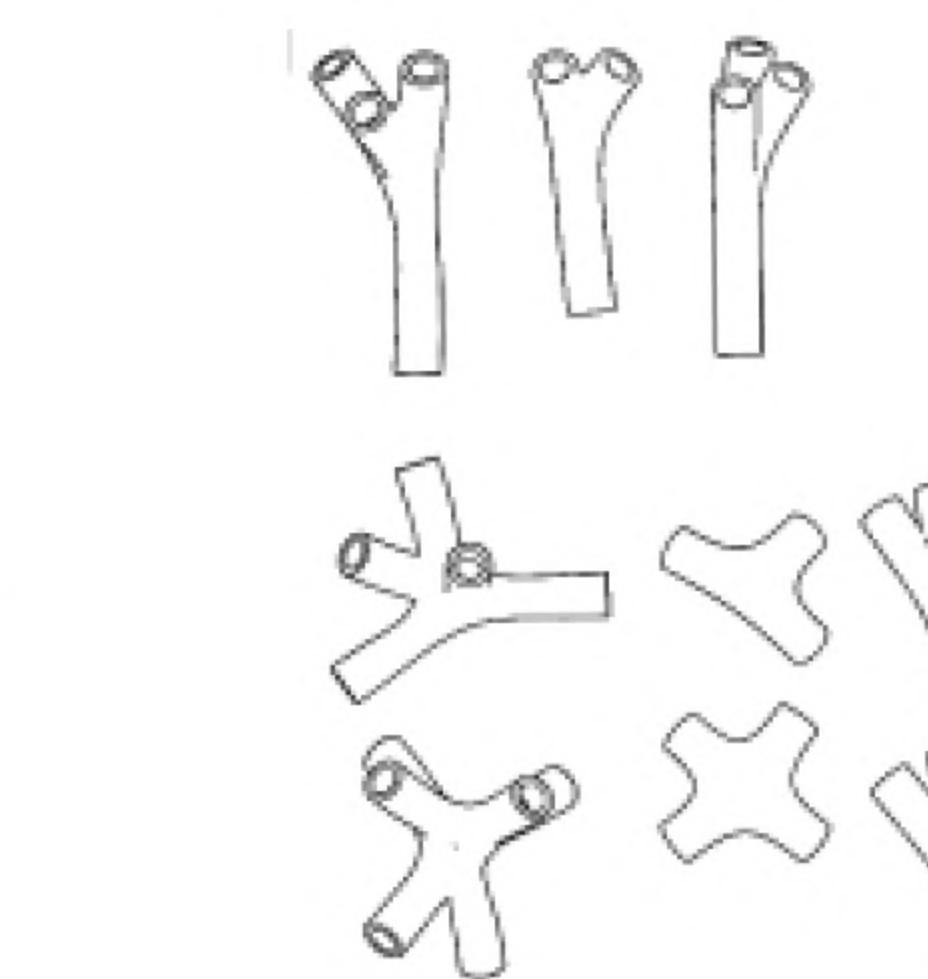
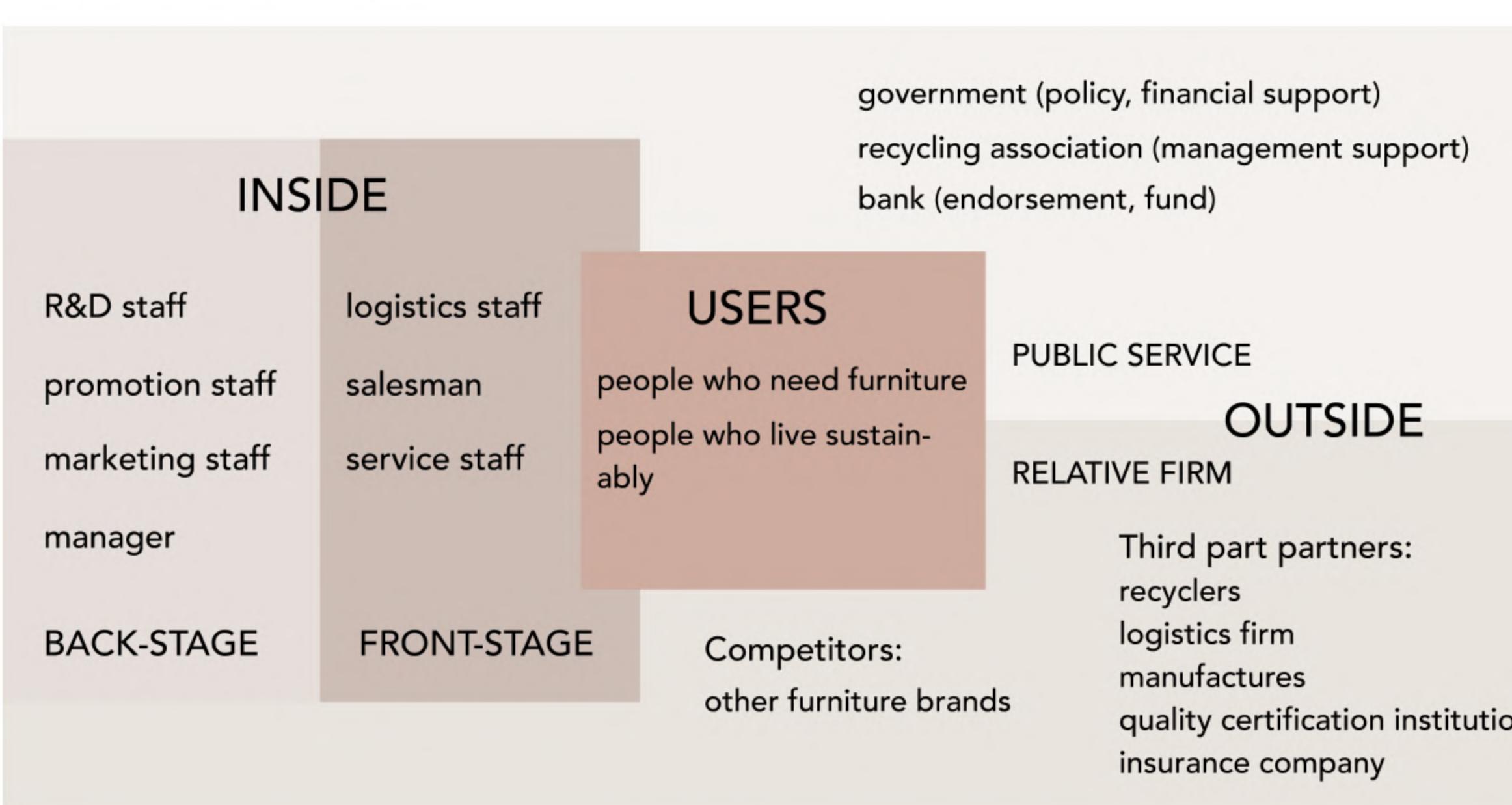


