# Sunbeam Express

An express company that delivers sunlight to your room.

**When we are bathing in the warmest sunshine,**

**Someone in another place of the world may be depressing by the gloom...**

**Why don't we just package and deliver the sunshine to him?**


## Abstract

This is a project that consists of a UV data-controlled natural light-like lamp and a mobile app. On a fine day, users can catch and share the UV data via the app. When the weather is bad, users may access their own or others' shared "sunshine date" and enjoy the "natural sunlight" from the UV data-controlled LED lamp.


Team: Jialing Li / Linqian Wu / Yixuan Huang
Duration: 4 weeks
My role: Concept Design 50%, Coding 60%, Prototype of lamp 70%, Drawing 50%, Vedio Shooting & Editing 100%

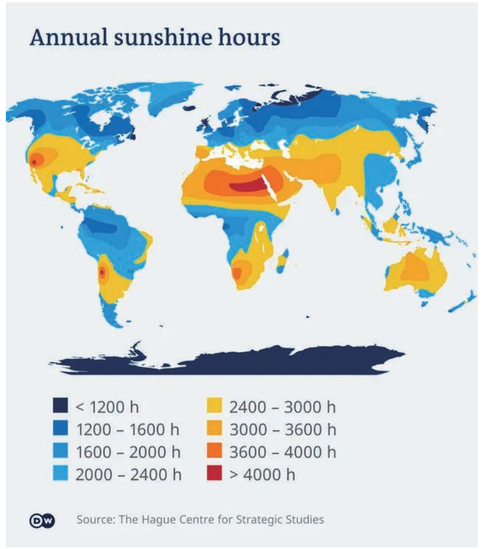
## Sunshine and mental health

> Sunlight cues special aeas in the retina, which triggers the release of serotonin.

According to the Mayo Clinic, decreased sun exposure has been associated with a drop in serotonin that can lead to SAD. People are more likely to experience SAD in the winter when the days are shorter and the nights are longer.

Exposure to sunlight can also benefit those suffering from nonseasonal depression, premenstrual dysphoric disorder, and in pregnant women with depression, according to the Journal of Psychiatry & Neuroscience. Anxiety-related disorders and panic attacks have also been linked with changing seasons and reduced sunlight.

## What is "Sunbeam Express" and who will need it ?




**"Sunbeam Express" is a platform combineing with smart illumination that allows people to catch and deliver sunlight to others who lacks of sun exposure.**

According to the data of Hagua Centre for Strategic Studies, more than 50% of the world has an annual sunshine hours less than 2400 hours.

A recent study [1] suggests that insufficient sun exposure is a significant public health problem.
Meanwhile, other studies in the past decade indicate that insufficient sun exposure may be responsible for 340,000 deaths in the United States and 480,000 deaths in Europe per year, and an increased incidence of breast cancer, colorectal cancer, hypertension, cardiovascular disease, metabolic syndrome, multiple sclerosis, Alzheimer's disease, autism, asthma, type 1 diabetes and myopia.


[1] Insufficient Sun Exposure Has Become a Real Public Health Problem Alfredsson et al. - International Journal of Environmental Research and Public Health - 2020

# The inadequacy of existing products - Light Therapy Lamps

We surveyed the relevant products on the market and found that although these products have their own features, they all **lack interactivity**.

| Product Name | Theralite Aura Bright Light Therapy Lamp | Bios SkyView Wellness Table Lamp | Philips SmartSleep Wake-Up Light Therapy Alarm Clock | Philips goLITE BLU | VAVA LED Bedside Lamp |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| Type of Lamp | Light Therapy Lamp | Wellness table lamp | Lumiled Luxeon Rebel | High power LED | Multifunction Night Light: |
| Strength | - Height and angle are both adjustable<br><br>- 4 Light setting.<br>For light therapy or task lighting<br><br>- Keep your energy lamp-sup, lift your spirits and mood | - Merge beauty and science with our patented BIOS SkyBlue® circadian technol-ogy<br><br>- Four different modes Sunrise,Daytime,Sunset and Nighttime | - Simulated sunset and sunrise and choice of 5 different natural wake-up sounds<br><br>- FM radio, tap snooze and automatic dimmable display<br><br>- Improve your mood in the morning | - Mimic the natural energiz-ing power of daylight<br><br>- Light and durable go-any-where design with protective pouc<br><br>- Fights energy dips, fatigue and winter blues | - Multifunction Night Light<br><br>- Adjust the brightness by long-press or change the color by light touch<br><br>- Made from toy-grade ABS materials with a pleasant haptic<br><br>- Memory Function and Temperature Control<br><br>- Strong Build & USB Convenience |
| Interactive | ✕ | ✕ | ✕ | ✕ | ✕ |

# How we make it different

## - 1. Research : How does sunshine touches our hearts?

In the medical area, the relationship of sunlight and human health has been demonstrated by a large number of scholars. But on the spiritual side, there's no clear answer to how sunlight touches human hearts. Hence we invited 25 people that is diverse in age, sex, and background **to describe their most remarkable experience of sunshine,** for designing a meaningful solution to recreat the surprise that sunshine gives.
As a resulut of our interviews, to recreate a desirable sunshine, we found that there are **three key points** that we need to address in our design:

### Share-able


In their memories, **16** people said they were in company with family or friends and admitted **it is a important factor of happiness** along with the sunlight.


**21 of the 25** respondents thought it is meaningful to record the sunshine by photo, **15** of them have taken photos and **12 have shared the photo** they took with friends or social media platforms.

### Unpredictable and changeful

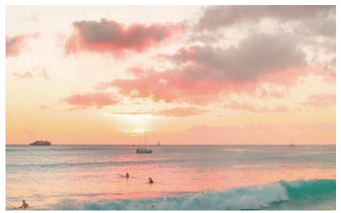
**23** respondents said the unpredictability of the sun's changes created many surpris-es.They were able to recall other details of the sun's change in addition to warmth.


### Sudden, sharp contrast

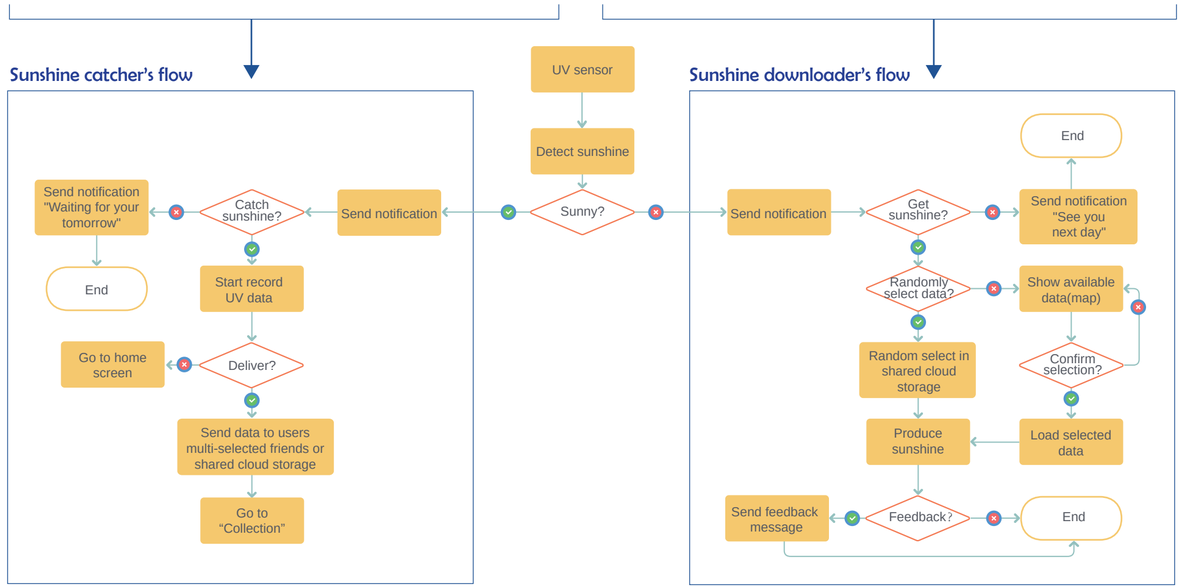
When we asked about the situation before the sunshine appeared, most respon-dents **recalled negative feelings**, such as a previous period of cold, wet weather, being hungry or tired, or live under stress for days, etc. The appearance of sunlight created **a sharp sensory contrast** to these unpleasant feelings.

# How we make it different

## - 2. Ideation :

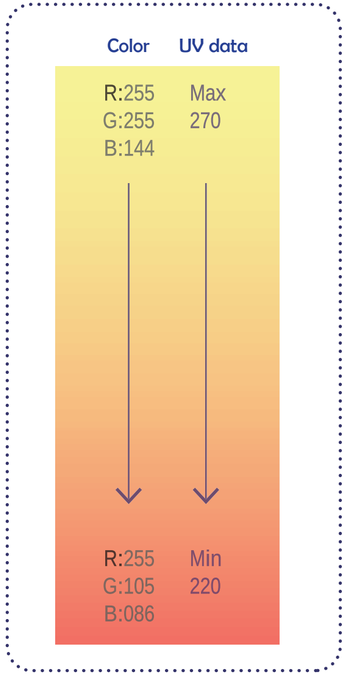
| | | | |
|---|---|---|---|
| **Thoughts** | **Share-able**<br>How might we create a feeling of sharing by “Sunbeam Express”? | **Unpredictable & changeful**<br>How might we simulate the daily changes of natural sunlight ? | **Sudden, sharp contrast**<br>How might we make the sunlight surprise people? |
| **Inspiration** |  |  |  |
| **Ideas** | Allowing people to attach massages with the delivery of sunshine to promote social interactions. | Not to "simulate" , but to record and reproduce the real changes of natural sunlight over daytime. | Designing an enhanced contrast between sunlight and haze to create “wow” effects. |
| **Solution** | Interactive device<br>**Mobile APP**<br>We decided to add an customized social function to the designed mobile platform, enabling users to attach anonymous or non-anonymous messages when they deliver and receive "sunlight"; Whether to display of personal contact information or not is fully up to users themselves. | Light Sensor<br>**UV Sensor**<br>We decided to capture real changes of sunlight by UV sensor instead of simulation. The data captured will be processed to control an artificial sunlight, giving it the variability of nature. | Refraction<br>**Window + LED**<br>Ceiling + light<br>We finally designed a sunny "window" (window-shaped LED smart illumination) to present a contrast with the gloomy indoor environment. It delivers a soft spreading of sunlight into the room naturally |

# The System

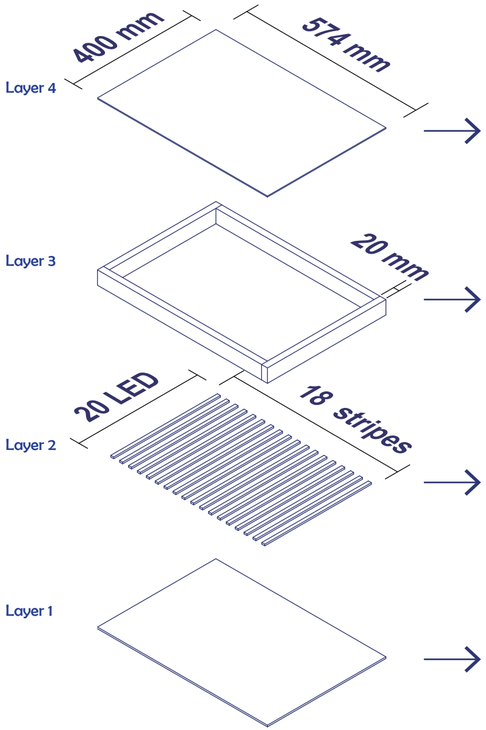
# UV data controled LED “Window”

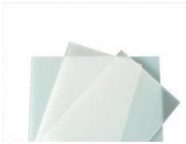
## The color range of Led




As the UV value changes from low to high, the color of the product gradually changes from yellow to orange.

## Structure and size of Lamp



PC Light Diffuser Plate
Thickness: 3mm

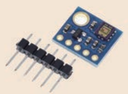
Foam Board
Thickness: 40mm

LED WS2812B
Matrix: 18 * 20

Plank
Thickness: 4mm

## Prototype by Arduino

Arduino uno



GY-8511 ML8511
UV Light Sensor

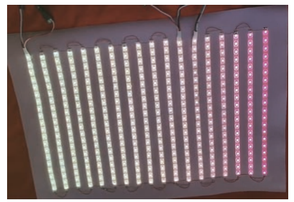
12V power

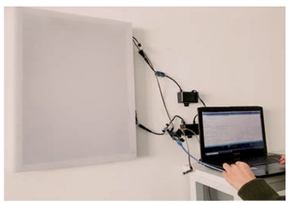
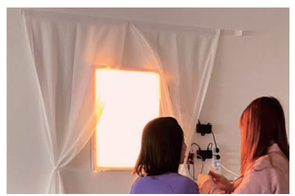
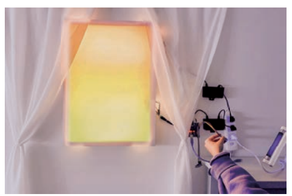
LM2596S DC-DC step-down power supply module & LM2576 3A adjustable step-down stabilizer module

We first certify the size of the lamp in order to decide how leds we need. And then we make sure how thick the foam shoud be to achieve the effect we need without seeing the single led lights with the 3mm PC light diffuser plate. And then we write the code to coinside with the UV data and the color of the LEDs. We use the UV light to mimic the UV light from the sun.

