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### Port-all: Reproduction of the sense of companionship in a long-distance relationship

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**Port-all:**  
**Reproduction of the sense of companionship in a long-distance relationship**

By Xincan Yang

A Thesis Submitted in Partial Fulfillment of  
the Requirements for the Degree of  
Master of Fine Arts in Industrial Design

Industrial Design  
College of Art and Design  
Rochester Institute of Technology  
Rochester, NY.

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Title: Port-all: Reproduction of the sense of companionship in a long-distance relationship

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Date: May 10th, 2021

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## **Abstract**

The long-distance relationship is a common phenomenon in contemporary society. Nowadays with the development of the Internet, we have various instant messaging software which gives us an effective way to keep communication with distant others. But it also brings a series of new problems.

Due to the lack of physical contact, time difference, and high dependence on the Internet, people often experience negative emotions in long-distance relationships from delayed communication, suspicion, and misunderstanding of messages. Research shows that most couples feel tired and anxious for a long time in a long-distance relationship, and one of the core reasons is the lack of sense of companionship in their daily lives.

The author will explore the design needs by analyzing the characteristics of long-distance relationship and the psychological components of the sense of companionship, explore design possibilities by investigating existing science and technology, and illustrate the design opportunities by enumerating specific scenarios. As result, the author will propose a complete set of solutions, which could present companionship to help long-distance couples maintain their relationships.

**Keywords:** long-distance relationship, companionship support, instant communication, social networking service, electronic product design

## Introduction

Long-distance relationships have been an important form of intimacy since ancient times. People used to keep in touch with distant friends and relatives by writing letters in ancient times, but now, thanks to scientific advances, we can communicate instantly through the more advanced and fast invention: The Internet. Instead of having to go through long waits, couples wanting to stay in touch can simply pick up their phones or turn on their computers and they can communicate with each other face-to-face, virtually.

This sounds wonderful, but surveys show that more than 75 percent of couples end up breaking up because they can't endure a long-distance relationship<sup>1</sup>, and more than 60 percent of respondents say they have been in or are in a long-distance relationship<sup>2</sup>. Why are long-distance relationships so common, yet so "deadly" difficult to keep together?

High dependence on the Internet and digital media are the most obvious tools of contemporary long-distance relationships. In such purely digital relationships, people can send each other a hug emoji but cannot actually give a physical hug; people can watch the same movie on Netflix together but cannot actually sit next to each other. Relationships built on digital content cannot provide a physical, tangible feeling, which often leaves people feeling empty and lonely, lacking a sense of companionship.

In this paper, I explore the main problems and their causal factors of contemporary long-distance relationships, provide insights into the sense of companionship in long-distance relationships, and propose solutions through a product design approach.

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<sup>1</sup> Doll, J. (2014, December 01). The loneliness of the long-distance Breakup. Retrieved April 18, 2021, from <https://www.thecut.com/2014/11/loneliness-of-the-long-distance-breakup.html>

<sup>2</sup> Kelmer, G., Rhoades, G. K., Stanley, S., & Markman, H. J. (2012). Relationship quality, commitment, and stability in long-distance relationships. *Family Process*, 52(2), 257-270.

# Research

## 1.1 Problems in a long-distance relationship

To research the problems prevalent in long-distance relationships, I will first analyze the way people communicate and interact with each other in long-distance relationships under modern technology, and then analyze the drawbacks of long-distance relationships and their consequences.

### 1.1.1 Long-distance relationships under modern technology

Instant messaging software and social networks are common communication channels used by contemporary long-distance couples. In instant messaging software (e.g. WhatsApp, WeChat), as the name implies, people communicate with each other instantly, but this "instant" is more for the sender, and the responder can ignore or delay sending a reply, which is unbalanced. In reality, when two people are chatting face-to-face, both sides need to respond to each other instantly to ensure the flow of communication and the accuracy of the message. With social networks (e.g., Instagram, Twitter, Weibo), people do not expect instant feedback after posting content; they wait for comments for a certain time frame, which can range from minutes to days and varies from person to person.