Production line

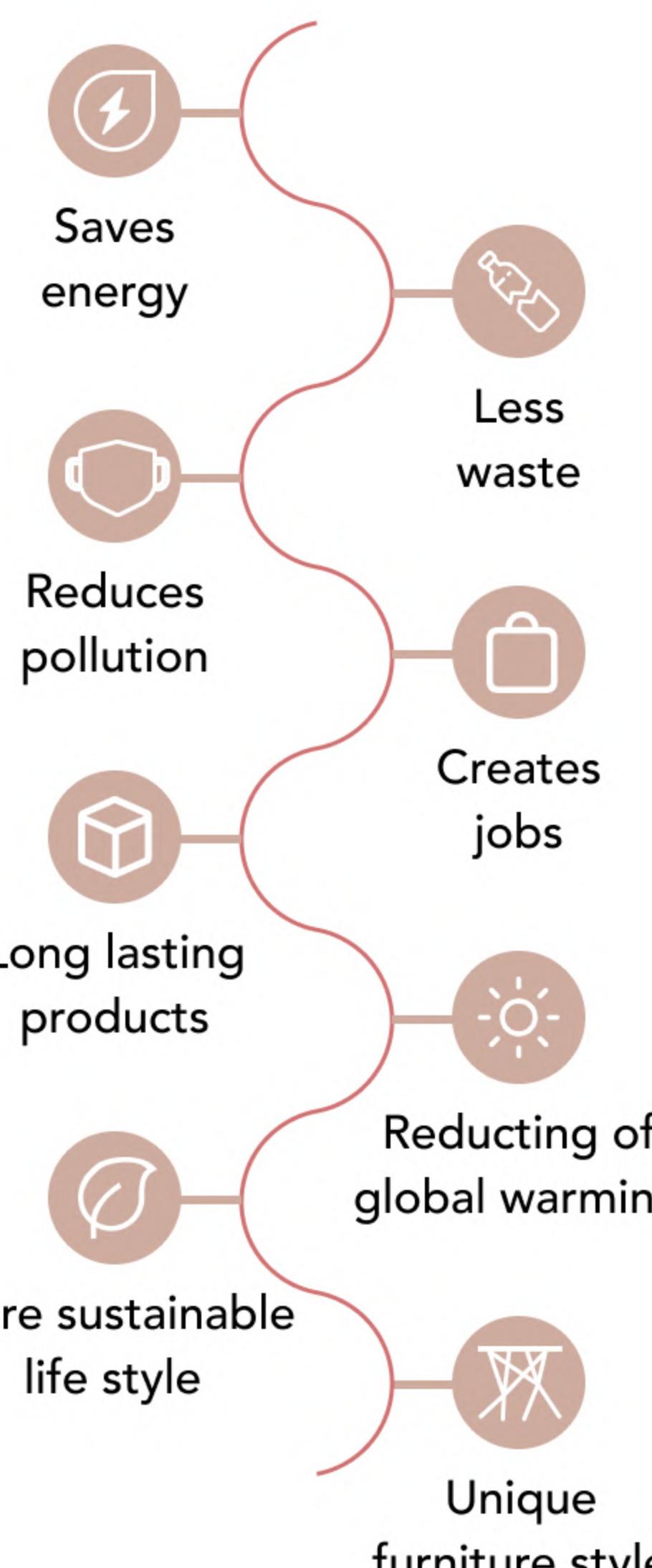
To determine the exact production process, I analyzed the workflow of the factory. The Relab furniture production line mainly involves the manufacturing process of 6 workshops.