# Implementation and Testing

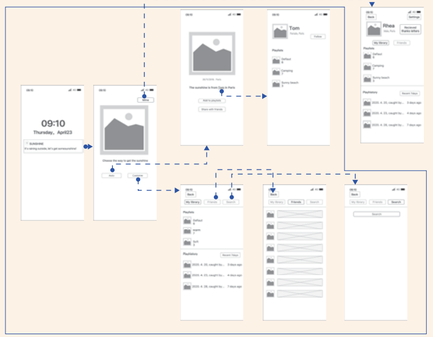




# Prototype of APP

We invited five people to do user testing with a rapid prototype to make improvements. As a redult we found several usability problems and reduced unnecessary screens and jumps.



Sunny

UV Sensor

Gloomy

When the user quits, a pop-up window opens saying "waiting for you tomorrow"

Go to "Collection"

Go to the destination chosen by the user

Allow user to over view available sunshine "parcel"

Show contact list

Show user caught and received "parcel"

Persoanl informa-tion with privacy options

Go to edit screen

Send data to control the LED "window" by wifi

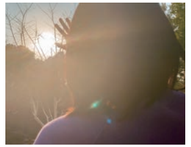
# Sunbeam Espress Journey

Watch the video: https://youtu.be/Zp7zhAgRQDk

## User Persona A - Mary

Weather: Sunny
Site: Shanghai
Time: 2020.4.28

**Catch and share the sunshine**



Marry encountered good sunny weather on 4.28.

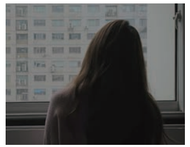
At the end of the day, Marry received the sunshine APP message: whether to catch today's sunshine and share it. Marry chooses to share.

The sunshine shared by Marry was used by Rhea and received a thank you letter.

## User Persona B - Rhea

Weather: Rainy
Site: Suzhou
Time: 2020.4.29

**Get and use the sunshine**

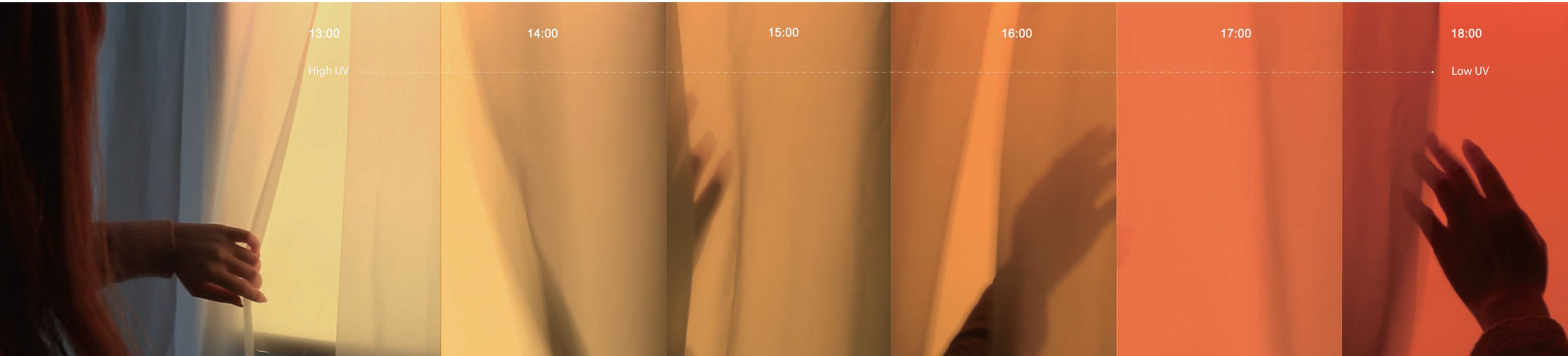


Rhea hasn't been out for a long time because of the epidemic. It started to rain outside today, and the atmosphere and mood are very gloomy.

Sunshine APP sent a message and asked if Rhea wanted to get and use sunshine. Rhea randomly searched for the sunshine shared by Marry and started using it.

The lights came on, and Rhea's gloomy room and mood slowly lit up.

Rhea wrote a thank-you letter to Marry after using the sunshine shared by her.



# Dialogue With Light

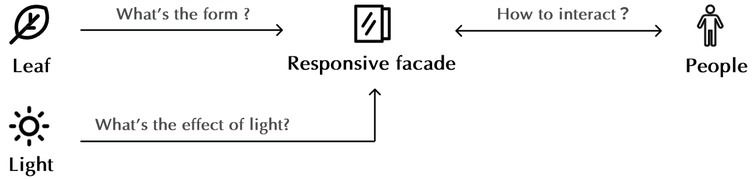
This is a responsive facade that can be changed according to different behaviors of people and natrual light.

Team: Jialing Li, Xinyi Guo, Xingzheng Qiu
Duration: 3 weeks
Toolkits: Rhino / Grasshopper / Machine Learning / P5.js / Arduino / Laser cutting / Figma

## Abstact

There are many high-density old communities in China, it is difficult for these spaces to get enough light, which has a negative impact on people's lives and physical and mental health. I hope to improve the light environment of these spaces through the design of responsive facade. I bring light into these spaces according to the reflection and refraction of the mirror paper. The program uses machine learning technology to enable the curtain wall to respond to human movements and light, so as to achieve the purpose of enhancing the spatial light experience, aesthetics and interactivity.

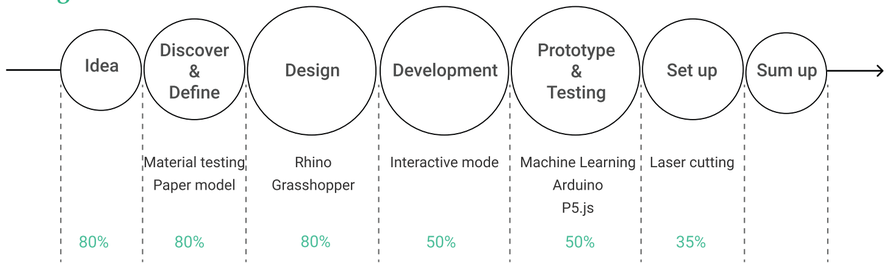
## Design questions




1. How to build the relationship between natural light and leaves in the urban space through the design of the curtain wall?

2. How to use artificial intelligence to realize human-space interaction and human empathy to nature?

## Design Process



## Background

During my practice in old communities in China, I found that the density of buildings in these communities is too high, which makes daylighting very difficult (Figure 1). At the same time, in the process of communicating with many children in the community, I found that they are very interested in interacting with light (Figure 2), A handful of well-lit corners, therefore, became their “secret bases” ( Figure 3). Inspired by these experiences, I hope to design an interactive device that can interact with light and people, and bring interesting and vivid light to these spaces. (The following photos are taken during my community practice)


(Figure 1)


(Figure 2)

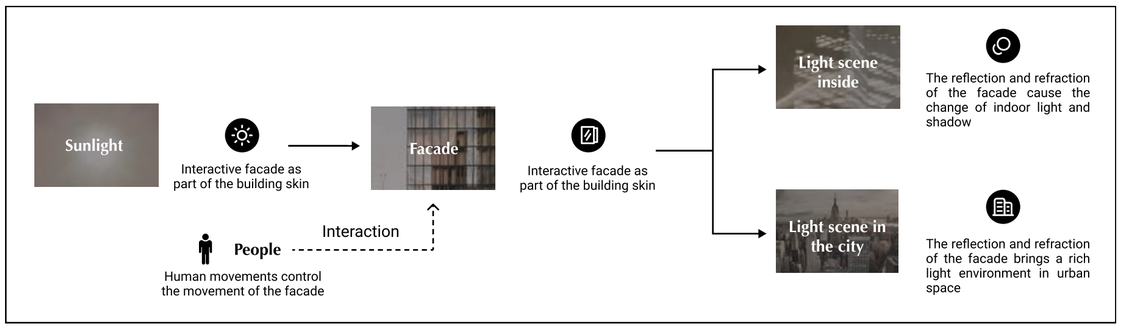

(Figure 3)

## Inspiration

The light and shadow formed by the interaction of light and trees in nature, the wind blows and then the light and shadow shake, these natural scenes are the source of inspiration for the design. Analogy to the dynamics of light and shadow in nature, I hope to use artificial intelligence technology in the design to control the change of light and shadow, so as to realize the reshaping of the light environment of urban space.

## Design proposal

People control the movement of the facade, and the movement of the facade leads to changes of light environment in the indoor and outdoor.




## Research on factors affecting the dappled light

We conduct research on natural factors affecting the dappled light from which we get our inspiration.

### A. Shape

The shapes of dappled light are influenced by distance and the shape of the illuminant .

### B. Phyllotaxy

Different arrangements of leaves can create different patterns of dappled light.

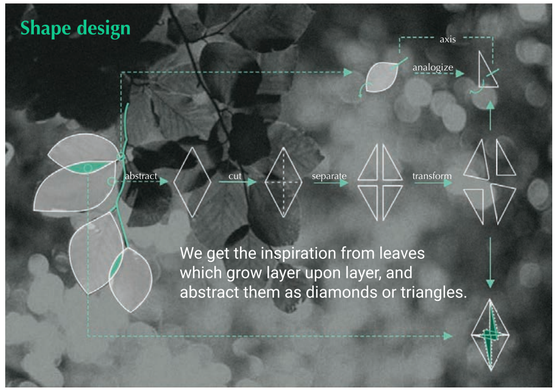
### C. Color

As time passes by, abundant color of sunlight can be seen within a day.

### D. Reflection

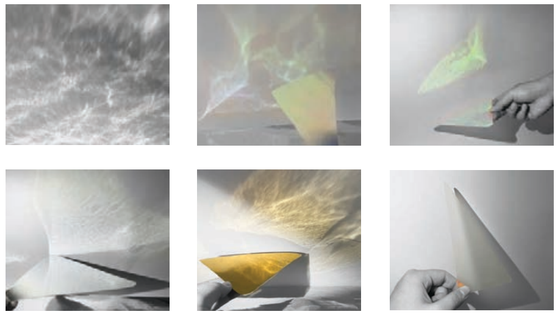
Glass facades reflect sunlight especially in the afternoon when beautiful colors can be created .

Explore suitable design forms and materials based on the natural factors above.



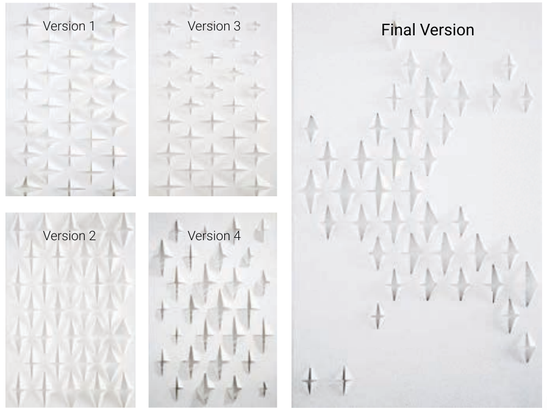

### Material testing

We tested four types of material to reflect different colors of light.

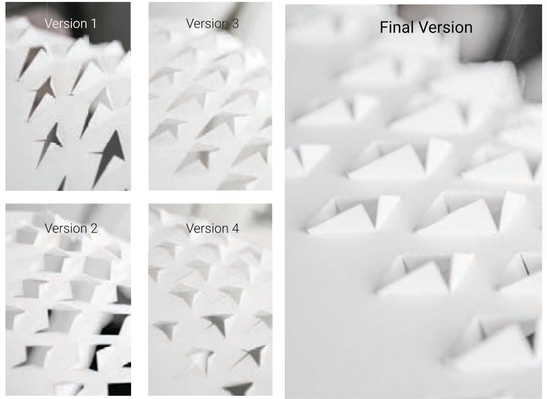


## Paper model research

– Facade form –

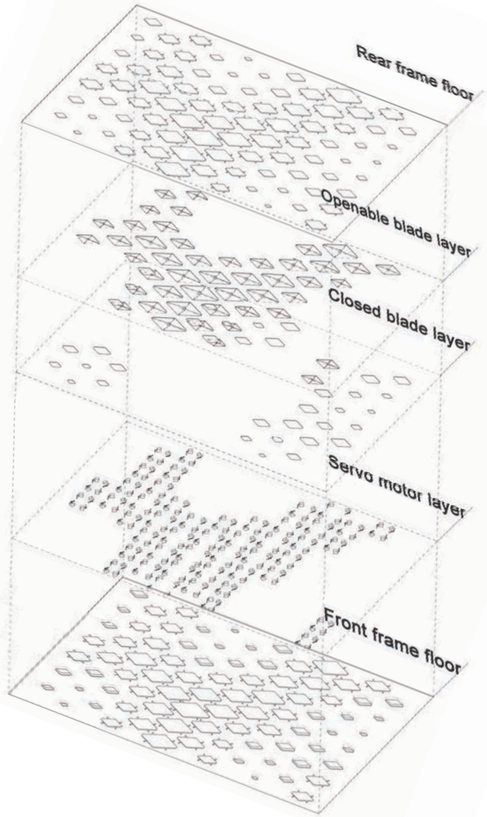



– Blade opening and closing mode –




## Design

– The structure of the interactive facade –




– The responsive facade –

## Interaction mode

### 1. The states of the facade in different time

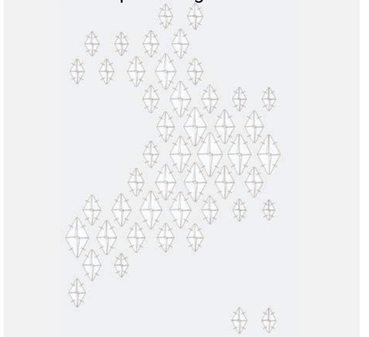
– 7:00 am –
The blades open 5 degrees to the east