The parallel use of these two different functional communication mediums leads to the complexity of communication in long-distance relationships<sup>3</sup>. When you want to share something interesting with your loved one, whether to send him/her a picture immediately via WhatsApp or to tweet it on your Twitter and wait for him/her comments presents two different emotional needs. The former is more intimate and exclusive, but if you can't get a timely response, you will have negative emotions like doubt; the latter is more open and non-emotional but without the need for timely feedback.

In addition to the complexity of communication styles, there are many other factors that contribute to the instability and fragility of long-distance relationships.

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<sup>3</sup> Barnes, M. L., & Sternberg, R. J. (1997). A hierarchical model of love and its prediction of satisfaction in close relationships. In R. J. Sternberg, & M. Hojjat (Eds.). *Satisfaction in close relationships*. New York: Guilford Press.

## **1.1.2 The drawbacks of long-distance relationships and its consequences**

### **Untouchable leads to misunderstanding.**

One of the main problems that long-distance couples/families face is that they can't physically touch each other. Not being able to communicate face to face makes it difficult for them to sense the exact mood of the other person. This often leads to a lot of misunderstandings.

### **Time difference leads to untimely communication.**

In addition to the distance in space, the difference in time can be an annoying obstacle in a long-distance relationship. Long-distance couples often have trouble keeping the same schedule, and when one person wakes up, the other may be ready to fall asleep. This gives them few opportunities to communicate.

### **Network-dependent leads to unstable contact.**

Almost all long-distance communication methods are established and maintained through the Internet. This is convenient and fast, but also very unstable and fragile. Unstable communication methods often have many hidden hazards. For example, when you need to contact someone immediately, their mobile phone may not be around.

These factors work together to compress the space for emotional expression between people in long-distance relationships, and "suspicion and loneliness take away the space for feelings of joy and companionship."<sup>4</sup> To address how to improve this problem, I conducted a study on the sense of companionship in a long-distance relationship.

## **1.2 The sense of companionship**

Sense of companionship is one of the most important feelings in intimate relationships and one of the most lacking feelings in long-distance relationships.

In this section, I will propose my own "companionship hexagon" model based on psychologists' research on intimacy to elaborate the component of the sense of companionship, and try to explore how to convey companionship through product design based on physicists' theories.

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<sup>4</sup> Kelmer, G., Rhoades, G. K., Stanley, S., & Markman, H. J. (2012). Relationship quality, commitment, and stability in long-distance relationships. *Family Process*, 52(2), 257-270.

## 1.2.1 The component of the sense of companionship

Based on Sternberg's "Love Triangle" and John Lee's "The Six Styles of Love" theory<sup>5</sup>, I came up with the idea of "companion hexagon".

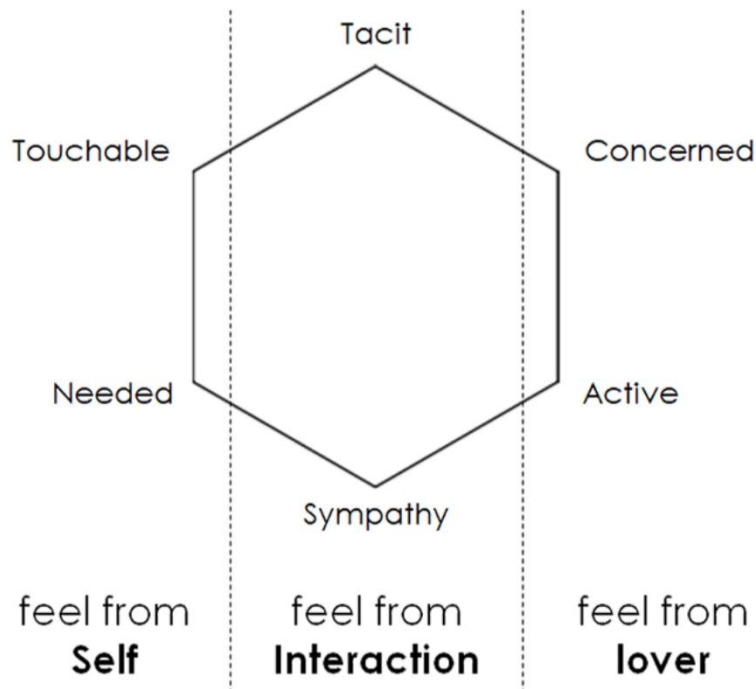


Fig 1: the companion hexagon

The hexagon is divided into three parts according to the feelings that people feel in "companionship", and each part is divided into two small parts:

Feel from self = being touchable + being needed. The "touchable" here refers to "the happiness of being able to keep in touch with the other party."