Stakeholder map



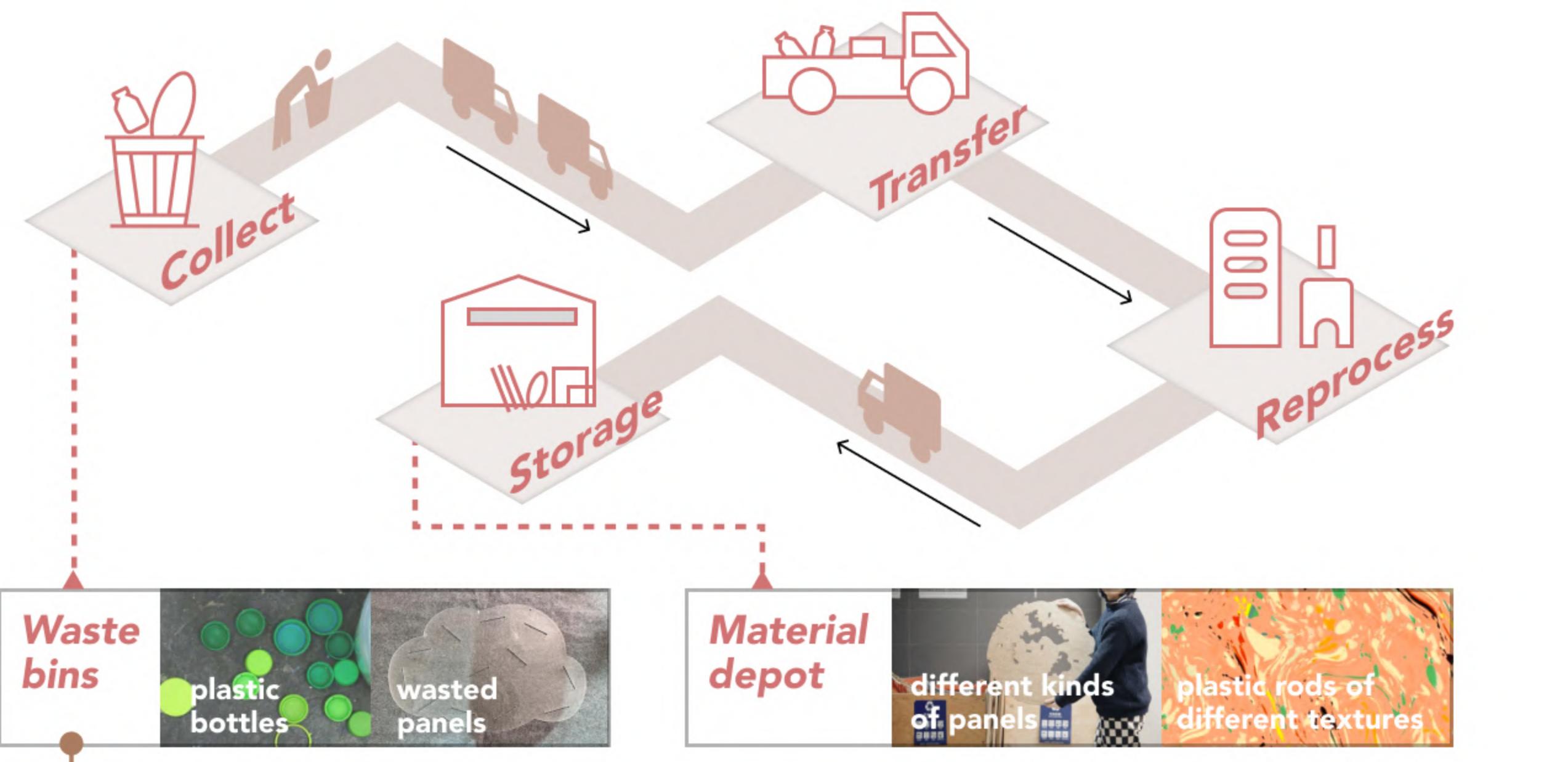
Benefits of Relab



Packaging

Connectors and rods can be assembled, which allows the furniture to be packed into flat boxes. The reduction in packaging space can significantly reduce the carbon footprint during transport.

