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A Tactile Interface to Assist Older Adults in Finding a Roommate

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Abstract

This thesis focuses on helping older adults find an ideal co-living roommate via physical interaction design. The literature review suggests that almost all of the existing systems and products for roommate-finding currently in market rely on digital devices. For older adults, this is a problem because they are not proficient at using computers or other smart devices ("Tech Adoption"). A tactile (physical) interface is an appropriate interface for elderly users for a roommate finding product (Güldenpfennig and Fitzpatrick, 1). This thesis proposes a design intervention that uses a tactile interface to solve this problem. The resulting design creates a positive and comfortable experience that responds to an elderly user group.

A TACTILE INTERFACE TO ASSIST OLDER ADULTS IN FINDING A ROOMMATE

by

Jia Guo

BFE, China Central Academy of Fine Arts, 2015

Thesis

Submitted in partial fulfillment

of the requirements for the degree

of Master of Fine Arts

in Collaborative Design.

Syracuse University

December 2019

Cultural Background

A preliminary review of the literature suggests that there is a big problem experienced by older adults who live in China. The current support model in China for an aging population is based on traditional filial piety culture which depends on a stable family structure (Fulin Zhou,1) . In recent years this structure has changed considerably due to modernization, mobility, and the impact of the one-child policy (Fulin Zhou,1) . Given this background, in some Chinese villages nearly one in three older adults elect to end their own lives due to loneliness, depression, and the strong desire to not be

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viewed as a burden to their offspring(Nathan VanderKlippe,1).

Older adults need both physical and mental care. What can't be denied in modern China is that more and more young people continue to leave their hometowns to pursue higher education and better jobs in larger cities. Often times these opportunities are far away from their parents. Therefore, the elderly desire to be less dependent on their adult children as they look to achieve a more meaningful retirement lifestyle. In other areas of the world, there are more community-based support models which provide elderly with more choices. Co-living is a progressive lifestyle could be a very good option for older adults in China.

Why is Co-living important?

The cost of living in a good nursing home or hiring a full-time nurse is unaffordable for most families. This presents a problem that can be solved through design. If they cannot pay for care services, why not let them live together and take care of each other? The co-living lifestyle allows people to share daily costs such as hiring a person to do the cleaning, cooking and driving. They also can share social activities such as dancing, yoga or other daily exercises. This progressive way of living is economical.

What are the obstacles?

The literature related to co-living was analyzed to understand why it is not popular globally, especially in China. The literature suggests several reasons. Firstly, Chinese elderly are not used to living with other people (cite). so co-living is an unfamiliar lifestyle. Secondly, they cannot benefit from the information and resources on the internet because of the habits they used to have. In the year of 1980s, almost no families in China have their own computer at home and seldom people know what a computer is. Up until 2000, people still don't know what even a cell phone could do except calling and texting. The older adults right now who are older than 55, missed their golden age to learning new things. As a result, they missed a huge amount of resources online. In addition, people know themselves better while the growth of their age and they are unwilling to make changes. It gives me a big challenge that we should consider more about the factor of personality matching.

In summary, older adults are a group of people who can not find an ideal roommate easily.

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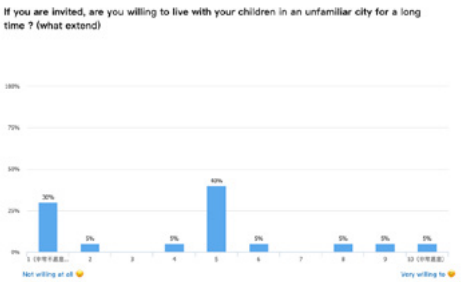
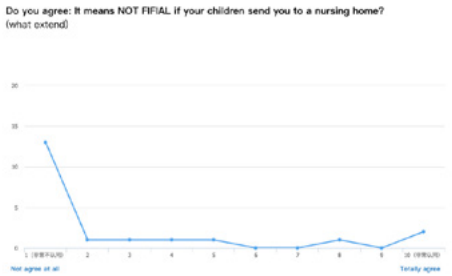
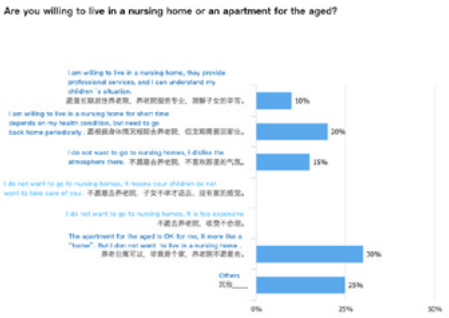
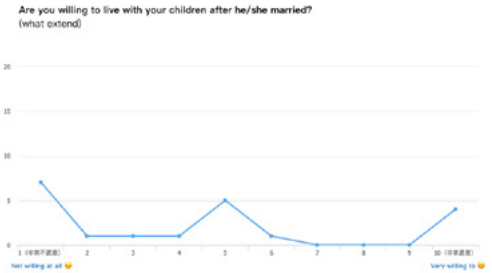
A questionnaire I did from China

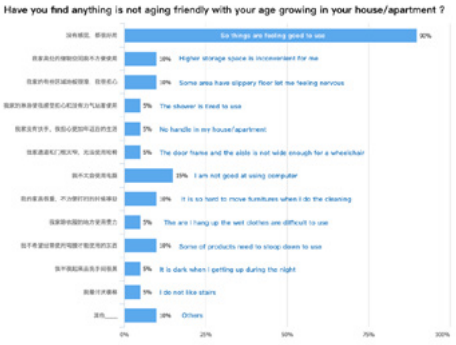
There are only 22 older adults participate in this questionnaire, but it is a good start for me to know how elderly think.

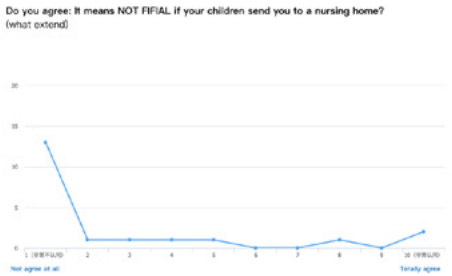












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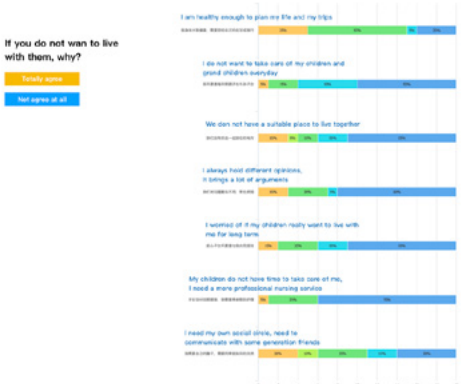
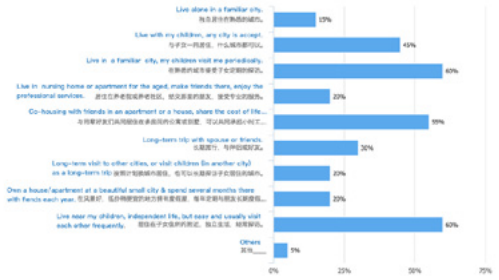
How do you communicate with your children ?

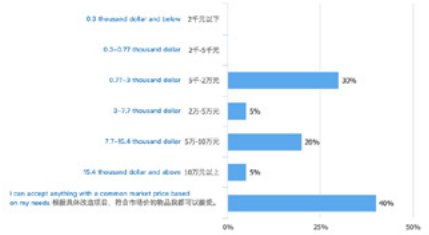
If you do not wan to live with them, why?