– 10:00 am –
The blades open 30 degrees to the east

– 1:00 pm –
The blades open 45 degrees to the north

– 4:00 pm –
The blades open 30 degrees to the west

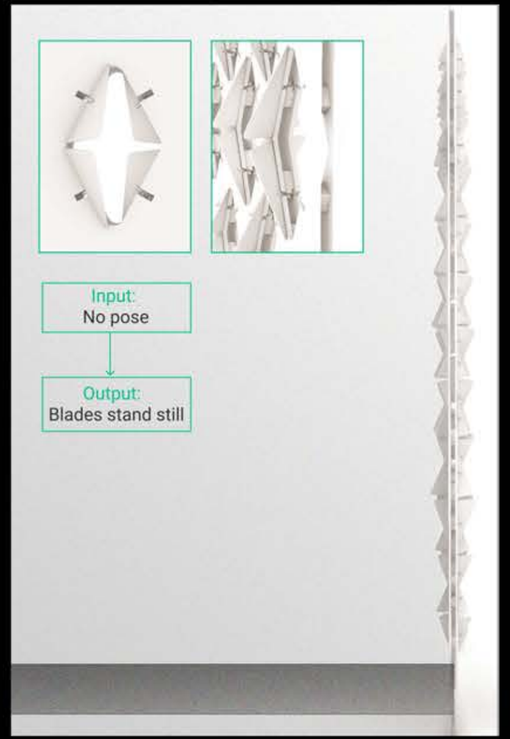
– 7:00 pm –
The blades open 5 degrees to the west



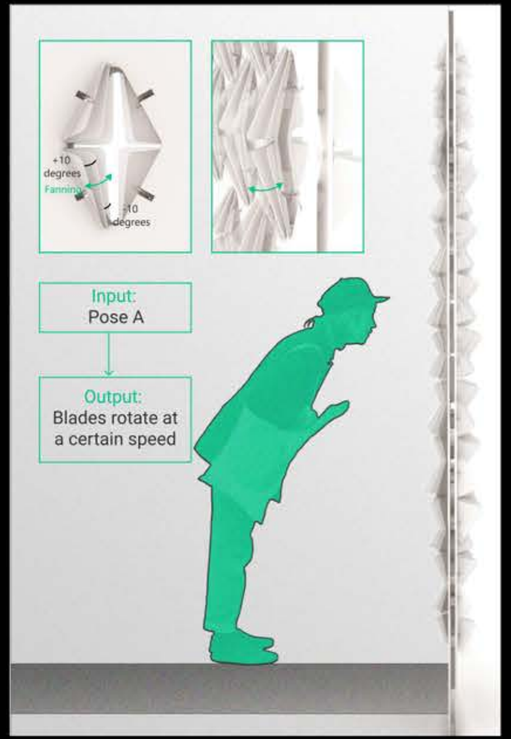
# Interaction mode

## 2. Interactive facade responds to human movements

When there is no one in front of the facade,
the blades are still at the angle of the corresponding period.




When there are people in front of the facade,
blades are fanned within the range of 20 degrees from the existing angle.

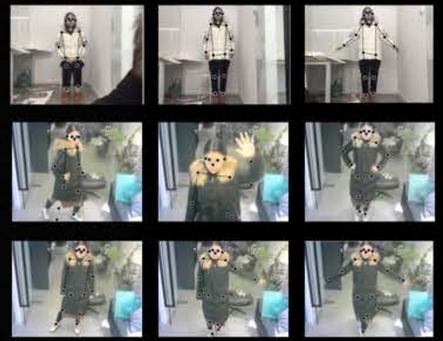



# Technology Research & Testing

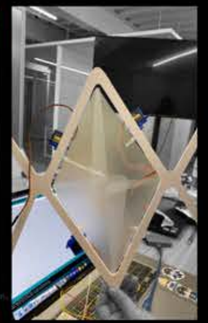
## Machine Learning

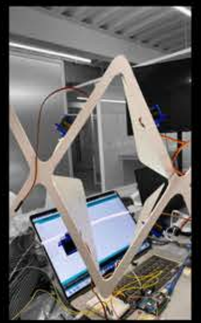
```
function keyPressed() {
  if (key == 's') {
    brain.saveData();
  } else {
    targetLabel = key;
    console.log(targetLabel);
    setTimeout(function() {
      console.log('collecting');
      state = 'collecting';
      setTimeout(function() {
        console.log('not collecting');
        state = 'waiting';
      }, 10000);
    }, 10000);
  }
}

function setup() {
  createCanvas(640, 480);

  video = createCapture(VIDEO);
  video.hide();
  poseNet = ml5.poseNet(video, modelLoaded);
  poseNet.on('pose', gotPoses);

  let options = {
    inputs: 34,
    outputs: 3,
    task: 'classification',
    debug: true
  }
  brain = ml5.neuralNetwork(options);
}
```

## Posenet

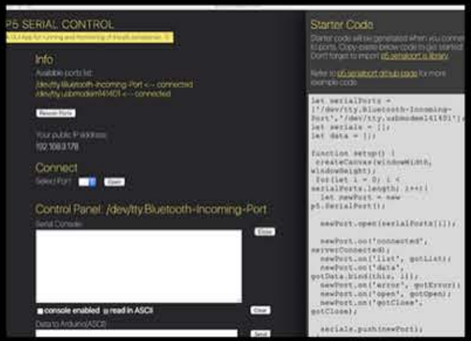


## Arduino





## Arduino to P5




## P5

https://editor.p5js.org/luyadyq/sketches/xU2XPbBQc

## Construction process

### Acrylic frame board

Install the wooden bracket for the 1.5m x 1.8m x 4mm acrylic board cut by laser.

### Servo motor

Stick 188 motors on the acrylic board in a clockwise direction, and connect each motor with a 1-meter wire.

### Blades

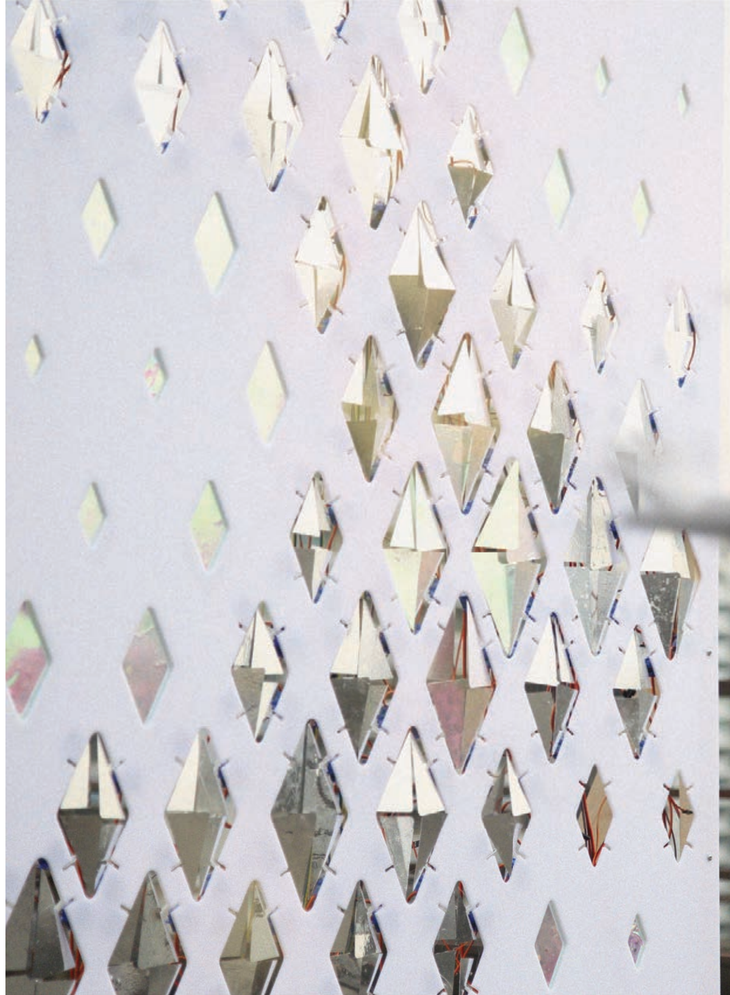
Paste mirror paper and laser paper on the surface of 188 blades, and then glue the blades on the rotating shaft of the motor.

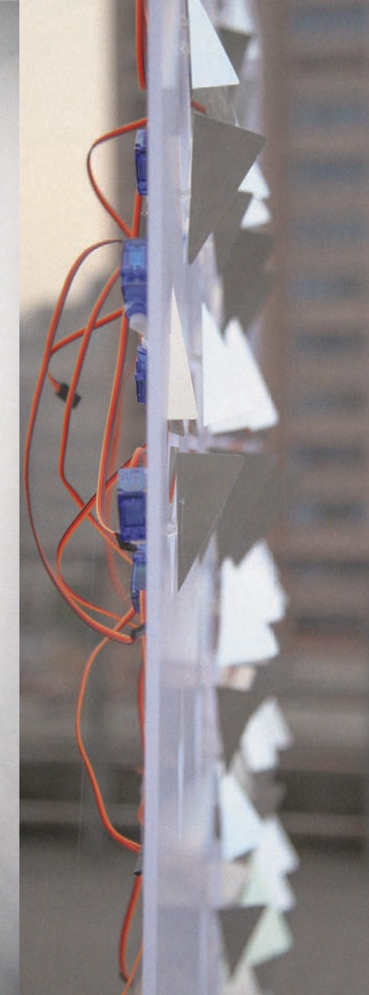
## Outcome display

Pose A

Pose B

Pose C





# Findit

Findit is an intelligent system that relies on MR technology and mobile phone devices, uses light spot positioning and personalized voice tags to help low-vision people recognize and find daily objects more conveniently, in familiar and unfamiliar environments.

Team: Jialing Li, Yue Fan, Ming Chen
Tutor: Cen Zhang
Duration: 6 weeks
My role: Research 35%, Concept 80%, System Desgin 35%, Testing 35%, Application Dsiplay 100%, Drawing 60%, UX Design 50%

Watch the video:
https://youtu.be/PRpZBJz5q4I

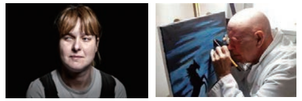
## Who was the subject of the study?

The main target group of this study is low-vision people. Low vision is a condition where one has a visual impairment that adversely affects daily activities and cannot be corrected with glasses or contact lenses [1]. Unlike blind people, low-vision people have functional vision and use their vision extensively in daily activities. The photosensitivity of this group is an important prerequisite for the project.

## Why do we design for low-vision people?

1. Impaired vision causes many obstacles to the lives of people with low vision.
2.Among the visually impaired people, people with low vision who are not completely blind account for the largest proportion and have the greatest demand.
3. People with low vision have limited vision, combined with the design of MR equipment can empower them, improve the utilization of vision, make life more convenient.

There are **253 million** visually impaired people in the world, **86%** of whom are **low vision** rather than blind.



## Why do we design for low-vision people to identify items?

Unable to identify and locate objects is one of the biggest obstacles faced by people with impaired vision. If this problem can be effectively solved, their lives will be more independent, convenient and safer. At the same time, it can also reduce the worries of family and friends of people with low vision.

## How do we help the low-vision people to identify items?

Using the light perception ability of people with low vision, combined with MR technology, smart glasses are used to replace human eyes to locate and identify items, and the information of items is converted into voice and light spot signals that people with low vision can perceive and read. The user controls the device by voice. All item information is stored in the equipment database, including network shared databases and local personalized databases. As long as the item information stored in the local database can be identified, the local database can be manually entered or loaded by the network database. Users can add personalized voice tags to items through the glasses, and their relatives and friends can also enter item information through the mobile APP.

## Design Process

**STEP 01** Research
1. Initial Research
2. User research

**STEP 02** Analysis & Concept
1. Insights
2. Concept

**STEP 03** System Design
1. System flow
2. Data flow

**STEP 04** Testing
1.Light spot precepton testing
2. APP testing

**STEP 05** Application Display
1. Instruction manual
2. Application senarios display
3. APP high fidelity prototype

**STEP 06** Contrubution & Limitation
1. Contrubution
2. Limitation

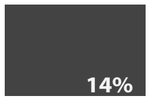
# Initial research

## 1. What is the visual field of low vision people ?

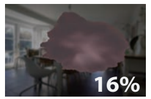
People with impaired vision can be divided into four types according to their vision[2], as shown below. Their vision can be summarized as: Cloudy vision; An inability to see shapes; Seeing only shadows; Poor night vision. The main target group of this study is low vision people with Blurry or hazy vision. The vision situation is: can perceive the intensity of light, can distinguish color blocks, but can not see the shape and details of objects.