Service map



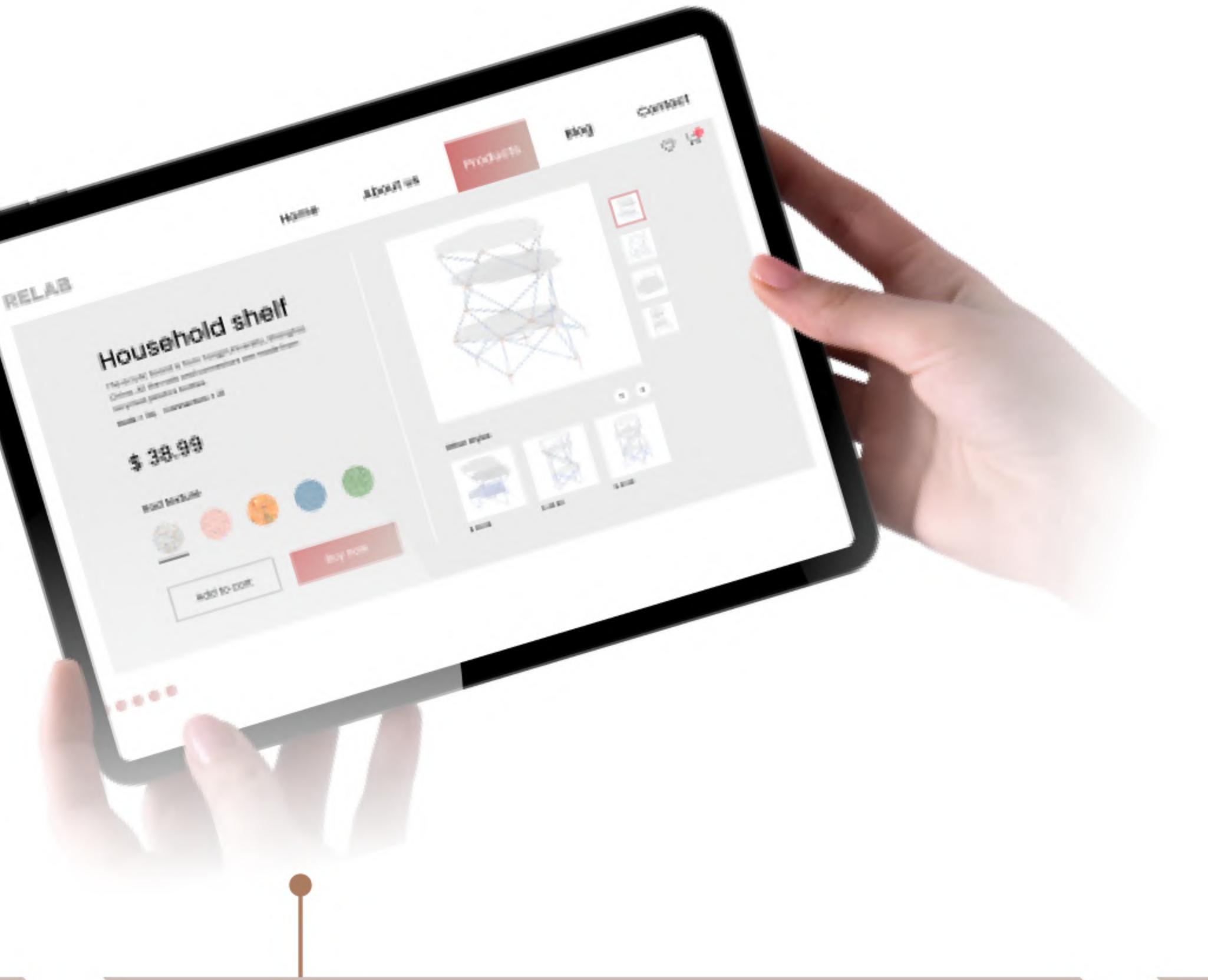
Relab recycles materials and reprocesses them.

Designers select a piece of panel and use generative design to design it into furniture.

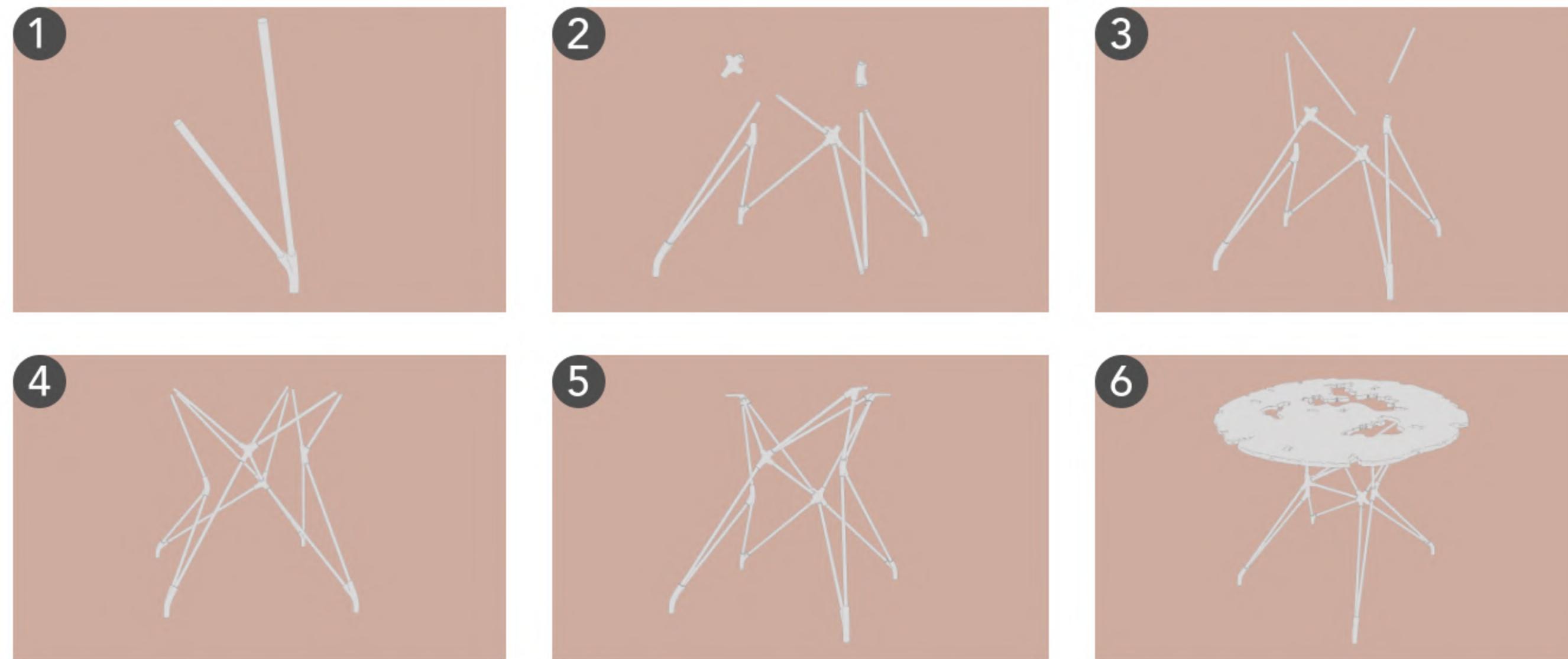
Users log on to the Relab website, browse and purchase furniture.