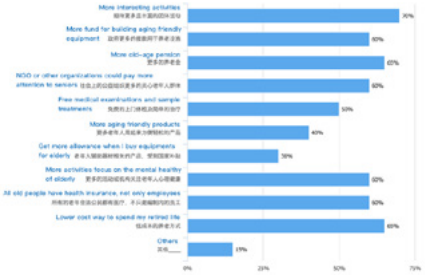
Which way below is your most expectant to spend your future life?



If you redesign and rebuild your own house/apartment to make it more aging friendly, how much money are you willing to pay? (RMB)



What expectations do you have to the pension industry?



What do you want to say to your children ?

We can good, do not worry about us.

Be nice to your parents

Work hard and have a good life!

Love you guys!

Hope my son have a healthy happy life and keep safe

Hope they have a happiness life

Be understanding, be helpful

I love you

Working happily, living happily

Healthy is the most important thing

Healthy is the most important thing

Independent is important

Growing healthily, try your best to be a better yourself, be responsible

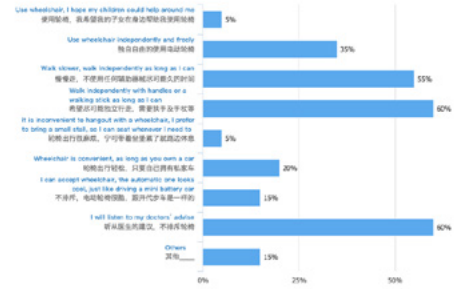
I will try me best to reduce the trouble I bring to my children, hope they have a happy life

Could give help when we really need it

Love your children, we parents will not be your trouble, we are helpers

I love you so much!

What kind of live do you want if you too old to walk well independently?



What comments do you have for Co-housing with your same generation friends?

I don not like it

Easy to create conflict when live together for long time

Closed friends will help each other, solve problems together, we need privacy space and also public space.

Consider about the health issues

Be happy together

I do not want to live together, I need independent life

Health issue

I can try

Never considered about it

Health condition

If people healthy, they can live together, take care of each other. Leave space for children's visiting, the left space can rent out, the rental money could support my daughter start-up a company

Share rights, responsibilities and costs

Easy to create conflict when live together for long time

After all, people need time to adapt to each other's personality
I do not want to live with friends.

Easy to create conflict when live together for long time

Literature Review & Content Analysis
— Cultural Background

A Statistical Study on the Family Structure of Our Country

Fulin Zhou, (2005)

This research of family structure is based upon 0.95‰ sample data of the 2000 National Demographic Census. Data analysis leads to some principal conclusions: the family structure of China has changed greatly from 1990 to 2000. It is a powerful proof of the serious issue of aging population which China is facing. It shows the family structure in China is changing, the flow of family members turned the entire family into separated families, which caused a mutation in the family structure.

As it shows by the article, population mobility is the main reason for the change of family structure in China. Since the implementation of the policy of reform and opening up in 1979, China has begun to enter into a rapid process of social transformation and urbanization. As a result, the mobility of migrants has been increasing and the floating population has reached an unprecedented scale.

If the whole family out of flow household is deducted, left-behind families and migrant families are actually two parts formed by the entire family. Dividing an entire family into two parts is bound to have an impact on the family structure. In the case of a nuclear family with one child, when their children go out to become migrants, the families left behind by their parents become a couple household, and if their children live alone, they will be one person household. Migration strongly influences and alters the family structure in areas where population is flowing out and where people are migrating.

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These research and data make my thesis topic sense, and support my assumption about that greater group of elderly need support and accompany than earlier years.

Left Behind - And Taking Their Lives

The state kept their families small. The economy has pushed their children to faraway cities. Struggling with solitude and stress, China's rural elderly are killing themselves at an alarming rate.

Nathan VanderKlippe, (2016)

This is journal article published in The Globe and Mail which is a popular magazine in Canada. It reported a serious mental issue of elders who live in China, and showed us many unbelievable data about it.

As they mentioned in the article, “Young people have abandoned ancestral villages, leaving their parents in the countryside a generation now struggling with solitude even as its health deteriorates and its economic circumstances languish. The problems they face have manifested themselves in widespread incidents of suicide.”

“In parts of rural China today, elderly people are killing themselves at rates exceeding those in South Korea, which has among the highest suicide rates on Earth. In some Chinese villages, nearly one in three older people end their own lives. But unlike the situation elsewhere, Chinese suicide is often not rooted in mental illness or substance abuse, but in negative life events - a fight with a child, the death of a spouse or chronic stress such as that stemming from illness, long-term financial problems, or isolation from families.”

The article talked a lot about loneliness, isolated and afraid from elderly who live in rural or small city in China. What can’t be denied in modern China is that more and more young people continue to leave their hometowns to pursue higher education and better jobs in larger cities. That is why I

was change my direction from how could we let children live with their older parents to how older adults can co-housing together and have a happier life.

Access and Prospects of Social Work in China 's Retirement Community

Jie Wei, (2014)

This is a master's thesis from Graduate School of Chinese Academy of Social Sciences.
this paper not only gives me many specific data about the aging population, but also talked a lot about how social work provide services to retirement communities in China.
At first, they said, China is in many developing countries earlier aging society of the country. According to projections, in 2001 to 202, rapidly aging stage in China every year, the growth rate of up to 3.28% increase in the elderly population as many as 6 million, is expected as of 2020, China's aging level will reach 17.17%, elderly population will soar to 2.48 billion respectively.

Then, they talked about how the pension community social work intervention can improve the level and quality of pension, can advance to some extent in terms of development and improvement of the country's aging system of social security services.

After that, they analyzed the data from Taiwan's Chang Gung Health and Culture Village as an important sample to find how could social work provide a better service for older adults who live in a retirement community.

This thesis article introduced the pension model in different counties in the world and also compared many types of pension models in China such as institution pension, home

care, community care, rural pension and so on.

I got lots of helpful information form the details in the article. For example, they mentioned only 25.3% elderly and 6% caregiver(adult children) think pay for the services from social workers is unreasonable. And, they have higher quality requirement for the health care service, but easy to feel satisfied for the daily care. They feel the equipments for elderly to keep healthy in the community is not that aging friendly, especially for very old seniors.

There is so much research that could help me to better understand how older adults in China think. As a result, I can provide a better solution to make them feel more satisfied.

In China, a Move to Tiny Living Space

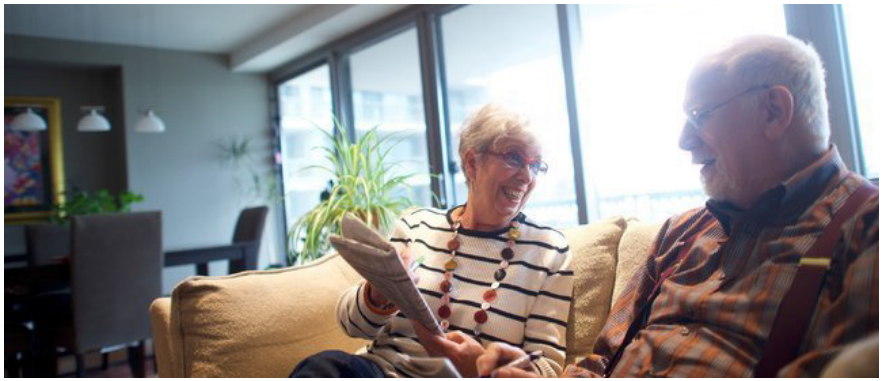
Orlik, Tom; Fung, Esther, Wall Street Journal , Eastern edition; New York, N.Y., (2012)

【table1】

This is an article about a new type of apartment in China from The Wall Street Journal. The information from the article serves as a very important resource and is strongly related to my master's thesis. It shows that how tiny the average living space people have in China, and how expensive the housing is in urban China. According to this article, " Some 50 million of China's 230 million urban households live in substandard quarters often lacking their own toilet and kitchen, research firm Dragonomics estimates. The firm figures China will need to build 10 million apartments a year until 2030."
Due to the limited average living space, building a brand new house as an approach to sustainable living after retirement is unaffordable to most senior citizens in China. They are forced to choose a co-housing lifestyle based on a variety of pension models.