Feel from interaction = be tacit with each other + sympathize with each other.

Feel from lover = concerned about each other + being active, which means to respond to each other's actions.

This model is a tool to evaluate and filter the design solutions. Three Feels correspond to different interactions and usage scenarios. Therefore, the final solution needs to take care of each element of the hexagon as much as possible.

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<sup>5</sup> Sternberg, R. J. (1988). The triangle of love: Intimacy, passion, commitment. New York: Basic Books.



## 1.2.2 Touch, the way to convey feelings

Another theory was inspired by Newton's laws of physics. I call it “The Way to Get in Touch”.

In Newton's theory of physics<sup>6</sup>, if an object wants to make another object move, it must either collide with it through motion or resonance. In addition, it can also extend itself. I think this also corresponds to the way two people in a long-distance relationship communicate and interact with each other.

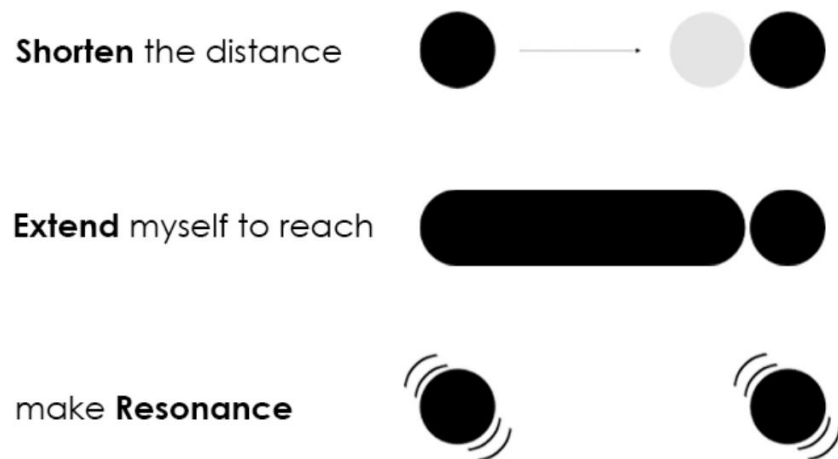


Fig 2: Three way to get in touch

These three physical attributes correspond to the three design orientations of long-distance relationship products.

Shorten the Distance means giving two people a high-fidelity, immediate means of communication. Fidelity is not only about the resolution of the video, but also about the integrity of the senses. The richer the auditory, tactile and other sensory interactions, the more the sense of distance is blurred.

Extend Myself to Reach means allowing users to be more involved in each other's lives and increasing opportunities for proactive communication.

Make Resonance means allowing users to break the time difference between each other and have the feeling of being in sync, taking advantage of the intersection of each other's daily time to create opportunities for interaction.

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<sup>6</sup> Newton, Isaac. (1968). The mathematical principles of natural philosophy. London: Dawsons of Pall Mall.

# Design Solutions

## 2.1 Design opportunities in long-distance relationships

In this session, I will analyze the implied design opportunities in the context of “the drawbacks of long-distance relationships and its consequences” above and suggest some possible scenarios for their application.

### **Untouchable allows the advantages of virtual interaction to be fully utilized.**

There are various virtual interaction methods for online communication today. Such as facerig, animated expressions, etc. The rich virtual interaction can penetrate into many corners of the user's life, such as eating, watching movies, sleeping, etc.

### **The time difference allows people to have free time to prepare surprises for each other.**

The time difference can also give couples more personal time, which somehow allows them more time to prepare for surprises. The surprise is not limited to a gift in the physical sense, but can also be some artificially created coincidence or, for example, a piece of music played at a specific time to set the atmosphere.