Relab produces furniture components according to customer requirements.

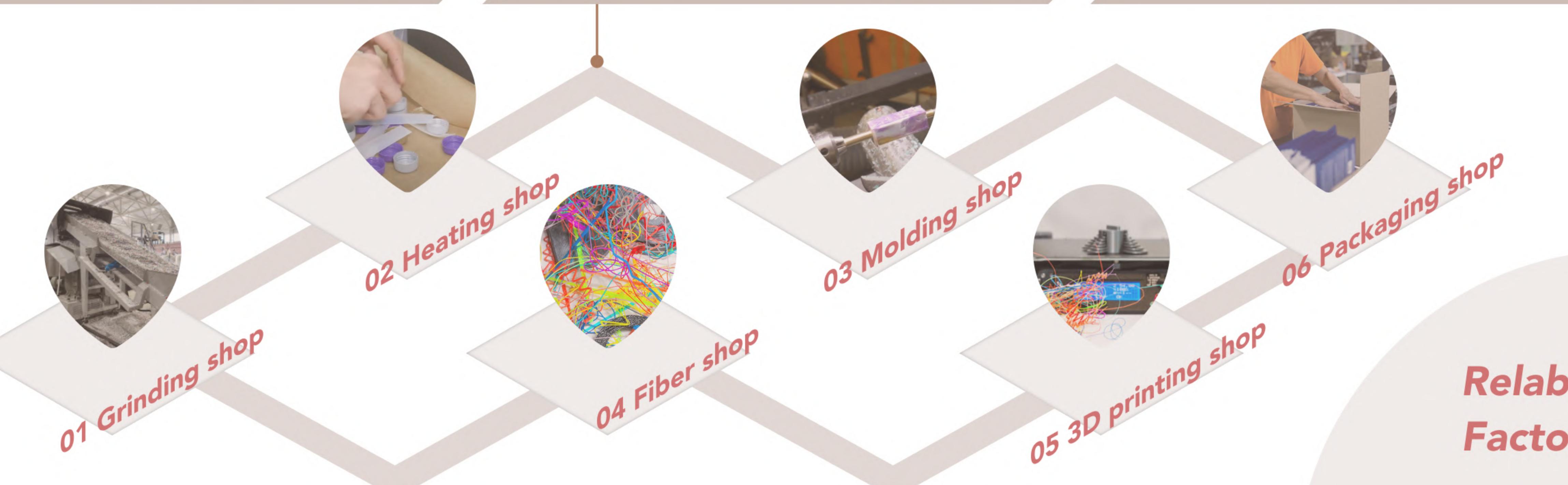
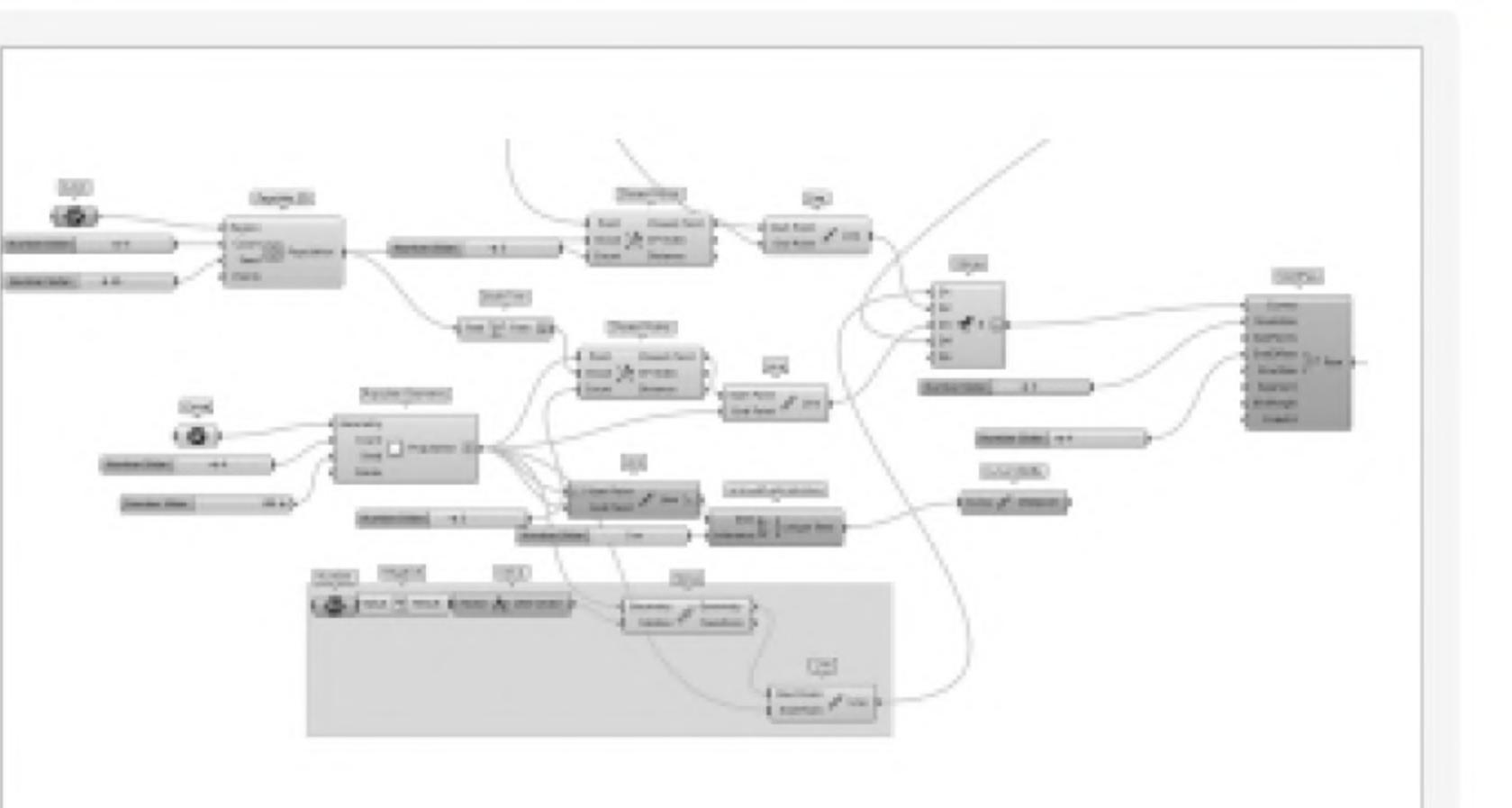
Users get the package and start furniture assembly.