More Older Couples Are ‘Shacking Up’

Paula Span (New York Times), (2017)



This is a article from New York Times, which is pretty new from this year. There is a new lifestyle for older adults becomes more and more popular in New York City. It called “Shacking Up”, which means that, to avoid all sorts of troubles, such as objections from their children, they choose to cohabit together without marriage. They live together with greater degrees of freedom and getting less pressures, both financially and healthily.

The number of cohabiters over age 50 rose to 4 million from 2.3 million over the decade, Ms. Stepler found, and the number over age 65 doubled to about 900,000. From the opinion on the article, “The whole idea of marriage as the ideal starts to fade, and personal happiness becomes more important.”

This is a phenomenon in US, but it shows the same problem as it in China. Seniors have the demands of cohabit, and they can share all the daily cost and take care of each other. Accompany is good and important for every senior to keep health in physical and mental way.

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Fact Sheet: Co-housing for Older Adults

Keith Wardrip, AARP Public Policy Institute , (2010)

Table 1
Top Five States in Completed Cohousing Communities

State	Communities
California	27
Washington	13
Colorado	12
Massachusetts	12
North Carolina	7

Source: Cohousing Association of the United States, Annual Cohousing Census 2008 Results.

【table2】

Table 2
Senior Cohousing Developments in the United States

Name	Location	Households	Completion
ElderSpirit Community	Abingdon, VA	29	2006
Glacier Circle	Davis, CA	8	2005
Silver Sage Village	Boulder, CO	16	2007

Source: www.eldercohousing.org.

【table3】

This is an article really focus on Co-housing lifestyle itself. which helped me a lot to define what co-housing is, how popular it is in US even in the world and how it benefits senior citizens.

As the author said, “Though relatively new on the residential landscape, co-housing is emerging as an appealing living arrangement for aging adults. Both the physical design and the practice of caring for neighbors as they age make this form of ‘collaborative housing’ appropriate for some adults who wish to age in place among friends and neighbors. Co-housing is a form of residential development designed to emphasize community interaction while still retaining and respecting individual privacy. The close-knit nature of many co-housing communities affords older adults the freedom to live independently among friends who believe in active ‘neighboring’ and who look out for one another. Because of these and other features described below, senior co-housing communities can forestall or prevent a move to an assisted living facility and allow residents to age in place as their needs change. ”

From my questionnaire, I find many seniors worried about their privacy will be violated by co-housing with others especially with someone they never know them before.
In this article, author gives some method to avoid this kind of issues, such as resident should be involved in the planning process. Although co-housing community has a lot advantages, still not everyone can afford the it especial in

China where has super high housing price. Not like the author talked about (build a new co-housing community), my thesis is more focused on letting seniors use their own apartment or house as a co-housing space and find more potential partners to live together. This article also mentions the high cost issue, therefore, to some extent it support my thesis idea.

Match Maker's Market Draws Desperate Parents

Wenting Zhou (China Daily), (2016)

"People's Park in Shanghai is the setting for an extraordinary marriage bureau, as elderly parents attempt to find partners for their unattached 30-something children. As the temperature soared higher than 36 C on a Saturday afternoon, more than 500 middle-aged people and seniors packed into a corner of People's Park in Shanghai. They carried umbrellas, folding chairs, soda water and mosquito
repellent. While the scene appeared no different to any other bustling market in China, the "commodities" were anything but ordinary. The items on offer were unmarried people, most of them older than 30, and therefore far above the optimum marriageable age, according to Chinese standards."

"The seniors and middle-aged parents were there to find spouses for their unattached children. They appraised each other with sidelong glances, attempting to hide their heavy hearts and appear uncompromising, while trying to prevent their offspring from being lonely when the next Chinese Valentine's Day rolls around." ZHOU Wen-ting reported.

As we can see in this phenomenon, it is an example of a low-tech system that is currently in operation yet, it works in a very direct way. From this example, we learn that older adults are more dependent on low-tech ways to socialize. I also considered how to design a toy or equipment which is aging

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friendly and uncomplicated to operate in order to help seniors find a co-housing partner. As a result, It's a strong connection between my thesis direction and the system they create.

A woman holds a sheet of paper carrying information about her daughter at the park.
[Photo by Wang Yadong/ China Daily]

A woman looks for a suitable candidate for her unatta-ched child at a matchmaking activity in Dongguan, Guangdong province.
[Photo by An Dong/China Daily]

Analyze existing products & services

Tinder, Silvernest, Airbnb, Speed dating, Roommate wanted paper, Craigslist and match.com

	free	attractive experience	safe	rely on computer	easy to engage	about house renting	match habits /personalities
tinder	✓	●●●●●	●	●	●●●●	●	●●●
silvernest	✗	●	●●●	●●●	●●●	●●●●●	●●
airbnb	✓	●●	●●●●	●●	●●●	●●●	●
SPEED DATING	✗	●●●●	●●	●	●●●●	●	●●●●
roommate wanted paper	✓	●	●	●	●●●●●	●●●●●	●
craigslist	✓	●	●●●	●●●●	●	●●●	●
match	✗	●●●●	●●●●	●●●●	●●●	●	●●●●●

【table4】

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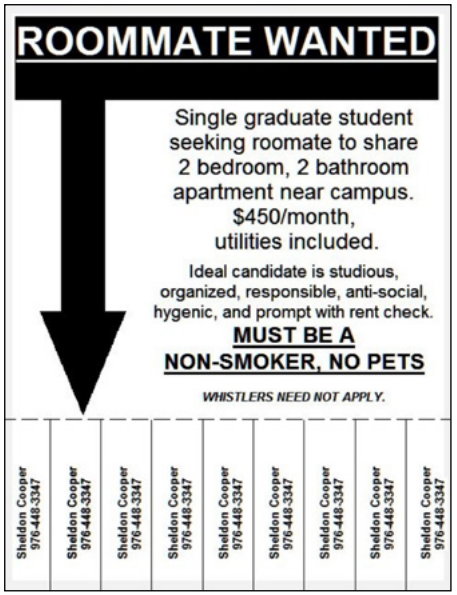


Roommate Wanted Paper

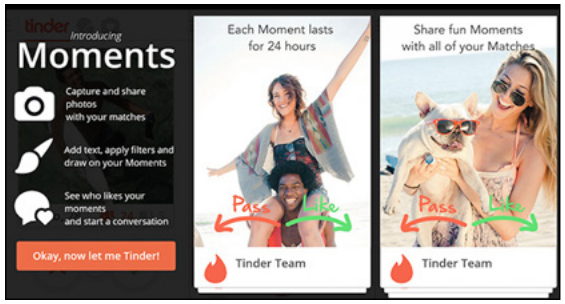
(low techonology)

Speed Dating

(Information limitaion)

Craigslist

(hard to use)