### **High-Reliance on the Internet allows smart products to function better.**

Many electrical appliances and devices can be controlled via the Internet. It might come up with some interesting applications. Smart products with different functions can be interconnected with each other to combine different functions to suit different times and special days.

## 2.2 Design development

After completing the analysis and summary at the theoretical level, I started the concrete design phase. This phase is divided into two major parts, one is the initial concepts phase in the form of brainstorming, and the other is the process of selecting a specific product direction and continuously iterating the design along this line.

### 2.2.1 Early concepts

I divided the user needs into four sections, Play/work with you, Touch with you, Share with you, and Surprise you, and used them as a starting point to come up with many different product solutions.

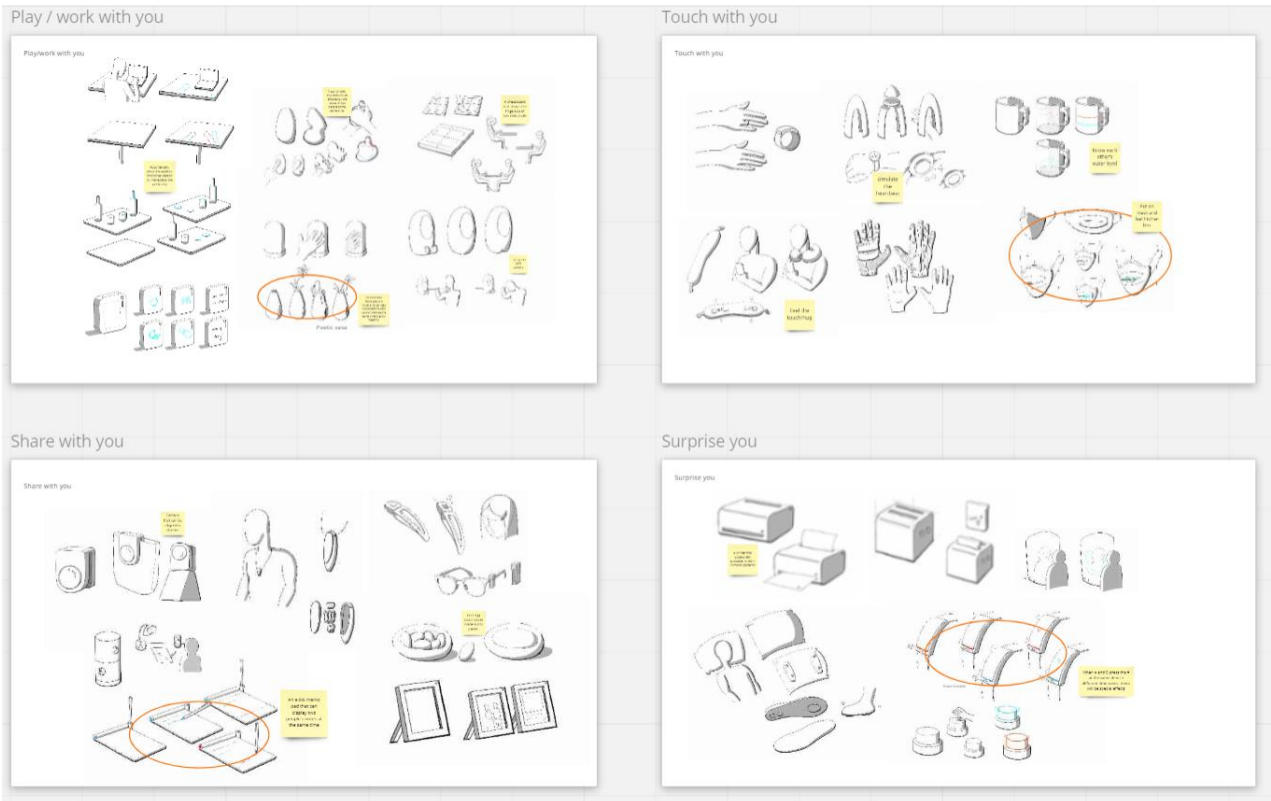


Fig 3: Early concepts

Eventually, I decided to integrate these four functional needs together and design a platform that can string different functional products of different users together. This platform is what I propose next: the Port-all.