**Normal vision**

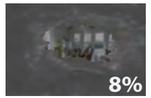
**Total vision loss**



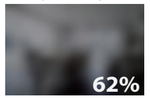

**Central vision loss**




**Peripheral vision loss**




**Blurry or hazy vision**




***Main Cause***
- Cataract
- Corneal Opacity
- Glaucoma

## 2. Related product research

We studied the existing smart devices used by visually impaired people, and classified and summarized them according to the technologies adopted, as shown in the figure below.

| Technology Category | Auditory | Touch | Human Assistance | Sight Enhancement | Machine Vision |
|---|---|---|---|---|---|
| Product | *Aiman Voice*<br>*Tag*<br>*Flashlight* | *Braille tag*<br>*Dot smartwatch*<br>*TACTILE TABLET* | *Aira Explorer*<br>*Be My Eyes* | *OXSIGHT & Epson smart glasses VR*<br>*X2 MR (ThirdEye)*<br>*SeeingVR: a New Toolkit from Microsoft*<br>*HTC Vive VR headset*<br>*Apple AR*<br>*SightPlus2 AR (GiveVision)*<br>*ForeSee++* | *StairLight*<br>*Relumino*<br>*Wayfounding AR*<br>*Canetroller*<br>*Cognitive Augmented Reality Assistant MR*<br>*Image alt tags Facebook*<br>*Seeing AI*<br>*Vision AI*<br>*CueSee* |
| Summary | The form of voice is the most accustomed and convenient way for visually impaired people to receive information. However, the existing products are troublesome to make and complicated to operate. | Only knowing the location of the object can produce touching behavior, which is helpful for identifying the object, but not very helpful for finding the object. | The way to rely entirely on remote help is low efficiency, remote help cannot provide real-time help, land it is easy to burden relatives and friends. The visually impaired need to be more independent. | It fully and effectively utilizes the functional vision of people with low vision, empowers their vision. But there is no function specifically for finding things. | Machine vision relies on machine learning to store huge amounts of information, and using this technology to help visually impaired people find items would be very helpful. |

**Insight 1**
There are few research and products that use vision to help people with low vision find things.

**Insight 2**
Using visual enhancement technology is the fastest way to help people with low vision find things.

**Insight 3**
Appropriate support and care from friends and family without undue burden is very important for people with visual impairment. The product should take care of their psychological needs at this level.

**Insight 4**
Phonetic labels are needed by visually impaired people.

Reference:

# User research

## 1. Life observation of people with low vision

Through a day of coexistence and observation, we have come to the conclusion that Shen Chunlan ( a low-vision person) have 3 problems in finding itmes in her daily life.

Name: Chunlan Shen
Age: 58
Vision: congenital cataract. left eye 0.05 , right eye 0.03. Can perceive light and color.
Occupation: Operating a family-style massage parlour
Living condition: Living alone

1. Items are few and well arranged.

2. Things that can't remember their location are slow to find.

3. She can't find the medicine she want because can't tell the packaging apart.

4. Work and life overlap in a 35 square meters space, rarely go outdoors environment. Rarely go out.

**Insight 5**
Visually impaired people try to simplify their belongings and rely on memory to find things.

**Insight 6**
The visually impaired people often cannot distinguish similar items and cannot find them.

**Insight 7**
Go to an unfamiliar environment will feel very insecure, rarely go out, narrow life.

## 2. We interviewed people with low vision and their families online and offline

Interview people with low vision and their families online and offline respectively to understand their status and problems in finding things in life.

**People with low vision**

*1. How do you look for items in unfamiliar environment ?*

I don't know what's in front of me in an unfamiliar environment. so I can only recognize one by one by touching or ask someone else for help.

*2. Does light perception help in your life ?*

Light perception is helpful in finding doors, sensing weather changes and identifying whether the phone is locked or not. But to be honest, if we can't recognize the item, light perception is of limited help in my life.

*3. How does it feel when you can't find items ?*

I often get anxious because I can't find things, and I don't want to always ask for help and put others in trouble.

**Families of low-vision people**

*4. What concerns do you have about helping visually impaired family members?*

We really want to be able to help them, but because of the emotional subtleties, we don't know how to be able to help just enough.

Due to time and space constraints, we are often unable to provide timely help.

**Insight 8**
The residual light perception plays a limited role and is not fully utilized.

**Insight 9**
Visually impaired people have higher self-esteem and desire for independence.

**Insight 10**
Family and friends want to help the visually impaired, but often they are unable to.

# Personas

*People with low vision*

**Linshun Ma**

Age: 26
Location: Shanghai
Sex: Female

Occupation: Masseur
Relationship: Unmarried, Live with parents
Visual acuity: Congenital cataract with light perception

*"If I can find things independently and quickly like a discerning person, It will save me and my kith and kin a lot of trouble..."*

**Pains**

- Slow to find items
- Can't find items in moved or forgotten locations
- Don't know what's in front of me in a strange environment
- Don't want to bother my family and friends

**Goals**

- Find items quickly
- Can find items easily if the item is moved or forgotten
- Independently recognize items in a strange environment
- Establish positive connections with friends and family

*Relatives of low-vision people*

**Yucai Wu**

Age: 48
Location: Shanghai
Sex: Female

Occupation: High School Teacher
Relationship: Living with a daughter with low vision

*"I want to help my daughter in an appropriate way to facilitate her..."*

**Pains**

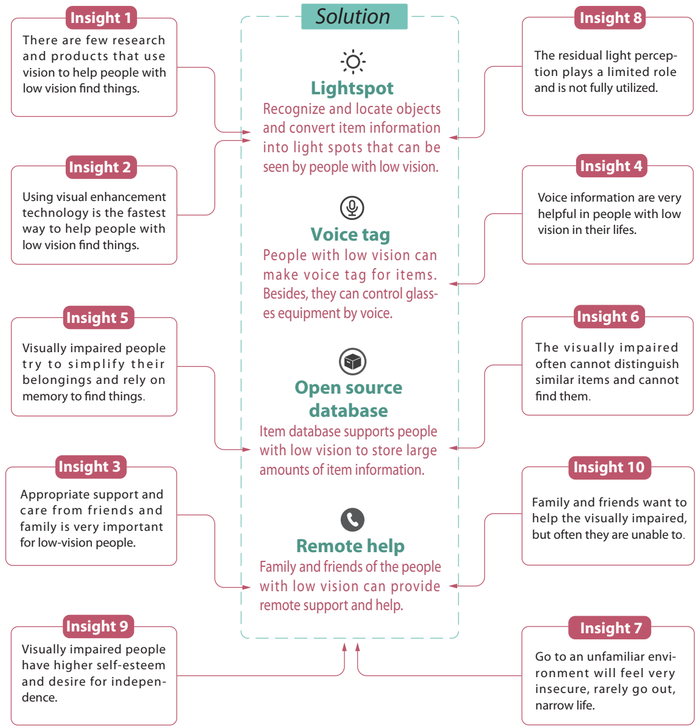
- Due to work often can not accompany my daughter
- My daughter is very sensible but there is a gap
- The discordance of time and distance prevented me from giving my daughter timely help

**Goals**

- Real-time and non-real-time remote help to match each other's time
- Personalized care embodiment

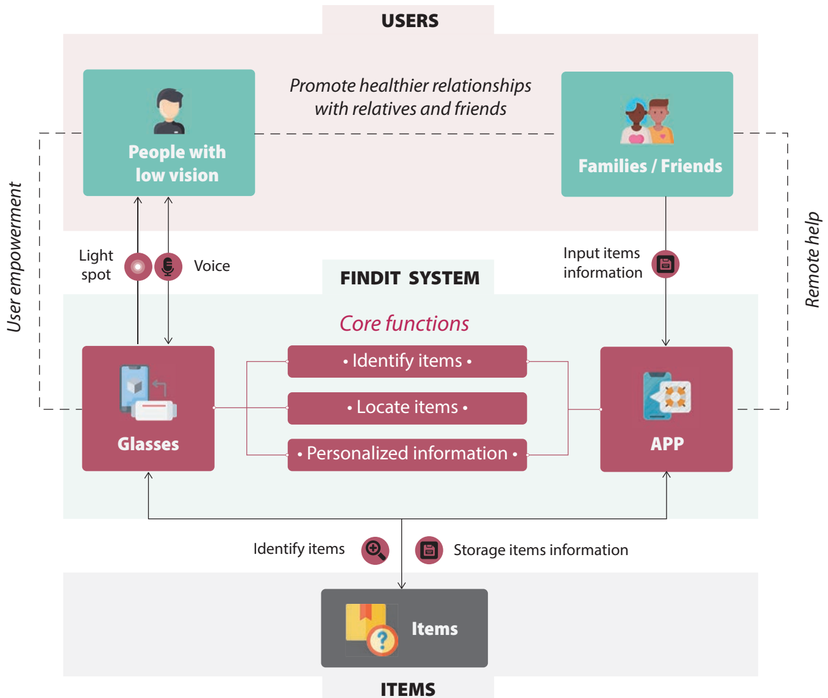
# Insight & Solution

Based on the 10 insights previously studied, four core design strategies are derived.

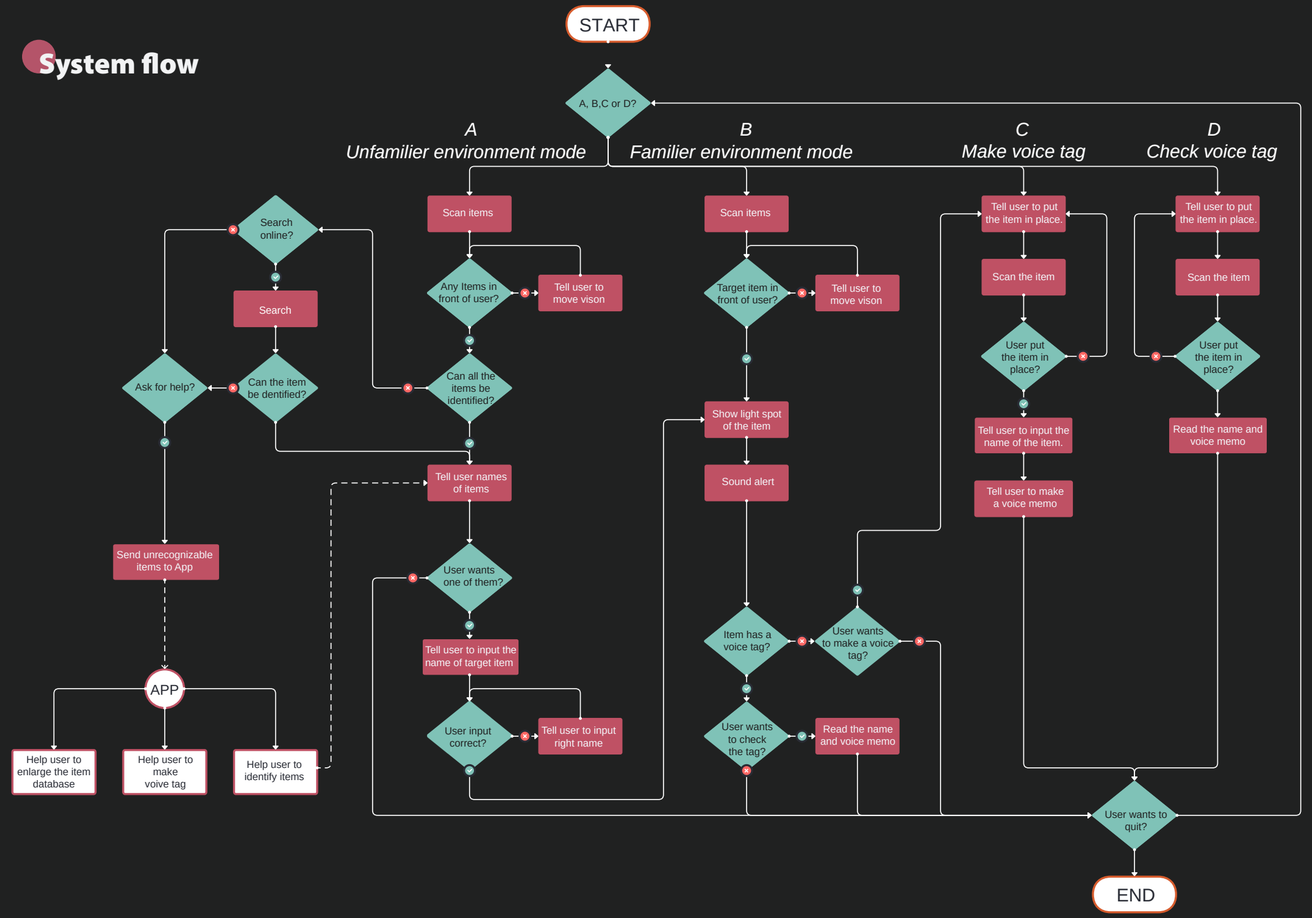



# Concept

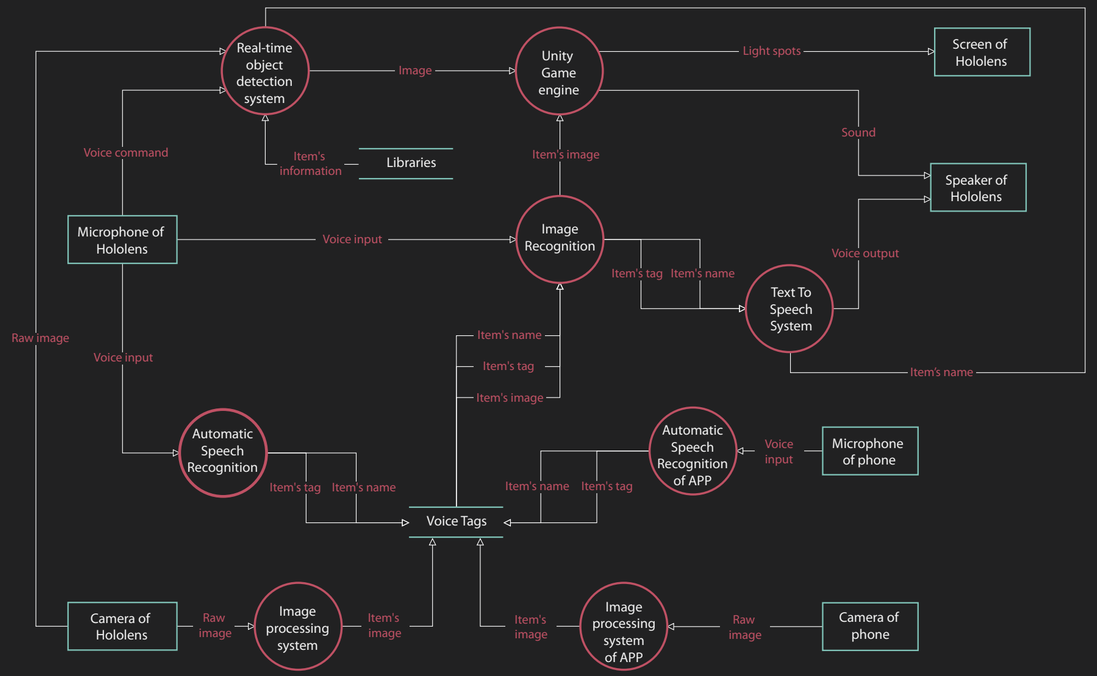
Based on solutions, discuss and conceive the design concept of the product system. The following figure mainly illustrates the relationship between the functions, hardware devices, user population and identification objects included in the entire product system. In the end, the product value including user empowerment, remote assistance, and optimization of the relationship between users and relatives and friends is constructed.