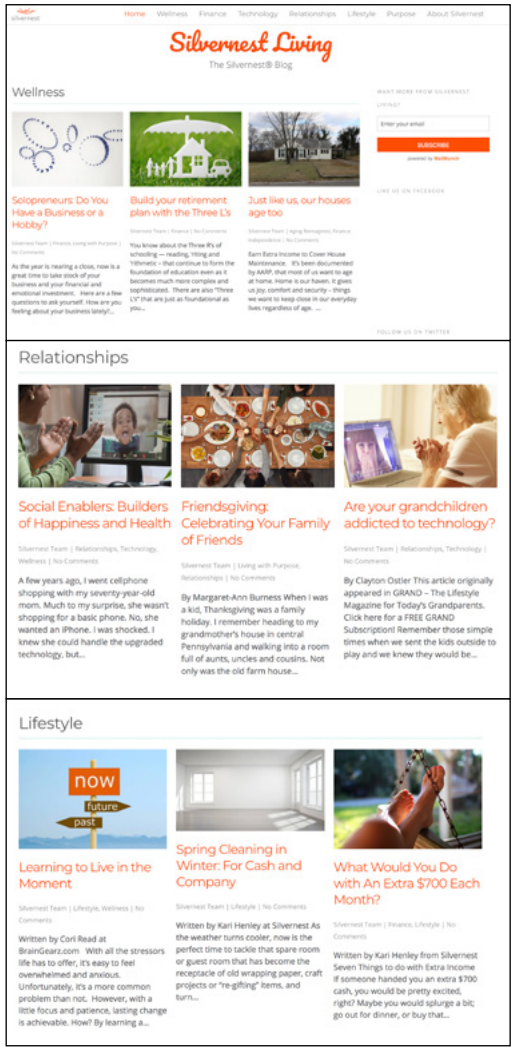


Tinder

(attractive & esay user experience)

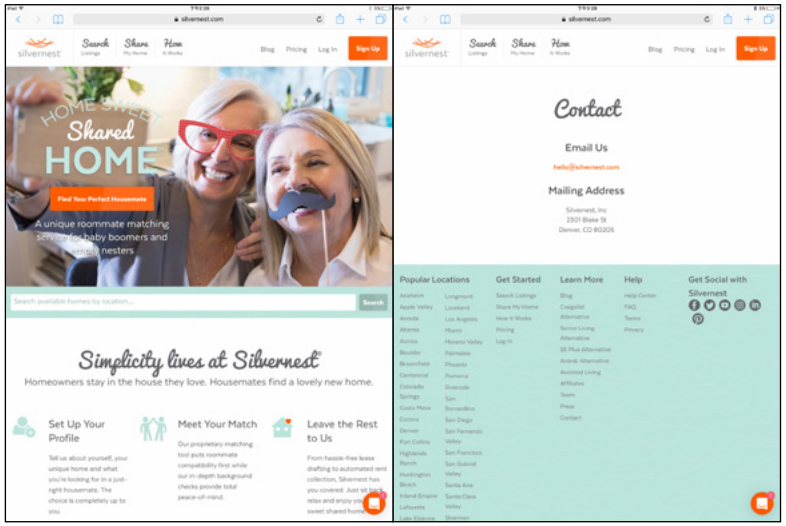
Matching.com

(personality matching)



Silvernest

(service for seniors)

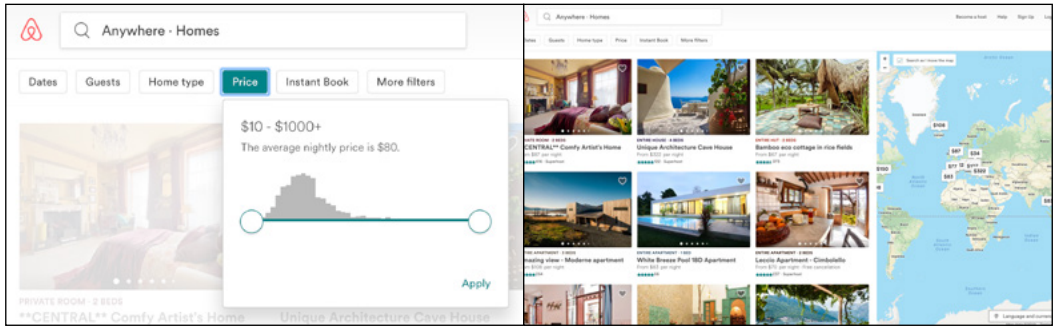


Silvernest

(service for seniors)

Air bnb

(expensive)



I researched some existing room finding or matching systems and products. The cases I selected are Tinder, Silvernest, Airbnb, Speed dating, Roommate-wanted paper, Craigslist and match.com. They are all associated with the topic of my thesis, however, each has its limitations.

I considered these cases in seven different aspects which are “Does it have a free version ?”, “How attractive the user experience is? ”, “Does it safe enough to protect user’s privacy?”, “How it relies on computer/smart device”, “How easy to engage into the service?”, “Does it give information about house renting?”, “Does the product considered about personality matching?”. These questions are based on the research I did, which let me know older adults better and got the needs of them.

After analysis, I found that Tinder actually gives the most attractive user experience and it is pretty easy to use as a free APP. But it is not safe at all since they never need your

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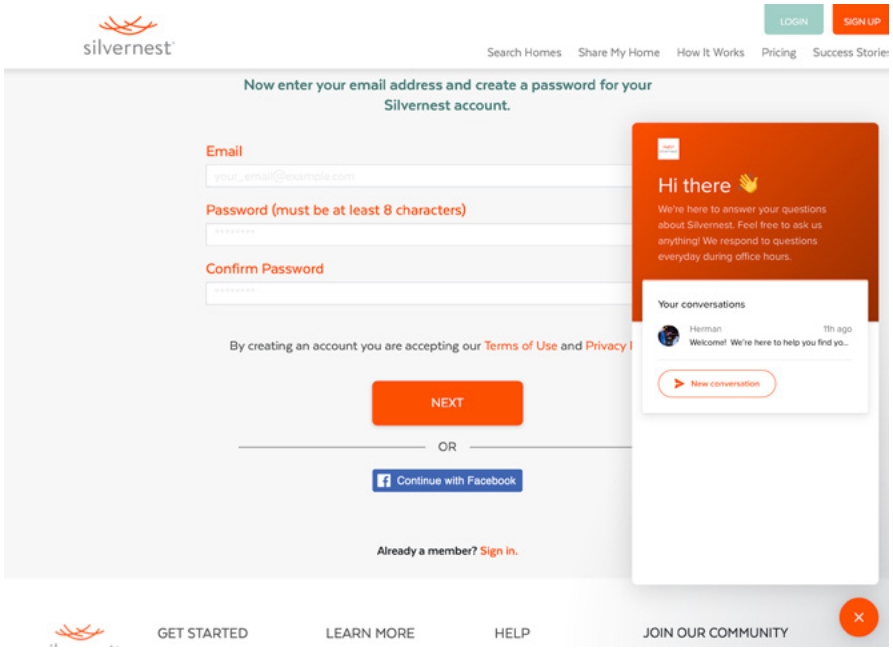
real information for the registration. Besides, it is not that focus on matching people’s personalities but more depends on the photos, which make sense as a relationship matching application.

I select four products related to house renting service which is Silvernest, Airbnb and roommate wanted paper and craigslist. All of them perform poorly in attractive user experience, although Silvernest, Airbnb and Roommate-wanted paper is kind of easy to understand for users. It is shocking to see Craigslist is totally a negative example of user experience as such a popular website in the United States. Young people even

cannot find a certain information easily on a website with messy logic and all visually same graphic design.