## 2.2.2 Design Iteration

### 1. Port-all

**Port-all** is a ring. What each user puts into the ring will be "linked". In the case of smart products, the two will automatically synchronize data, and in the case of non-smart products, they can be registered through the mobile app to give specific switch functions.

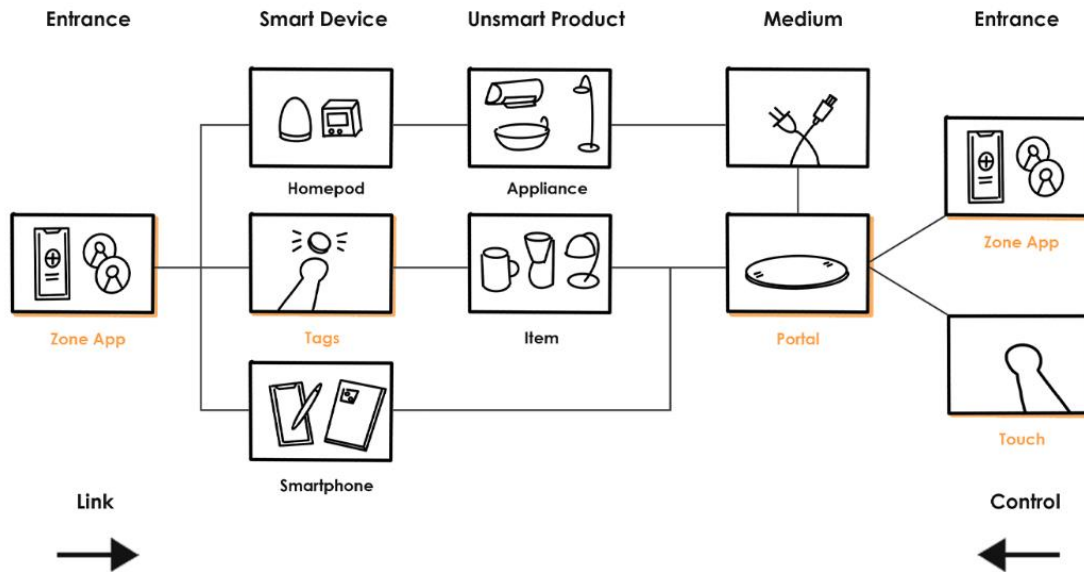
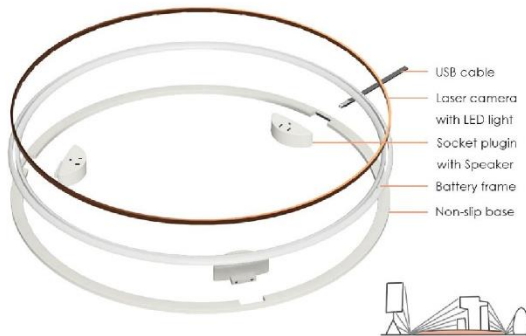


Fig 4: the workflow of Port-all

Here are some specific product details and usages.

### Components



The entire **Port-all** consists of four parts, a ring laser camera, a ring battery frame, a non-slip base, and 3 socket plugins (with built-in speakers). The ring laser camera can scan the three-dimensional models of the objects inside and outside the ring to determine the corresponding products. When registering a product with Zone App, just put it in the ring and move the ring up and down to complete the scan.

When using Port-all, users can realize various functions by linking their items with each other. The following are three specific examples.



#### Smart coffee maker

Hand her a cup of her favorite cappuccino from afar.



#### Synchronous notebook

A diary to each other, records the beautiful moments in each other's location.