## System flow

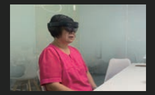



## Data flow



# Light spot perception testing for low-vision people

Ms. Chunlan Shen helped us to complete the light spot perception test. Her vision is as follows: congenital cataract. left eye 0.05 , right eye 0.03. Can perceive light and color.



## 01. Light spot brightness perception

*Process:* We create a light spot in HoloLens (Hololens has 10 levels of brightness adjustment), then let the sbject recognize the light spot and perceive the brightness of the light spot.

*Results:* 1. The light spot can be clearly identified
2. Need to adjust the light intensity for different users

## 02. Light spot size perception

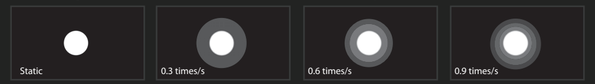
*Process:* We create 2 light spots in different size, then let the suject recognize them.

*Results:* The subject can easily identify the size of 2 light spots.

## 03. Light spot flashing speed perception

*Process:* We create 1 static light spot and 3 light spots with different flashing speeds, then let the subject recoginze them.

*Results:* 1. Flashing light spots can be identify easier than static one.
2. Flashing too fast can cause discomfort to the user's eyes



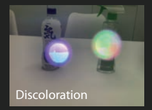

## 04. Light spots & object recognition simulation

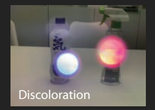
*Preparation :*

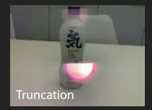
Bcause of the limitation of our technology and project time, we use a relative easy method to simulate light spots and objec recognition. In general, we use Vuforia engine to complete the item recognition part, and use Unity to achieve the presentation of light spots. Then we use the Mixed Reality Toolkit to generate application and publish it to HoloLens.

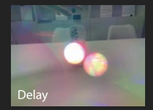

*Process:* We let the subject wear HoloLens to experience the process of identifying objects and positioninng item with light spots.

*Results:* 1. Using light spot to locate item is really more convenient than touch.
2. It is difficult for people with low vision to capture the light spot when the distance is very close, because the HoloLens camera is on the forehead not eyes.
3. Beacuse of the limitation of Hardware, the light spot sometimes shows discoloration, truncation, and delay.









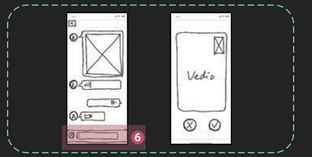

## Conclucion :

1. Using light spot to location item is feasible
2. The distance of the object can be judged by the change of the light spot size
3. Flashing light spot is better than static one
4. The brightness and flashing speed of the light spot needs to be adjustable
5. Using HoloLens as a carrier has some hardware deficiencies

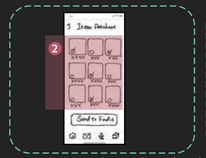
# User interface design and testing for relatives and friends of low-vision people

## Low Fidelity Prototype

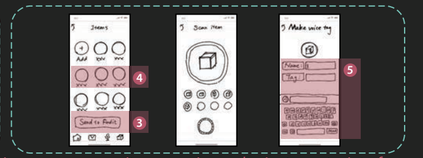

*Entered Page and home page*




*Remote messaging interface*

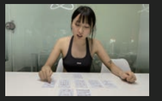
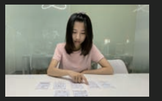
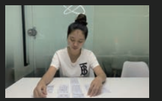



*Item data package download page*




*Item scanning and voice tag entry interface*

## User testing

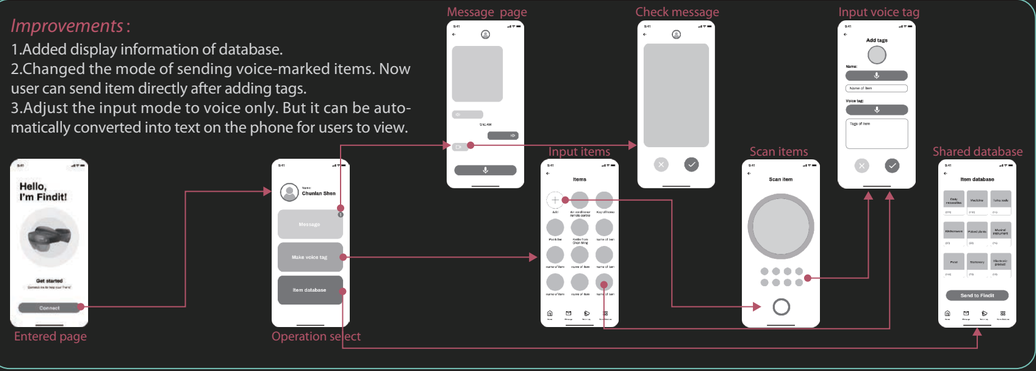




1. The information of database may not be enough. I think it would be better if the number of items in the database could be displayed.
2. If there is a message, I should be able to see it in the main menu, and then I will click to check it.
3. I think this button is a bit redundant.It is more convenient to send directly after adding the voice tag.
4. For items that have been entered before, the function of adding voice tags again should be considered.
5. Voice is friendly to blind people, while text is friendly to App users. But it would be
6. confusing to have text and voice input methods at the same time.

## Middle Fidelity Prototype

*Improvements :*

1.Added display information of database.
2.Changed the mode of sending voice-marked items. Now user can send item directly after adding tags.
3.Adjust the input mode to voice only. But it can be automatically converted into text on the phone for users to view.

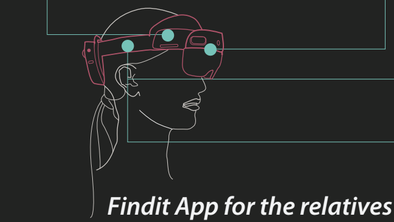


# Instruction manual

When using the product for the first time, the user needs to prepare and learn for operation according to the following steps. The process must be completed with the assistance of staff or relatives and friends. After completing all setting and checking content as instructed, users can start using the product.

## *Findit Glasses for low-vision people*

- ***After opening FINDIT , the user completes the following four steps of setting and testing with the assistance of professionals or relatives and friends.***



**STEP 01** *Set light spot and voice*

Users need to match the appropriate light spot brightness and flicker frequency as well as speech speed according to personal needs and habits.

**STEP 02** *Check the function of object recognition*

Scan item A to ensure the activation and normal operation of the glasses scanning function.

**STEP 03** *Check the function of making voice tags*

Make the voice tag "Voice Test Item A" for the successfully scanned item A.

**STEP 04** *Check the function of reading voice tags*

Read the successfully inputted voice tag "Voice Test Item A".

## *Findit App for the relatives or friends of low-vision people*

- ***The user's relatives and friends need to follow the steps below to complete the operation of the mobile APP.***

**STEP 01** *Binding of glasses and APP*

Professionals or users' relatives and friends bind and control the mobile phone for the user's device, and enter common contact information.

**STEP 02** *Input item information via APP*

Through the mobile APP, the user's relatives and friends scan and input the relevant information of item B. Then, Scan and check item B on the glasses.

**STEP 03** *Import data package via APP*

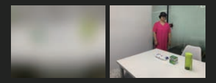
Select and import the commonly used item package D in the item database of the APP. Then, scan and check the item C ( exist in item package D) on the glasses.

- Supplement: Items A, B, C are test-specific models provided by the product.

# How low-vision people use Findit Glasses in two different senarios?

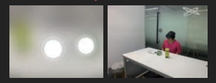
## *Senario 1 : Unfamilier environment*

*1.0 Scan items*



Please turn your head to catch surrounding objects.

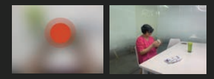
*2.0 Identity items*



Three objects are in front of you: cold medicine, wet wipes and a unidentified item.

Do you want to input items inforamtion or make vioce tag?

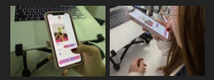
*3.1.0 Make voice tag*



"Cold medicine, three times a day, one pack at a time, the shelf life is until June 2021."

Voice tag made successfully.

*3.2.3 Input on mobile phone*



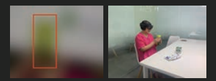
"Call Emily"

Video call or a voice message?

"take photo and voice message"

Message sent

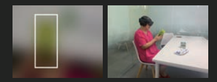
*3.2.1 Input through Hololens*



"Take photo, search in database"

Haven't searched the item.

*3.2.0 Input item information*

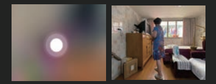


"Input item information"

Input information through Hololens or from others ?

## *Senario 2 : Familier environment*

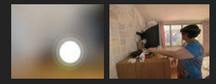
*1. Look for items*



"I want to find cold medicine."

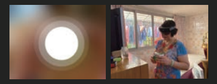
Bibi Bibi Bibi ...

*2. Location the item*



Bi~ Cold medicine.

*3. Check voice tag*



"Read voice tag"

"Cold medicine, three times a day, one pack at a time, the shelf life is until June 2021."

According to the test results, we designed the application process and scenarios of the product. The application scenarios are divided into familiar scenarios and unfamiliar scenarios.

We once again invited Ms. Shen Chunlan to experience and give feedback on the entire use process. The prominent problem in the experience lies in the hardware of the device itself, including the following two aspects:
1. The Hololens lens is above the head and the field of view is narrow, and the user cannot accurately place objects within the visible range of the lens;
2. The light spot in the Hololens Unstable, sometimes absent and delayed.

The perspective of people with low vision

Environment of the experiencer

***Machine voice:***

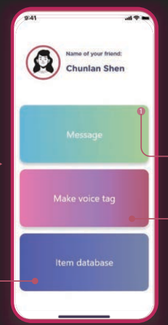
Hello, I am here, what do you need?

***User voice:***

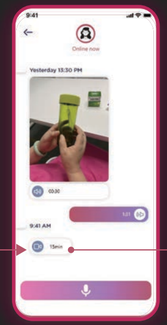
Hi,Findit!

# APP for relatives and friends of low-vision people

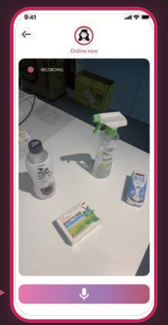

Open the app, the phone will automatically pair with the bound smart glasses. After successful connection, it will automatically enter the next main menu page.




Main menu includes 3 functions. These three functions are the auxiliary and supplementary functions of smart glasses.




Click to enter the message interface, you can get in touch with the smart glasses terminal, the contact methods include short message, voice, video, real-time or non-real-time.




Check the latest video message and reply.

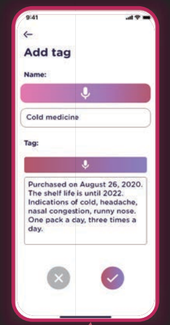


The content of the network shared database includes common item packaged by the development team, as well as item information uploaded by other users for sharing. Relatives and friends of people with low vision can download these item information packages through them, and the downloaded information will be synchronized to the smart glasses.


Click the plus sign to scan the item.


Article scanning needs to scan six sides of the article. After successful scanning, a picture at the bottom of the screen will be generated until all six sides are successfully entered and the scanning ends.

After the item is scanned, a personalized voice tag can be entered for it. If it is an item that has been scanned and entered before, you can directly enter a personalized voice tag.





# Contrubution

1.Take advantage of the limited vision of people with low vision to help them find items.
2.Use voice tags and item libraries to personally meet the needs of people with low vision.
3.Overcoming space constraints and using APP to enable family and friends to remotely assist the user.

# Limitation

*• About usage:*

1. People with low vision have difficulties in making voice tags by themselves. Because the camera of Hololens is probably on the user's forehead and the user has very low vision, so it is difficult for them to place the item in the correct position and capture the complete image.