Assembly instructions



Each corresponding connector and rod is marked with a number corresponding to each other.



**Relab
Factory**

Molding and Assembly

Using the wood rods, a panel, and the resin-printed parts, we started the isometric model making. Since we didn't have the ability to 3D print with recycled plastic, the ideal connectors were replaced by resin 3D printing.



Project reflection

In face of the ecological crisis, making change is a task of top priority. Relab starts a revolution in waste recycling. We practice the purpose of sustainability at every step from processing to transfer. Through this project, I deeply practiced the concept of sustainability and learned to use generative tools.



Otherworks Roblox game design

Call on players to reduce food waste

Running Food

Wasted food on this planet produces a huge amount of carbon emissions. Running Food is a game that allows players to broaden their understanding of the food waste phenomenon and gradually implement the concept of sustainable living.

Video: <https://youtu.be/TWKGrwcCydY>

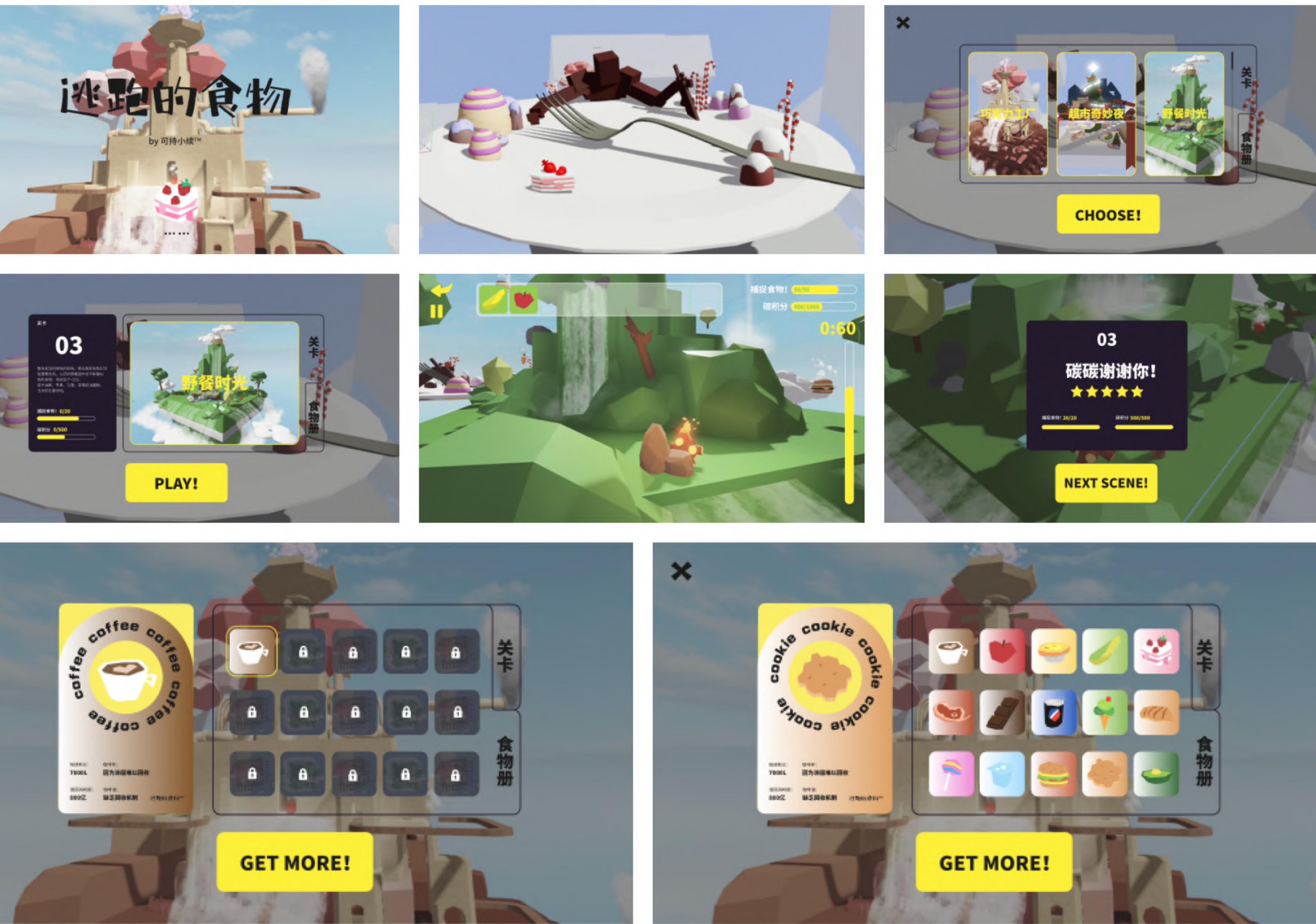
2021.11 - 2021.12

Team Project (5 people)