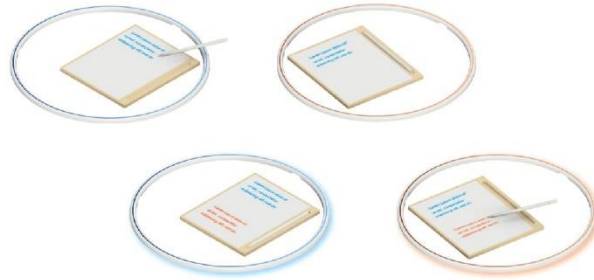
#### Automatic speaker

Share the music you are listening to with her, simply and directly.

## Synchronous **notebook**



An electronic notebook made of an e-ink screen and a stylus. When the notebook is in the circle, the data will be uploaded to the cloud, and when two linked notebooks are both in the circle, the screen will display synchronously.



When both his and her notebooks are in the circle, while he is writing, her notebook will also display e-ink simultaneously. At this time, she can also join his creation, and the two can write diaries together.

## Automatic **speaker**

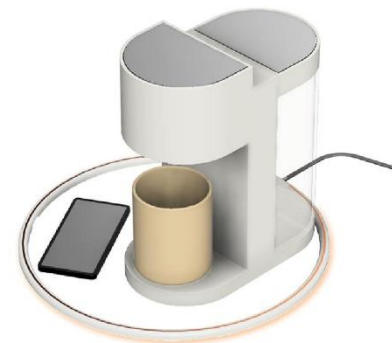


By installing the speaker plugin to the ring and linking it with the corresponding music Apps, the functions of music sharing and automatic play can be realized.

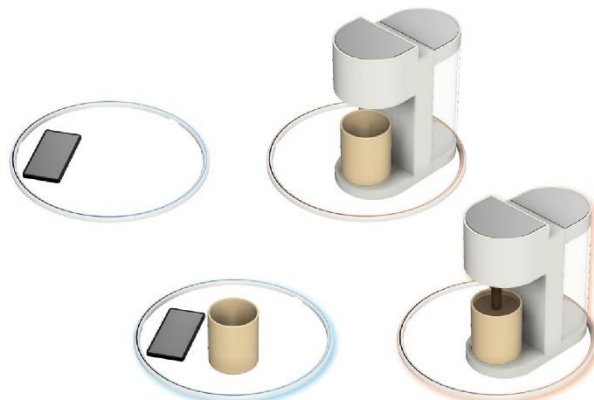


He heard a nice song on Spotify and wanted to share it with her. So he put his phone into the circle. If her phone is outside of the circle, she'll receive a notification from the Zone App: "He shares you a song". And if her phone is inside of the circle, it'll play the music automatically.

## Smart **coffee** maker



The smart coffee machine can customize the taste and temperature settings through the Application. By Linking his coffee cup with her coffee machine, he can "share" his coffee with her.



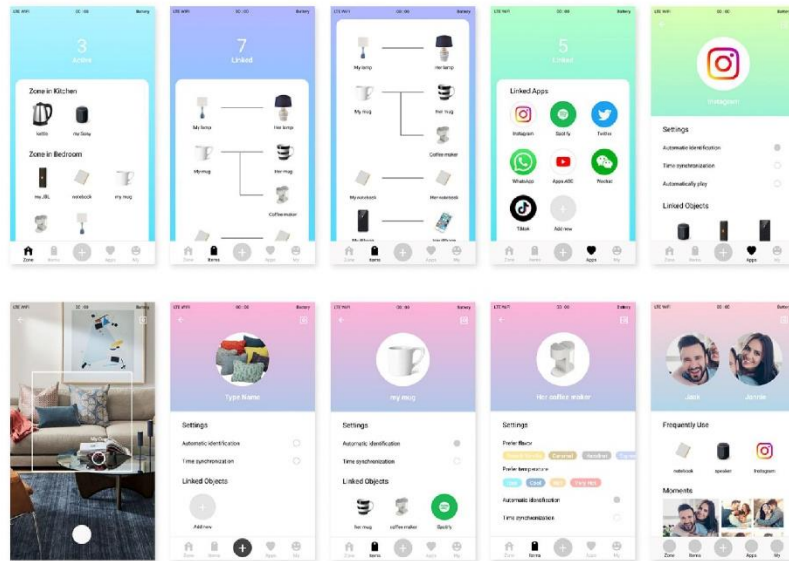
When he put his coffee mug into the circle, her coffee machine in the ring will start at the same time (Time will be converted by time difference). Therefore, every morning when he wakes up, she can have the coffee "he made for her".