*• About hardware:*

1.Low vision people use HoloLens itself is a kind of difficulty.
2.Beacuse of the limitation of Hardware, the light spot sometimes shows discoloration, truncation, and delay.

*• Objective factors:*

1.Cannot recognize objects in the dark.
2.Poor recognition performance in places where the light is too strong.
3.Cannot be used to identify occluded objects.

# Living Apart Together

**A smart mirrior for lovers in long distance relationship**

**Watch the video:**
**https://youtu.be/mLD2gEmEN9E**

By Jialing Li & Weiting Chi

3 weeks

Touchdesigner / Arduino

## About

By this project, we tried to create a lite way to enhance the sense of presence for couples/lovers in long distance relationship ( LDR ).

According to the research of ICHARS, it is usual to feel alone and lonely when you are in a distance from your significant other. These emotions of missing one's partner every single day are very normal. Sometimes it is just the emptiness that one may feel and sometimes it is a loss of contact with the partner. This starts making people wonder whether they are close to their partner or not.

Therefore, we tried to create a way to make people in LDR know that they are not alone and their partner is there to back they up.

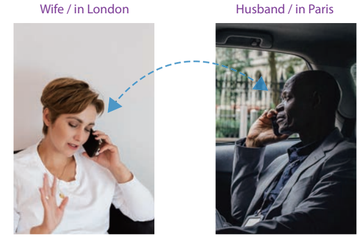
## Background

2020 the pandemic has slow down the pace of the world. The lockdown has emphasized the hurts of loneliness. It brought us time to rethink the meaning of relationship with our loves.

**1/4 of lovers are in long distance relationship in China, 3750,000 couples in the US, and 785,000 in England and Wales.**

They are trying their best to resist the time to wear out their emotions.

There is always a need of new ways to create meaningful interactions to cherishing the right person of our life.




Haven't seen each other for 3 months

Data source:
*Survey Report on the Emotional State of Young Workers in China in 2018*
*U.S. Census Bureau, Current Population Survey, 2017 Annual Social and Economic Supplement*
*Office for National Statistics, UK*

# Research

## The Top 8 Challenges of A Long distance relationship

A survey conducted in Oct. 2018 by OnePall with a simple of 1000 Americans who have been in a LDR

- 50% **Feel lonely**
- 66% **Lack of physical intimacy**
- 43% **Growing apart**
- 45% **Expensive to visit each other**
- 40% **Lack of communication**
- 55% **Worried my partner would meet someone else**
- 33% **Time difference**
- 55% **Difference of opinion on mode of communication (call vs text etc.)**

● **Focused challenges in our project**

○ **Not focused challenges in our project**

# Inspirations

**LOVE TESTING**

- ITP WINTERSHOW 2017 by IVY Huang, Ella Chung and Eva Chen

The designers believe love is not determined or limited by age, race, gender or sexual preference. Every single person deserve love. Love is very abstract, and our love testing has transferred this abstract feeling into visualization art.
This project is based on P5.js Sketch and Arduino Sensors cooperated together. The designers have use heart sensor and humidity sensor to testing participants' heart rate from finger tip and humidify level of palm.

**[ i miss your touch ]**

- by PluginHUMAN (Dr Betty Sargeant and Justin Dwyer, the artists)

[ i miss your touch ] is a live collaboration between the participants and artists. The artwork responds to people's movements. PluginHUMAN affect, in real-time, live video streams from participants' webcams. People can instantly see the creative effects of their movements and interactions. They can also experience virtual touch. It makes people feel as if they are together in one space.

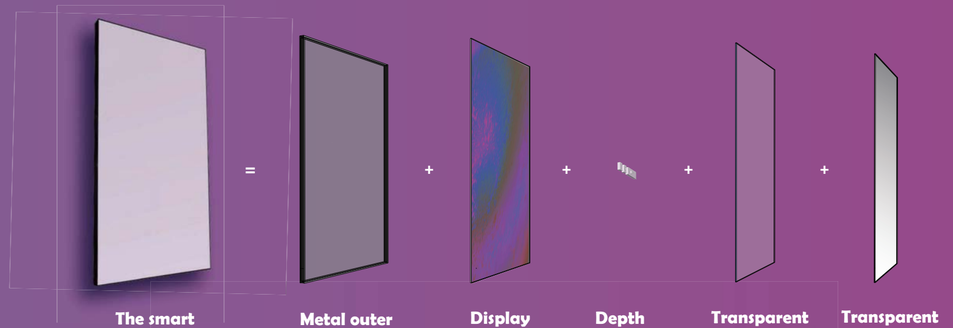
**Felt Presence**

- by Naomi Lea at UCL Interactive Architecture Lab

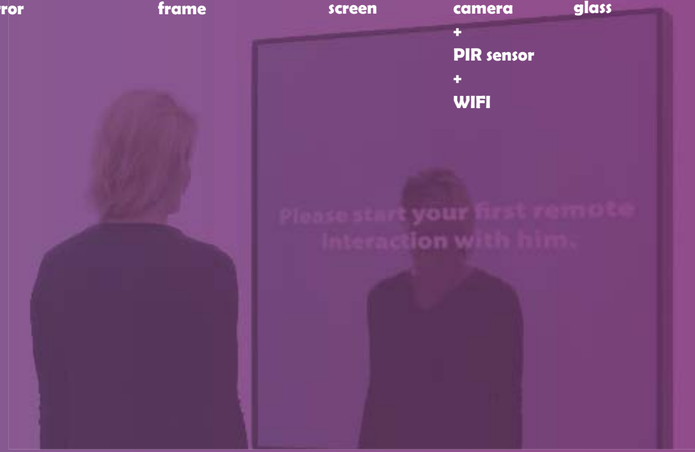
It is an on-going research experiment on the minimum amount of multisensory stimuli it requires to induce the Feeling of Presence (FoP) experience in participating visitors.Â FoP is a fleeting sensation often associated with neurological disorders or spiritual encounters, and yet its experience among healthy individuals is scarcely researched.

# Our Design Concept

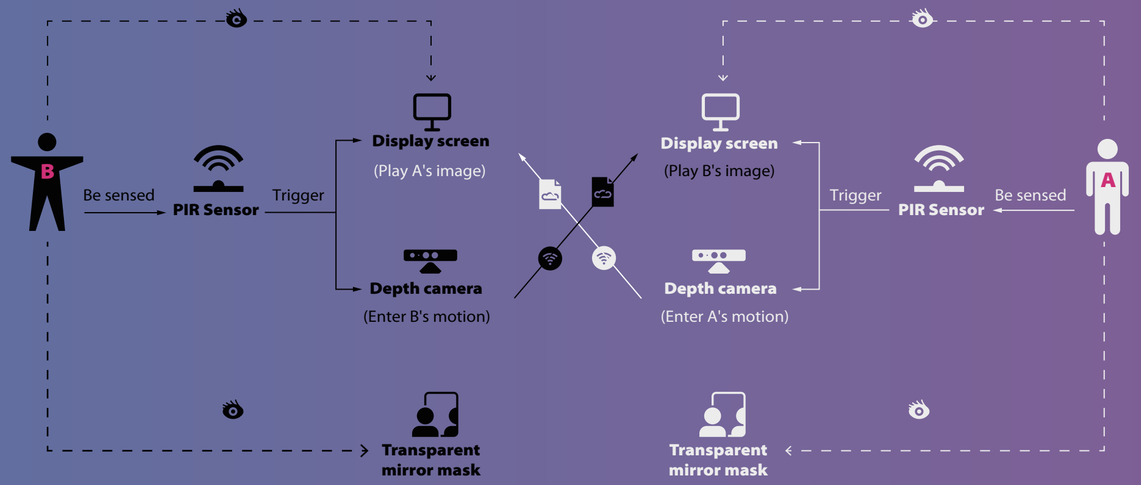
## • A smart mirror




**The smart mirror** = **Metal outer frame** + **Display screen** + **Depth camera + PIR sensor + WIFI** + **Transparent glass** + **Transparent mirror mask**



# • Functions and relationship of each part of the mirror




***When the sensor senses B, it automatically triggers the screen to play A's image, and the camera starts recording B's actions.***

***B will see A's image on the screen and B's own image in the mirror at the same time.***

***The functional relationship of A is the same as that of B***

# • Mike & Nina's Story

Mike and Nina are a long-distance couple who met in college. Mike went to Seattle for his master's degree and stayed, and Nina went to Shanghai after graduation.They have been in a long distance relationship for nearly three years, and both are looking forward to moving to their partner's city in the future. Meanwhile, they also worried their relationship will changed during the separation

**(GMT-8) 07:00 - Mike in Seattle**
**(GMT+8) 23:00 - Nina in Shanghai**

**(GMT+8) 07:00 - Nina in Shanghai**
**(GMT-8) 15:00 - Mike in Seattle**

Waking up alone made Mike felt bad and missing Nina a lot


When he is washing himself, he finds Nina's shadow in the mirror

Mike makes a body gesture of love for Nina


This reminds him to text to Nina


After these, Mike felt better and go to work


The infrared sensor is triggered

The mirror is started playing the image left by Nina

+

Camera is synchronously be turned on to record Mick's image

The infrared sensor is triggered

The mirror is started playing the image left by Mike

+

Camera is synchronously be turned on to record Nina's image


Nina wakes up alone in her Shanghai's apartment


As soon as she got out of bed, she got Mike's "good morning"

When she is waching, Mike's "love" gestures appear in the mirror

Nina responds to Mike's shadow


She felt Mike is always at her side

# Visual Prototype

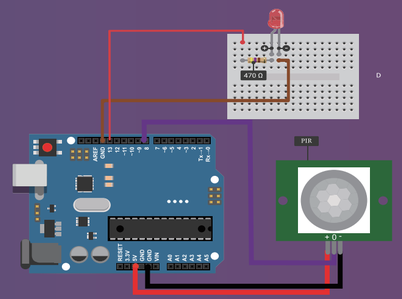
- **Visual exploration process**


- **The final visual effect**

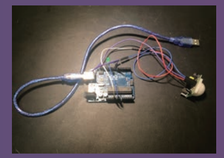
The visual prototype is made in Touchdesigner software and Kinect Azure. The main components and logical relationships used in Touchdesigner are as follows: Particle components generate randomly moving particles, Feedback forms the tailing effect of particles, and Ramp gives variable color effects; then, with the help of Matte components, the portrait captured by Kinect Azure Combined, together constitute the presentation of visual effects.


- **Touchdesigner software interface**

# Arduino Prototype

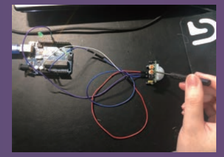



1. Design the circuit diagram for the project.

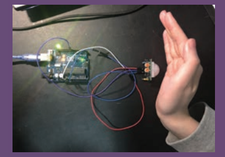


2. Connecting the PIR sensors and LED light with Arduino.

3. Coding on Arduino.



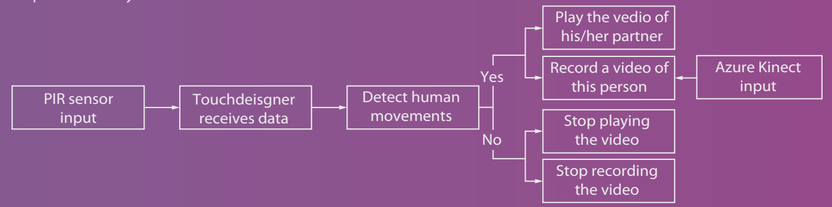
4. Adjust the sensitivity of the PIR sensor to the most suitable level.



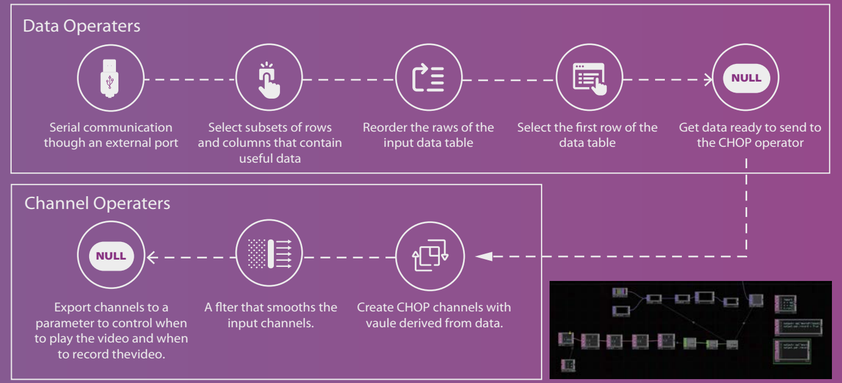
5. Make sure the blue LED lights up when the PIR sensor detects human motion. Finish connecting.

# Touchdesginer Control

- In this project, the PIR sensor is the input of information about human movements. The PIR sensor will trigger two activities at the same time if it detects human movements. One of the activities is to play the video of the user's partner automatically. The other is to capture user's motion using Azure Kinect and automatically generate a video, which can be sent back to the user's partner. If the sensor can not detect human movements, those two activities will stop immediately.

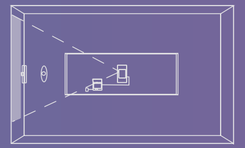



- While Touchdesigner receives data, it can not use data directly to detect and those two activities. A preprocessing of the set of the data table is needed. We need to select useful data and recorder them by using data operators. Then,create CHOP channels with data from the data operator to apply a flter to smooth the channels. Finally, we can export channels to a parameter that can control the two activities.