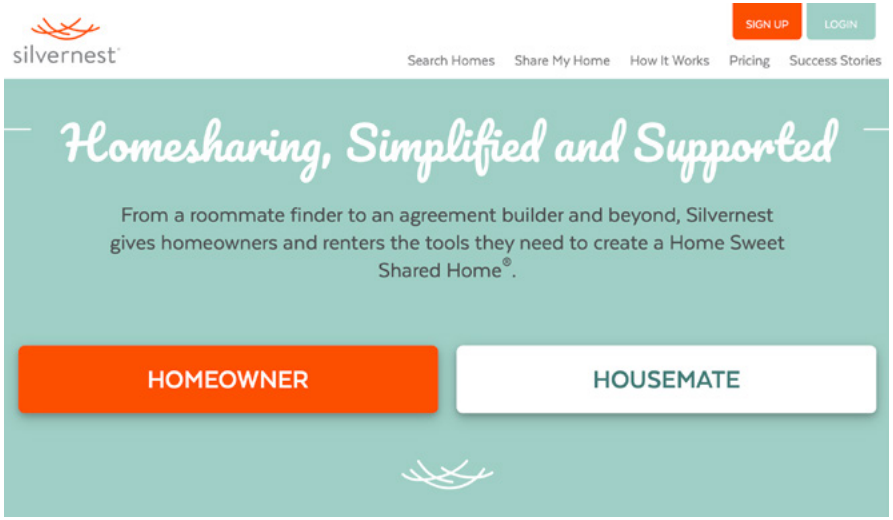
Interestingly, I find match.com as a successful couple matching website actually really focus on personality matching and they do ask lots of daily habits which is so significant for living together.

Silvernest, as a house/apartment renting website, is the one most close to what I want to do for my thesis project. They not only focus on renting system but also specifically choose older adults as their main user group. As an extension project, they also have lots of other services and products about Health, insurance and financing for elderly. It is a mature product which is already on market, which is a good guide for me to develop my own design ideas.



As we can see in these pictures, the user experience design of Silvernest is good for a normal user (the color and the layout). But the biggest problem is that older adults are not a group of people who is good at using smart devices. So that the website still needs something extra supported to make the user experience more friendly for there end-user.

In Silvernest, the "match" concept was mentioned. It shows that people know that finding a roommate needs to match people's situation for a more satisfying result.



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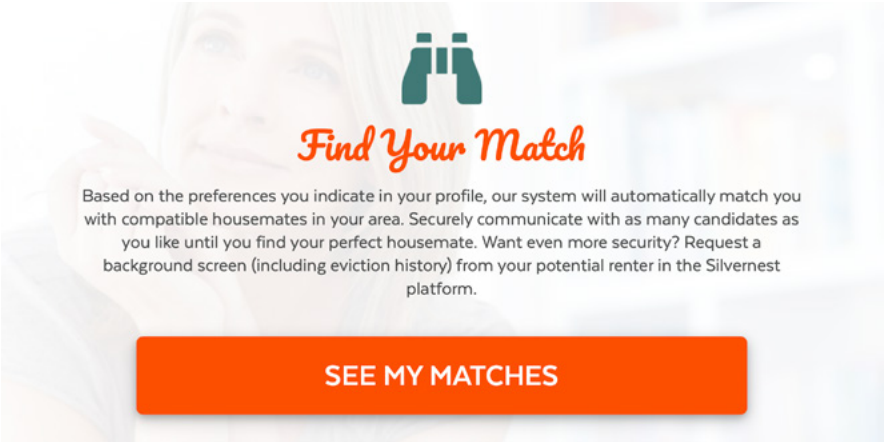


All of these services above is not simple enough for everyone. In Addition, I found that the user experience always unattractive when it doesn't rely on digital devices.

Finding the Gap

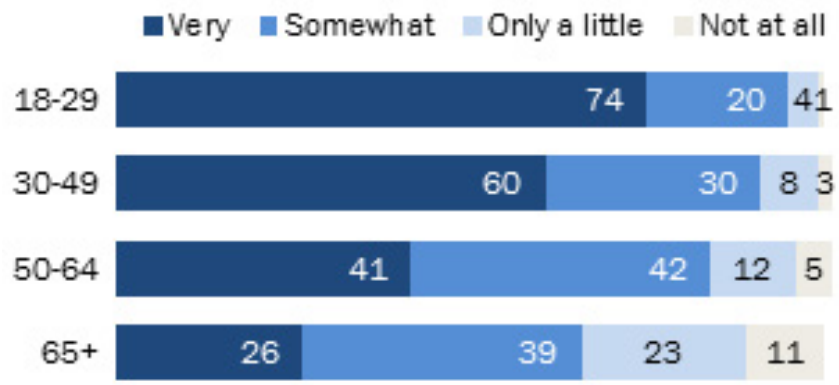
After a lot of analysis, research, and brainstorming, I learned that the gap is how to help older adults to access websites such as silvernest and benefit with their large database of potential roommates. The problem is how to let the elderly feel comfortable to interact with computers. It should be something as a connector between older users and computers to make the user experience easier to access and more comfortable for everyone. That is what I plan to do for my thesis project.

Matching roommate is a significant part of Silvernest. If we can find a better method to help older adults to match a roommate, the whole user experience is going to improve a lot.

Therefore, the concept of TUI (Tangible User Interface) jumps out of my mind. I researched several existing TUI designs to learn from them - to understand what they are, what they can be and how they work. Hopefully, it could help the GUI (Graphic User Interface) becomes more understandable.

Seniors are less confident when using electronic devices

% of U.S. internet users who say they feel ____ confident when using computers, smartphones or other electronics to do the things they need to do online, by age



Source: Survey conducted Oct. 13- Nov. 15, 2015.
"Tech Adoption Climbs Among Older Adults"

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【table5】

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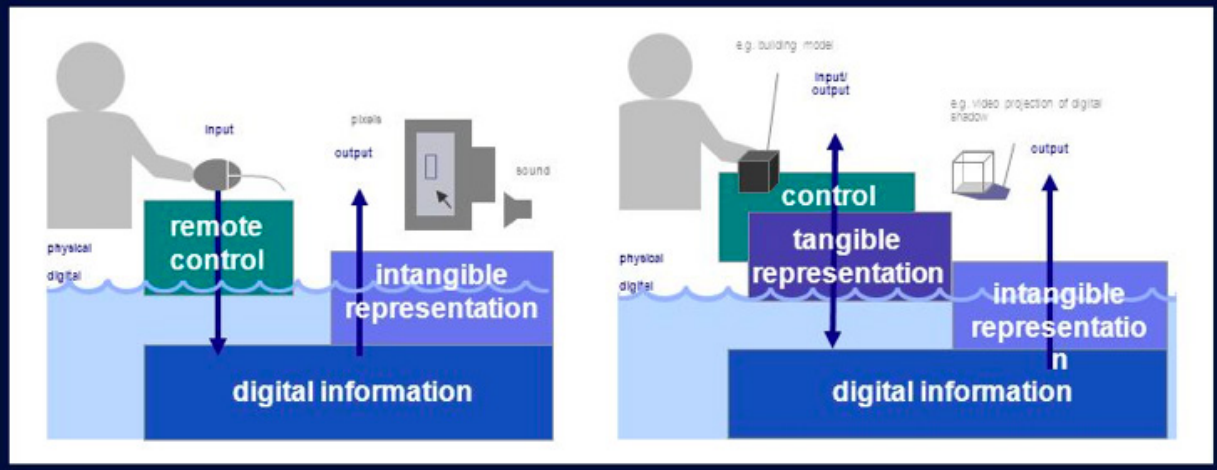
Models of GUI and TUI



GUI

TUI

Computational coupling of tangible representations to underlying digital information and computation

Literature Review & Content Analysis

—TUI

Towards Rapid Technology Probes For Senior People

Florian Güldenpfennig and Geraldine Fitzpatrick, (2013)

In this paper, they talked about that In HCI(human-computer interaction), there is much interest in exploring novel technology-mediated communication that can empower older users who don't have easy access to regular computers.