## Zone App

In Zone App, the user can manage his and his lover's products, and can link various items with different Apps to customize specific functions.

For supported smart devices (such as smart coffee machines and Synchronous notebook), users can also make further settings.

Users can add their own items by taking pictures and ring scanning, and can also manage smart homes with the help of the smart assistant device.



## Showcase



Fig 5, 6, 7: the details of Port-all

## 2. PortalVision

After proposing Port-all as a solution, I conducted user testing on it. However, the results were unexpected and the feedback from users was not satisfactory. Many people had difficulty understanding the significance of linking their products with others and found it cumbersome and took up a lot of space on their desktops, contrary to their daily habits. Most importantly, the "ring" was too abstract and lacked a visually obvious and easy-to-understand guide and feedback.

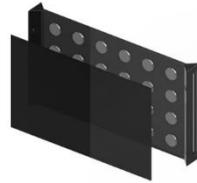
To address these issues, while keeping the basic functionality intact, I redesigned another solution, PortalVision, a portable smart television with a size-variable screen.

# Overview

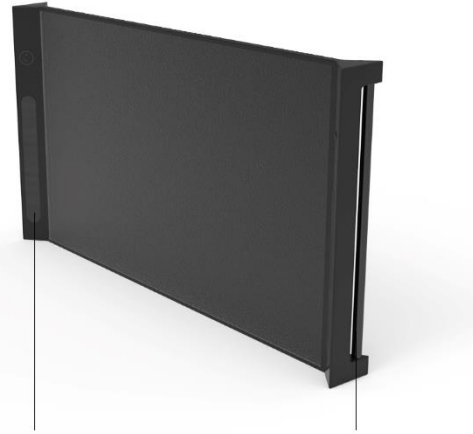
Portalvision is a multi-functional touchscreen television designed specifically for people in long-distance relationships.



40-inch OLED touchscreen with ultimate narrow bezel



Multifunctional sensors and small vibration motors are built into the bottom of the screen

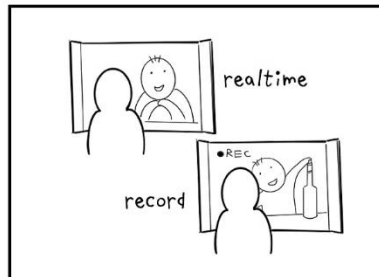


There are fisheye cameras and surround speakers on the left and right sides of the screen for 3D filming and recording. And the backs on both sides have handles for easy movement.

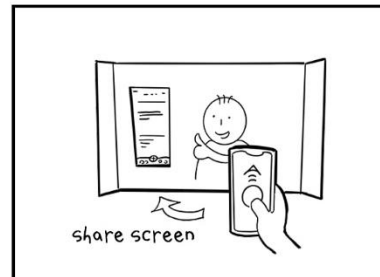
# Features

Unlike other traditional televisions, the PortalVision is better suited to more mundane scenarios such as dining tables and desks.

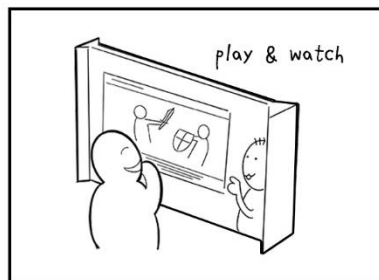
It has the following main functional features: One to one big-screen video calls, Screen sharing, Enjoy together mode, and Haptic reaction.



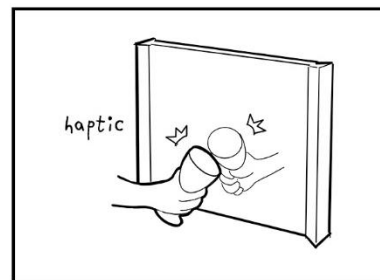
One to one big-screen video calls, as if chatting face to face. For users with time differences, it supports prerecording function. The record can be played automatically at the corresponding time of the other party.