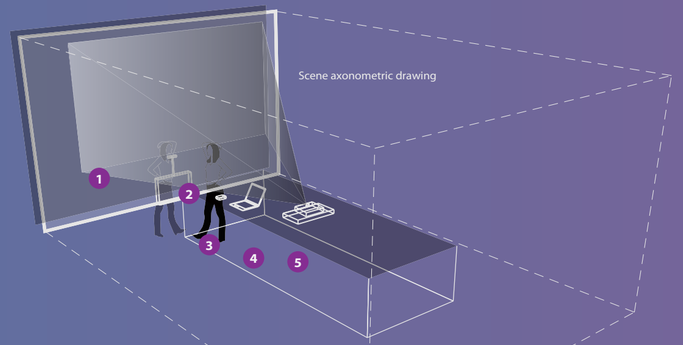


# Testing

The prototype was built in a classroom with a glass wall, with the purpose of restoring the expected effect of the design as much as possible. Since the A-side and B-side of the design are extremely similar, the prototype chooses one end (tester B-side) for construction and testing.



Scene plan




1 Mirror projection screen

2 Kinect Azure

3 Arduino prototype

4 Touchdesigner prototype

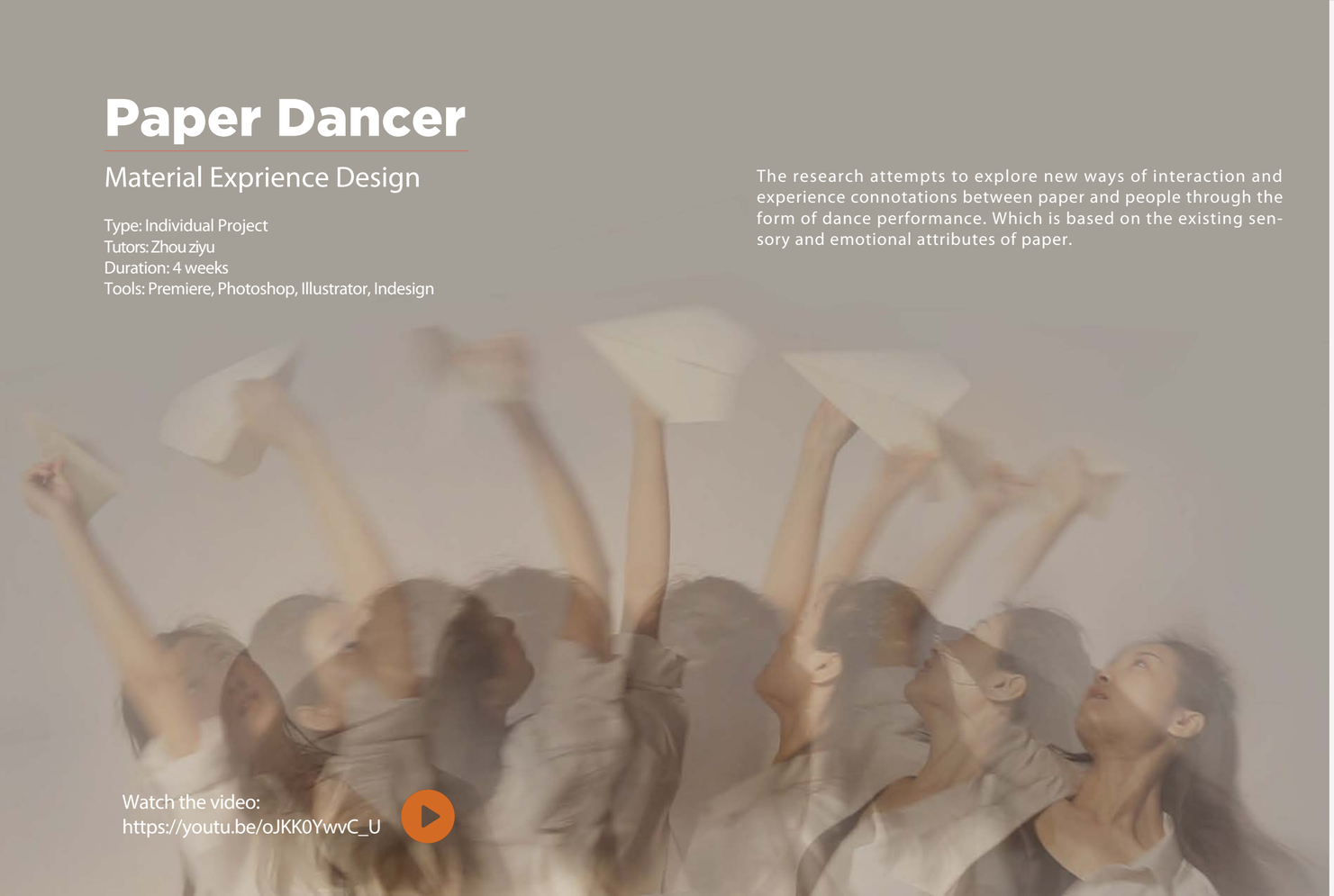
5 Projector

# Paper Dancer

## Material Exprience Design

Type: Individual Project
Tutors: Zhou ziyu
Duration: 4 weeks
Tools: Premiere, Photoshop, Illustrator, Indesign

The research attempts to explore new ways of interaction and experience connotations between paper and people through the form of dance performance. Which is based on the existing sensory and emotional attributes of paper.



Watch the video:
https://youtu.be/oJKK0YwvC_U

### Why research on the paper experience?

Material as one of the most important entities for designers, is highly related to our experiences.  Paper is one of thousands of universal materials which occurs in human life very often, but it is often overlooked. The countless moments of interacting with paper in life triggered a series of thoughts and feelings. As a designer who interested in the materials' experiences, I wonder which kind of emotions are behind the interaction between people and paper. I' m trying to start this research by a series of questionings: which kind of experiences can paper trigger? How do common paper materials bring unconventional or novel experiences? If some emotions are expressed through paper, how could they be presented? I consider these questions are the starting point of the material experience exploration.

### Why express the experience of paper through dance?

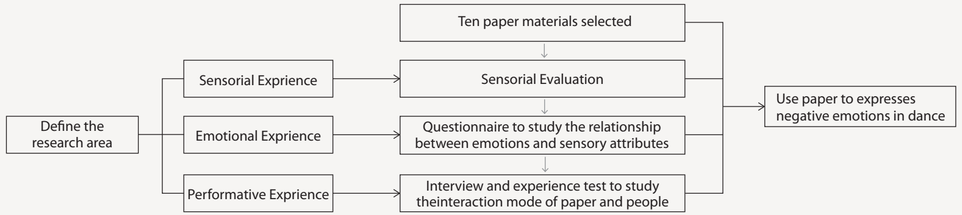
By the primary research, I understood that paper and dance both can bring a fleeting sense of beauty and uncertainty to people. Behind these poetic moments are rich and profound emotions and narratives. In this resonance, I look forward to the combination of paper and dance brings new expression and experience.

### What is the research method?

The project selected 10 most common paper types in life. Focus on their affective attributes, I evaluated and classified their basic attributes and matched them with different emotions, screened out the attributes that are most suitable for expressing positive, negative and neutral emotions, and researched on the interaction mode between people and paper in different emotions. Finally, the material experience pattern of paper had generated. To manifest and express its sensory-expressive attributes, I invited a dancer to experience the interaction between paper and narrate different material expressions. The dancers used toilet paper to perform improvisations to express negative emotions and feel the new experience brought by paper.

### Research process

Step 01: Understand Mateirals Experience — Step 02: Paper Experience Research — Step 03: Material Narrative

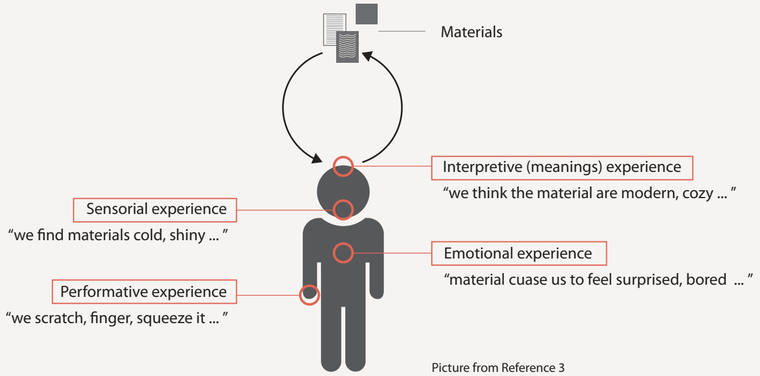



Based on the material experience research methods of previous studies, the paper' s sensory attributes, emotional attributes, and performance attributes are studied separately, including negative, positive, and neutral emotions. In the end, the research chose to focus on negative emotions and use impromptu dance to narrate materials.

## Theoretical framework

### What is material experience ?

The phrase 'materials experience' was first coined by Karana et al. (2008), who defined it as the experiences that people have with, and through, the materials of a product. Giaccardi and Karana (2015) defined four levels of materials experience as: sensorial, interpretative (meanings), affective (emotions), and performative. Each of these components of materials experience is highly intertwined, subject-, object-, context-, and timedependent attributes. [1-2] This research focuses on the innovative experience of paper in dance, so we will no longer study the functional experience of paper, and focus on discussing the remaining three experiences.




Picture from Reference 3

### How to understand material experience ?

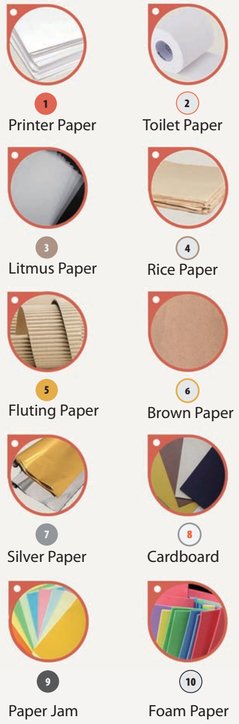
The relationship between materials and experience has long been emphasized in pioneer philosophical works. Physical interaction with materials, or at least the aesthetic experiences that derive from hands-on manipulation of materials, can positively influence the creative process. In the field of art, Focillon and Dewey emphasized the unique role of material engagement in one's process of thinking and reflecting. [4]


Reference :
1. Karana, E., Barati, B., Rognoli, V., Zeeuw van der Laan, A.: Material driven design (MDD): A method to design for material experiences. Int. Journal of Design, 9(2), 35-54. (2015)
2. http://materialsexperiencelab.com/
3. Karana, E., Pedgley, O., & Rognoli, V. (Eds.). (2013). Materials Experience: fundamentals of materials and design. Butterworth-Heinemann.
4. Karana, E., Pedgley, O., & Rognoli, V. (2015). On materials experience. Design Issues, 31(3), 16-27.

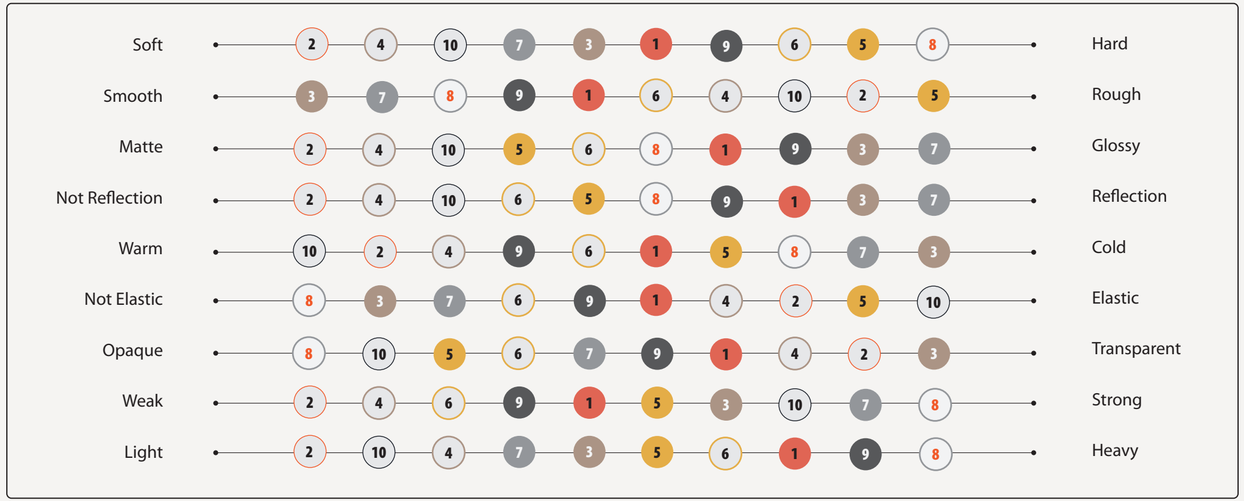

## Sensorial attributes of paper

The study selected ten common paper materials in daily life. The sensory attributes of paper are evaluated and researched through 9 indicators. The numbers in the evaluation chart correspond to the ten materials on the left.

### Material selection




### Expressive - sensoral evaluation




### Conclusion

According to sensory evaluation, there are four types of general atmosphere for planting paper. Their sensory experience is summarized as follows.

**1 Printer Paper, 6 Brown Paper, 9 Paper Jam**

The indicators in the evaluation form of Paper No. 1, 6, and 9 are mainly concentrated in the middle value, and the overall sensory attributes are also biased towards peace and stability.

**5 Fluting Paper, 8 Cardboard**

The indicators in the evaluation form of Paper No. 5 and No. 8 are biased towards tough, strong and heavy, giving people a relatively tough and powerful sensory experience.