"A simple example of tangible UI is the computer mouse: Dragging the mouse over a flat surface moves a pointer on the screen accordingly. There is a very clear relationship about the behaviors shown by a system with the movements of a mouse. " They explained the concept of TUI as such a simple thing in the paper.

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In this paper, they utilize the potential of smartphones and tablet computers to create a series of technology probes that we deploy long-term making use of close family members. By this means participants can gain experiences with robust and fully implemented devices at a very early stage of design. They lay out four prototypes of communication technologies with different forms and functions for older adults. And they describe the features of these devices including some indicative feedback from their informal deployment study. "We thereby suggest that mobile phones are a suitable means for the rapid prototyping of communication technologies for senior people and can possibly provide useful input to later participatory or co-design activities."

"The implementation of a TUI helped make this product more accessible to elderly users of the product. The 'friend' passes can also be used to activate different interactions with the product."

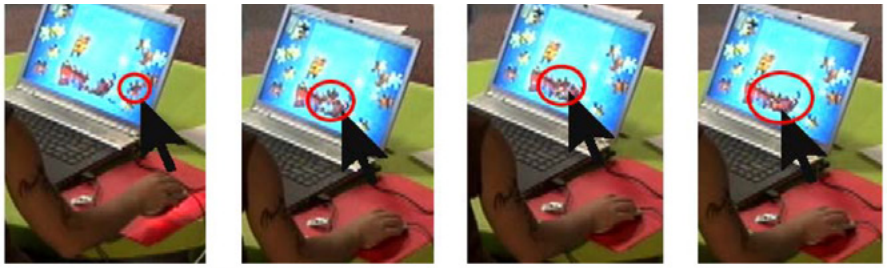


Figure 1. Direct placement using a mouse as input to a graphical user interface.

Figure 2. Direct placement of a tangible object on a digital tabletop.

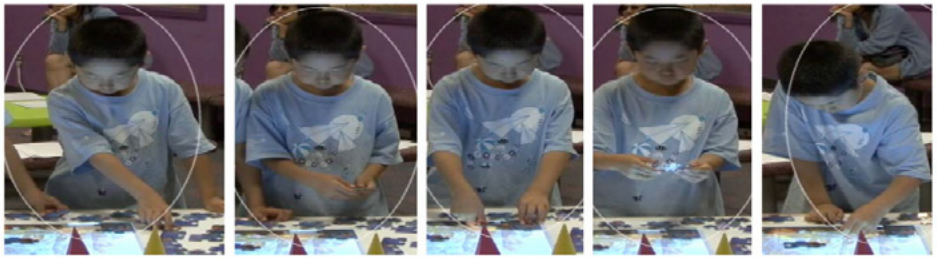
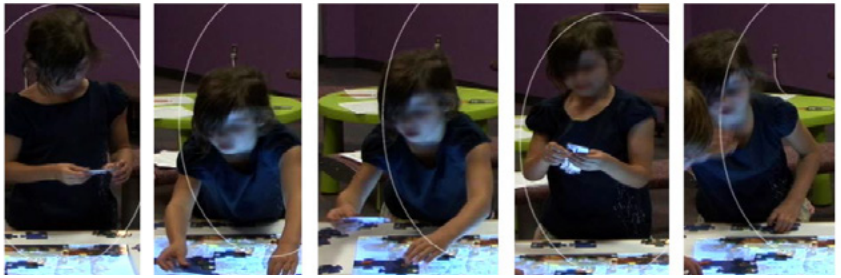


Figure 3. Indirect placement of a tangible object on a digital tabletop.




Alice
60 years

Methodology for Design

From these academic papers, we got the information that TUI (tangible-used interface) is effective for problem-solving (from children to elderly). Currently, there are no TUI-based systems for finding a roommate on the market. My thesis project is important for that group of people who are not proficient at using computers or other smart devices because it fills the gap. So I started my design process with a lot of brainstorming and quick sketches, and I learned that the target of my design creates a way to collecting data from people by a tactile product to instead of the traditional GUI interface in computers.

Base on my analyze, I decided to start with an existing product which is similar to my idea. Silver-nest, a mature website focuses on a house renting for the elderly, is the best choice for me to develop my design as an existing connector between users and the real database. As a designer, I will be more focus on the TUI design part as a big challenge for my thesis. In the design process, I considered Don Norman's Principles of Interaction Design as a guide for my design which is feedback, visibility, Constraints, Mapping, Consistency, Affordance.

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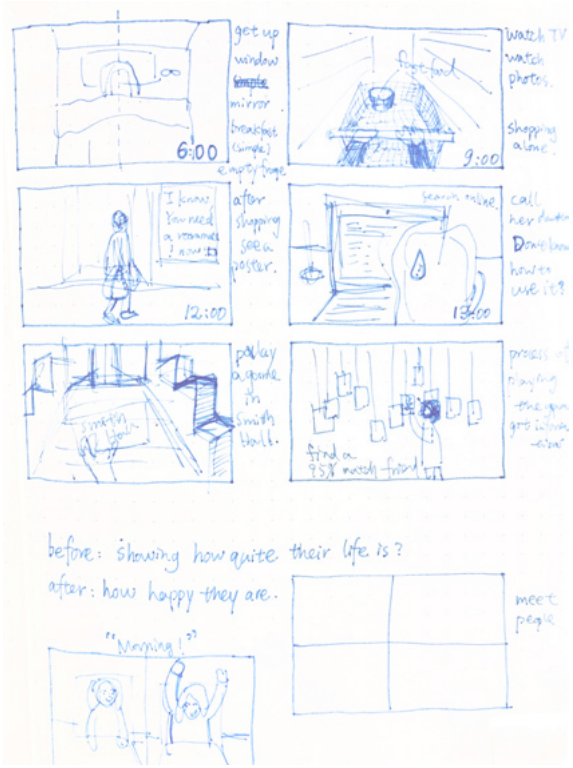
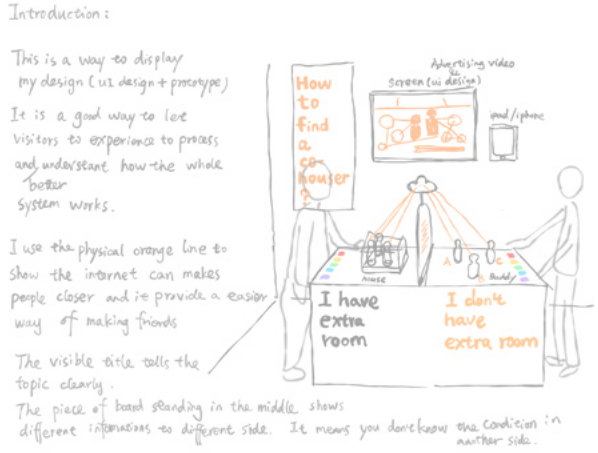
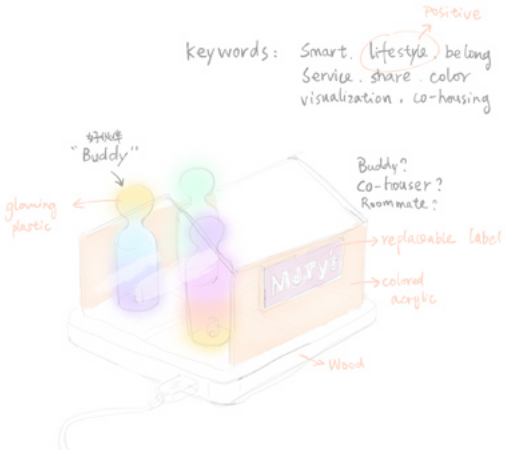
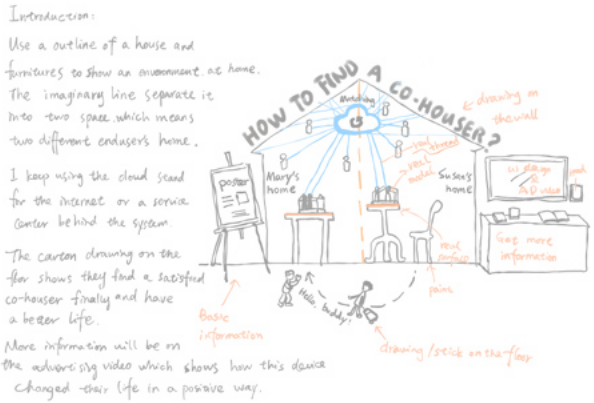
How did I start?