Screen sharing. Users can project the screens of their devices onto PortalVision. In this way, two people can share music, photos, social findings, etc., and can add notes to each other.



Enjoy together mode. When playing a movie or a game, users can turn on the "Enjoy Together Mode", which displays each other's faces on the corner of the screen, as if they were sitting together playing and watching.



Haptic reaction. Tiny vibrating motors line the bottom of the screen, which vibrate when a user or object touches the screen, and can simulate high-fives, toasts and even kisses.

Fig 8: the details of PortalVision

# Scenario

With PortaVision, couples in a long-distance relationship can eat together, chat together, watch movies together -- as if they were sitting face to face, or more -- they could share and document each other's lives better.



Fig 9: user scenarios of PortalVision

But again, frustratingly, this design has not received much positive feedback. Although this solution is more convenient and intuitive than the Port-all, it also makes the product too ordinary - "it's just a big TV". The previous concept, Port-all, while seemingly complex, delivered a different experience, "with a different kind of romance to its abstract interaction instead."

## 2.2.3 Reflection

So, what do users really need? Fundamentally speaking, the best solution to the long-distance relationship problem is a plane ticket. But obviously, this solution is impractical, precisely because in time and economic or other conditions do not allow, two people must live separately. In order to propose a more realistic solution that meets the needs of users, I compared and reflected on the two previous solutions. Here is a form I put together based on comparing the characteristics of the two.

	Easy to use	Innovative	Intuitive	High-tech	Low cost
<b>Port-all</b>	<b>4</b>	<b>5</b>	2	3	<b>4</b>
PortalVision	3	1	<b>5</b>	3	2

Port-all's usage is more abstract and highly dependent on the mobile app for collaborative operations, so users may need to spend more time to understand its usage and familiarize themselves with specific usage scenarios. And PortalVision's screen makes its usage simpler and more intuitive, but it lacks innovation and is difficult to bring new experiences to users. It might be a good combination if combining the two, having both the screen and the circle. Eventually, building on the above analysis, I present my final solution.





## 2.4 User feedback

After conducting user tests, I received feedback on various aspects such as size, material, usage, and user scenarios, and I made adjustments accordingly.

Regarding the size, at first, I set the diameter of the product to 16 inches, but interviewees mostly think that this size is too large and inconvenient, so I modified it to 14 inches, a size similar to the size of mainstream laptops. As for the material, in order to avoid a "cheap feeling", I decided to use matte metal as the material of the product frame. (But in the prototyping, I used acrylic + spray paint to produce)

Most users feel convenient and comfortable using Port-all 2.0 horizontally, but some users feel uneasy about using it vertically (hanging it on the wall). This is mainly due to privacy concerns. After all, it's not a good idea to hang a camera on the wall. So, I thought I should add a very visible switch to the product to always know if the camera is on or off.

After combining the above feedback, I improved my product to the form shown below.



Fig 11: the details of Port-all 2.0

### 3. Conclusions

The well-known Chinese writer Lu Xun once said, "Different people do not have the same sorrows and joys."<sup>7</sup> Likewise, for different people in long-distance relationships, the sense of companionship they lose is not the same. Some of them lack effective communication, some lack physical contact, some lack time together, etc.

Throughout the process of research and design, I felt more and more the complexity of this issue through self-reflection and contact with different people. Love is inherently a vague and ambiguous thing, and for people in long-distance relationships, the best solution is always a plane ticket. So as a product designer, the solution I offer to this problem is not so much a solution but a tool to help users explore solutions that work for their own situation. The Port-all, as its name implies, is a portal that connects two people in different locations, conveying messages and feelings through screens, sounds, and vibrations. It is a tool designed for two people in a long-distance relationship to interact in a rich variety of ways, with each couple able to explore their own unique way of using it.

With the development of the Internet, it is likely that in the future long-distance relationships will become more common. Thus, I will continue to develop this topic in the future.

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<sup>7</sup> Xun, Lu., Xianyi, Y., & Naidie, D. (2003). Lu Xun Selected works. Beijing: Foreign Languages Press.

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