**2 Toilet Paper, 4 Rice Paper, 10 Foam Paper**

The indicators in the evaluation form of paper 2, 4, and 10 are biased towards soft, fragile, thin, warm, which makes people feel soft, close and fragile.

**3 Litmus Paper, 7 Silver Paper**

Paper No. 3 and 7 have obvious and prominent features, such as: the transparency of No. 3 paper and the light-reflective property of No. 7 paper, which are easier to give people a kind of innovation and uniqueness.

## Emotional attributes of paper

Based on the sensory evaluation of the ten selected papers, a questionnaire survey on the emotional attributes of the ten papers was carried out to study the inner relationship between the sensory attributes and emotional attributes of the paper.

### ■ Questionnaire review

There are 73 valid questionare in this survey, most of them are design students or designers (54.79%), age range is 18-25 years (72.60%), 25-30 years (24.66%).

Famale x 52

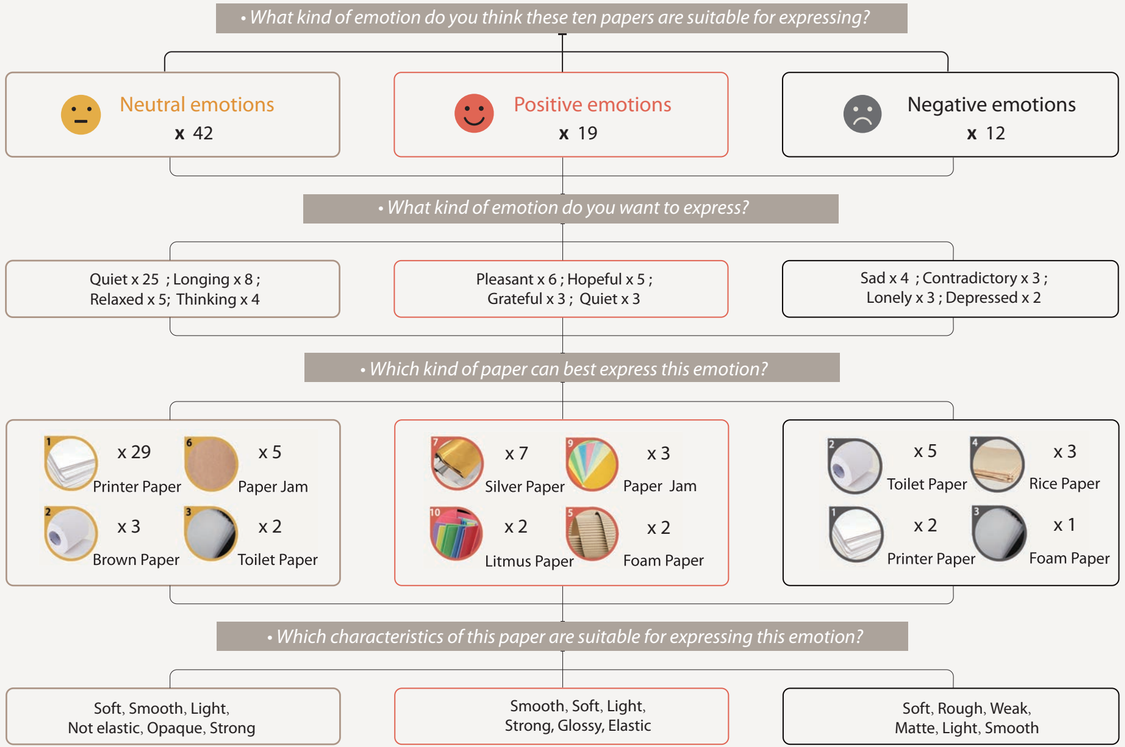
Male x 21

• How to describe the feeling of paper in life?

| | |
|---|---|
| 20.54% | Environmentally friendly |
| 19.17% | Memorable |
| 15.06% | Complex and changeable |
| 13.06% | Fast-moving consumer goods |
| 12.32% | Tender |
| 9.58% | Many possibilities |
| 7.21% | Close |
| 3.00% | Other description |

### ■ Questionnaire on emotional experience

The research divided emotions into three tendencies: positive emotions, negative emotions, and neutral emotions. Respondents choose a specific emotion in a certain emotional trend, and choose paper suitable for expressing this emotion and describe its characteristics.



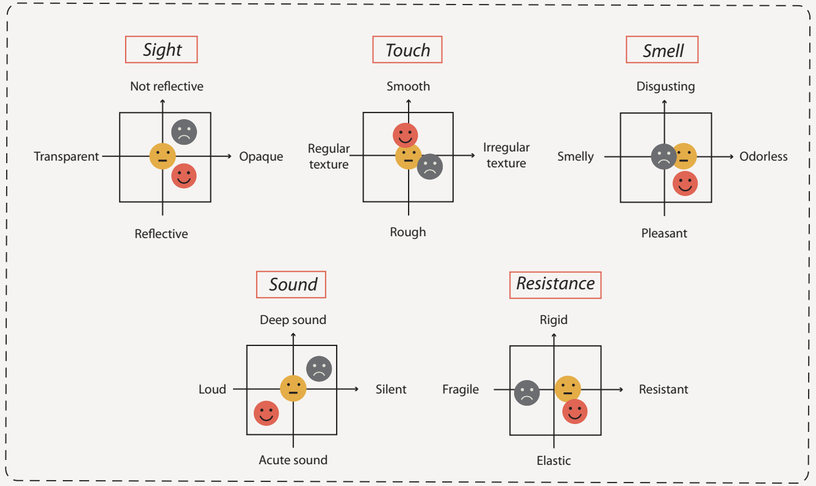

### ■ The relationship between emotion and paper sensory attributes

Based on 73 interviewees' perceptions of these ten types of paper, the following conclusions are obtained:

① Ordinary printing paper can express neutral emotions best, because among the ten types of paper, its various experiences are in the middle and average state, which brings people a sense of calm and stability.

② The silver paper that can convey the most positive emotions is mainly due to its smooth texture and reflectivity, which gives people a pleasant and fashionable feeling. In addition, its sporty sound also brings people a crisp and relaxed feeling.

③ White toilet paper is the material that best represents negative emotions, which mainly depends on its fragility, softness and a bit rough texture. It is reminiscent of the fragility and powerlessness of negative emotions.

# Performative attributes of paper

## Interview

PART 01: In the research on the performance attributes of paper, I first interviewed 12 respondents who participated in the questionnaire survey, hoping to dig out their stories and interactions with paper, and understand the performance attributes of paper from these interactions.
Among the 12 interviewees, 4 represented negative, positive and neutral emotions respectively. The picture below lists the stories and interaction methods of 6 of them.
The other 6 interviewees' understanding of the performance attributes of paper focused on common forms such as reading, writing or touching.

**Jin Yang**
26
Design teacher

I became obsessed with paper of various textures because of studying binding design. I often buy all kinds of paper for collection, just looking at or touching it will be very satisfying and enjoyable, like a friend accompanying me.

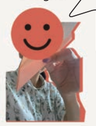
- Key words:
  - Feel and touch the paper
  - Collecting hobbies and satisfaction

**Qin Yu**
27
Civil servant


I like to use torn paper to make hand account collages. I think the texture of torn paper with raw edges can make people feel natural and comfortable.

- Key words:
  - Tearing paper and collage
  - Hobbies and record mood

**Li Yue**
27
Designer



When I was a child, I might have a deeper experience with paper, such as making handicrafts with paper, origami airplanes and paper windmills, etc. These are beautiful memories that accompany childhood.

- Key words:
  - Origami and handmade
  - Childhood memories, innocent and childlike

**Xiao Ma**
25
Artist

I became obsessed with paper of various textures because of studying binding design. I often buy all kinds of paper for collection, just looking at or touching it will be very satisfying and enjoyable, like a friend accompanying me.

- Key words:
  - Feel and touch the paper
  - Collecting hobbies and satisfaction

**Sheng**
35
Sculpter

When we shed tears, paper heals our wounds, accompanies those in grief, and heals. I have always felt that paper can capture and accompany our delicate emotional moments. It is a very beautiful material.

- Key words:
  - Wipe tears with paper
  - Listen and accompany

**Shang**
23
Design student

Every year, I burn up my diary from last year. I think it is a better commemoration that the tangible records are turned into intangibles. It also gives myself a new opportunity to end and start.

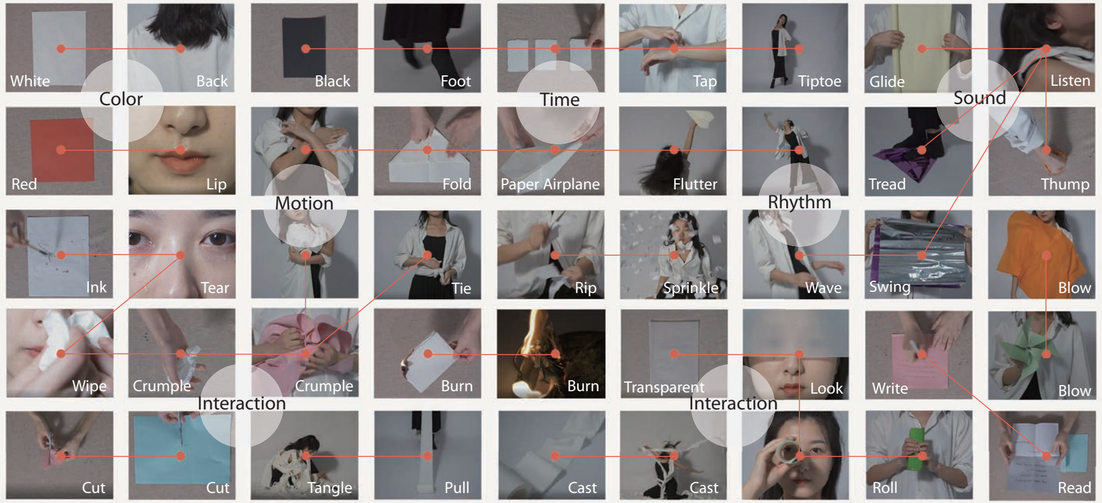
- Key words:
  - Writing and burning paper
  - Sense of ritual of ending and beginning

## Conclusion

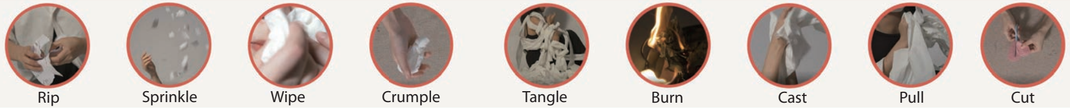
The way people interact with paper is complex and changeable and all correspond to specific scenes, stories, and emotions. Paper has different performance attributes in different stories. Respondents who chose positive and neutral emotions interacted with paper in a more relaxed way, closer to our daily experience. The interviewee's description of negative emotions has brought me greater touch and inspiration, and is more story-telling and breakthrough. I think this may be an entrance to experience innovation in paper materials.

## Interactive experience of a dancer and paper

PART 02: The second part of the research on the performance attributes of paper is to explore and interpret the performance attributes of paper through body language.
I invited a dancer to have a paper performance experience. The dancer interacted with the paper according to her own understanding and had an association with the dance language. Finally, the dancers choose the part that best interprets the negative emotions among these interactive methods, and perform impromptu performances with white toilet paper that represents the negative emotions.




## The dancer's choice of interaction method suitable for expressing negative emotions



## Material Narrative

• Description of the dancer's experience :

I have two feelings: One is that the interaction between materials and dance brings more ways to express emotions. For example: you can express struggle through the entanglement of body movements and toilet paper; express hesitation and hesitation by kneading sheets of white paper into a ball; and express release by throwing scraps of paper into the air... using the medium of paper to show dance Provide more possibilities, but also provide a more iconic way to express emotions.

The second is that the different materials and forms of paper bring more vivid feelings to the expression of dance. Just like an origami airplane floating in the air, it can express the feelings of a girl and is always a poetic situation; the soft paper is rubbed on the chest to express tender feelings; the body swings with the paper and it seems to express a free and casual feeling... As a material, the combination of paper and body movements can not only make the expression of movements more tense, but also because of the difference in the material and form of the paper itself, more situations and feelings can be expressed more intuitively and vividly.

• Description of this dance performance:

In this dance, toilet paper is like a performance prop that aids in the externalization of emotions. The soft and fragile characteristics of toilet paper are like a materialized reflection of sadness, like a visualization of sadness itself. The rhythm of the whole dance is just like the psychological journey of people facing sad emotions. At first, it was tightly enveloped by huge sad emotions, and then slowly began to try to break free. When the struggle reached the extreme, then it entered the exhaustion after the struggle. And the state of peace, and finally the sadness is digested and precipitated, people get sublimated from it, and reach a new peace of mind.

• Conclusion:

The research starts from the physical properties of paper and sensory experience to the transformation and presentation of body language. The final dance performance is composed of paper, the interaction between the paper and the dancer, the superimposition of the dancer's body movements and inner sadness, which is a concentrated explosion and presentation of emotions in a short time.

The entire project, whether it is paper, dance or research process, has been groping in a kind of uncertainty, and the final results may be diverse and there is no standard answer. The final foothold is the dancer's performance. Whether it is paper innovation or performance innovation, it is an interesting combination and exploration. The dancer’s experience may be abstract and personal, but it also provides provocative concepts and visions for future material-related innovation.