At the beginning, I did lots of sketches to find a way for data collecting. During that period, the only target was making the information visually as simple as possible. So that I did some research about the information visualization and benchmark of existing hands-on games for more inspirations. I was trying hard find different materials for my mock-up stage in order to see how many possibilities there were and what could happen with various trials. I was surprised to find that this physical way (mock-up) of problem solving truly helped me a lot. It could be seen as a good example to support my idea of using physical games as a connector between users and computers for people to find a roommate.





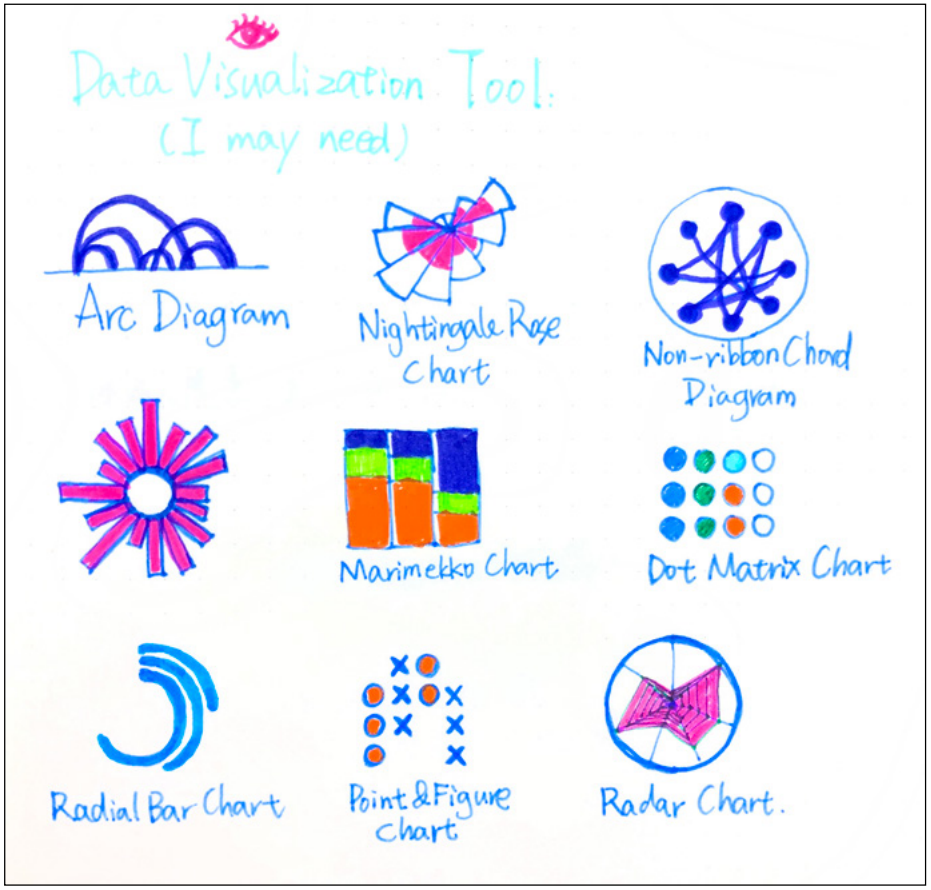


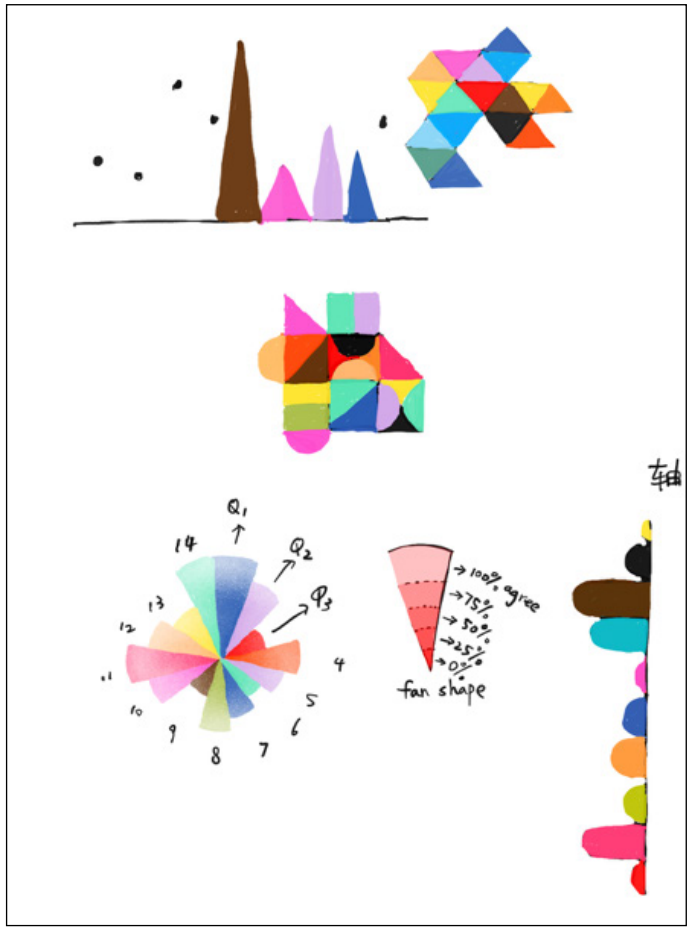


Data visualization Tool

use geometric partterns/
elements

research from internet





what I designed

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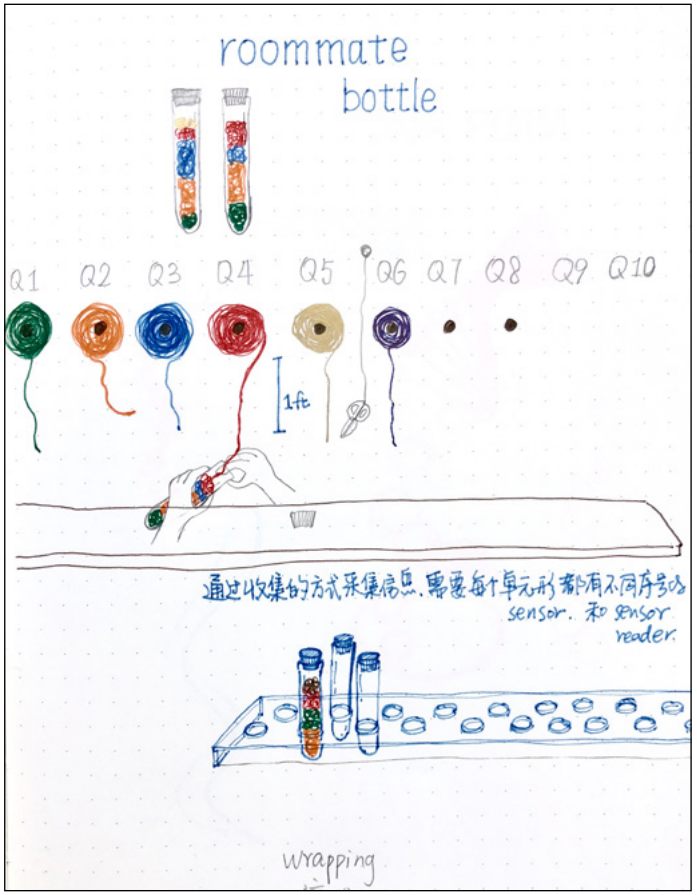
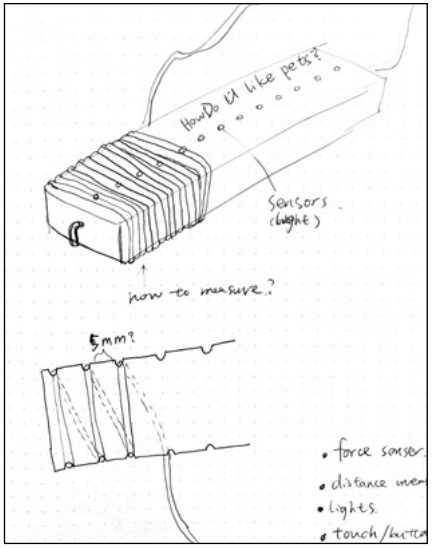


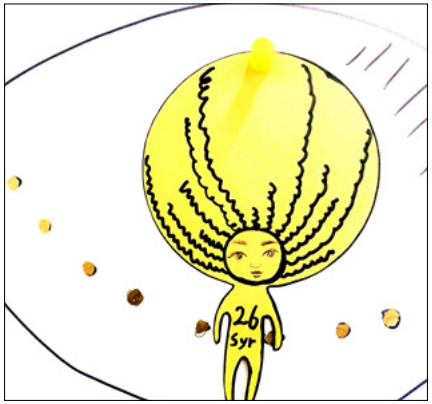
Roommate bottel (yarn version)

use yarn measure how much you agree with those questions I prepared about personality matching

use yarn measure how much you agree with those questions that I prepared about personality matching



Use the doll's hair or face area to show the data collected data collected by turning the doll's body to touch those metal spots




requirments:
Answering Questions by selecting degre
existing method:
A B C D E
1 2 3 4 5
Rader
A
B
C
D


people
home /house
Love/friendship
MATE
MATCH
DNA FORM
Welcome
A
B
L. people
now

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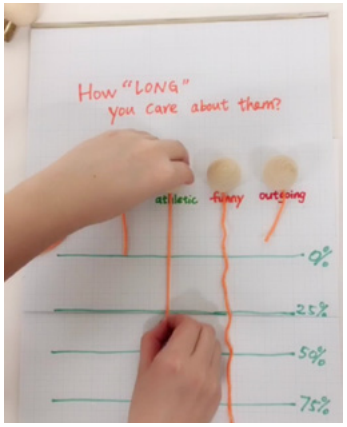
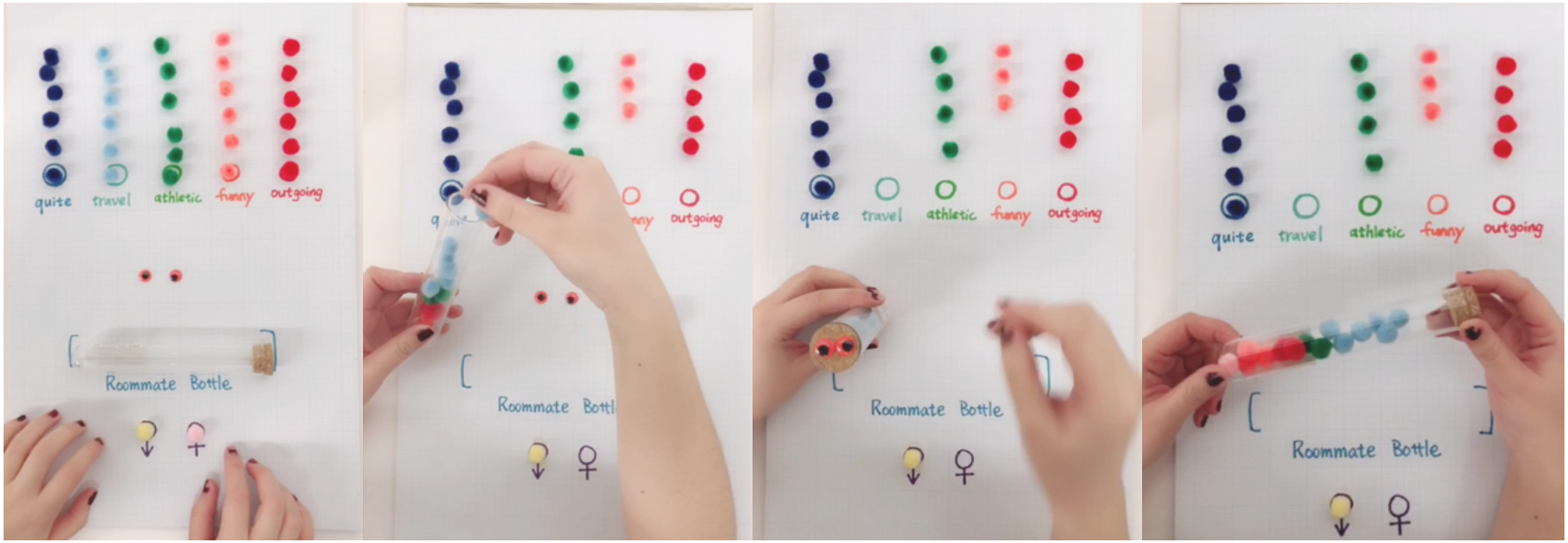
Mock-up Videos