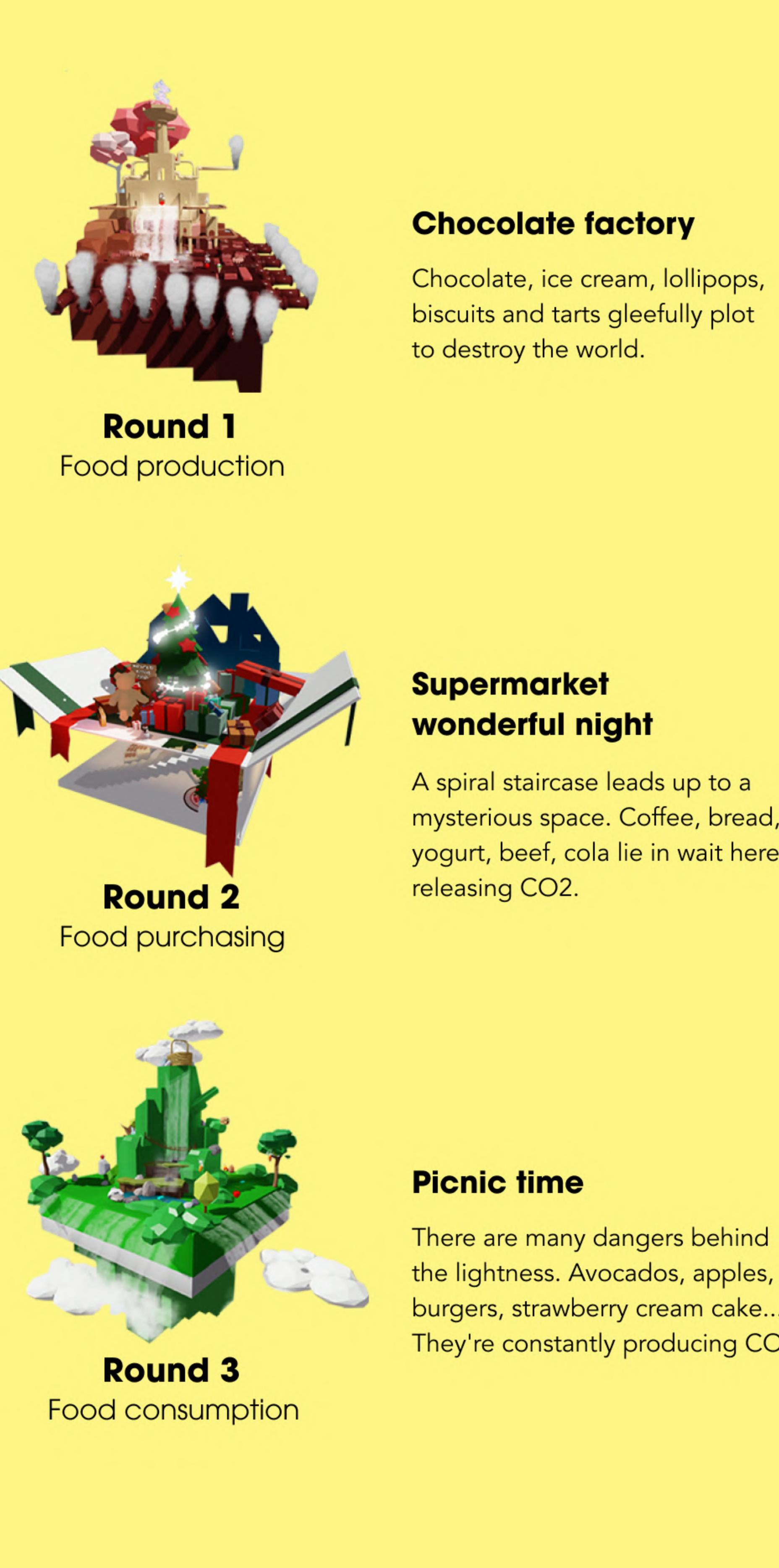
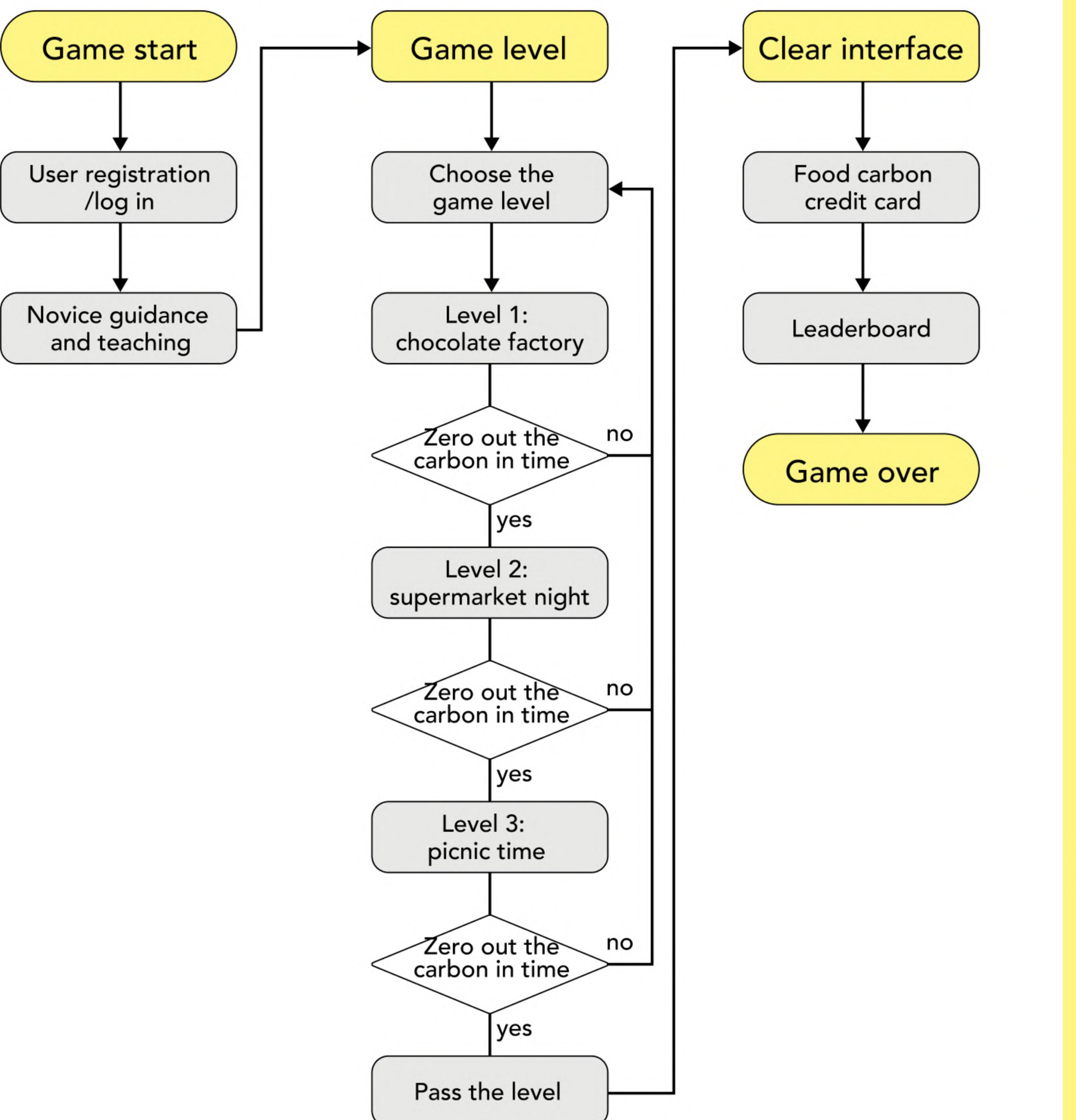
My work: Game story, UI/UX, Coding in Roblox



Game scenes



How to play



Card design