Several playful mock-ups made by me received a lot of positive feedbacks from my classmates, teachers, and my friends through their testing process. At a presentation to our committee members, I received a very useful feedback from one of them. He mentioned the idea that using the movement which older adults already got used to do, such as picking up little balls from one box to another, or grabbing something on the table and putting it on somewhere else might be a better way to extend the project . When one of my mock-up videos showed up, he suggested that the "roommate bottle" one makes more sense for him since the movement of picking up little balls with different colors is quite similar with putting different pills into a pillbox in a correct order. So that we could possibly assume that this physical movement will not be too difficult for them.



Roommate bottel (balls version)

Use balls measure how much you agree with those questions that I prepared for personality matching



Design outcome

My first design outcome is a hands-on interface which could match people's personality and assist users to find an ideal housemate(co-living partner). This product help users to gather their personality information and connect them to a larger database. The users do not need to operate the computer by themselves or provide information in a traditional way such as filling forms. The tangible user interface gives our users the feeling that they are just playing a physical game. The information collected will be shared with a database that belongs to an existing mature website. The matching results will be sent to our users.

In my first version of design, I chose to use the movement of "arrange flowers" as an inspiration. The movement could also be considered as any other motion of "plugin" since it gives users a feeling of "collecting", which older adults were used to do. 30 questions collected from SILVERNEST and MATCH.COM were offered to older adults. (which are good examples of house renting and matchmaking website in US).

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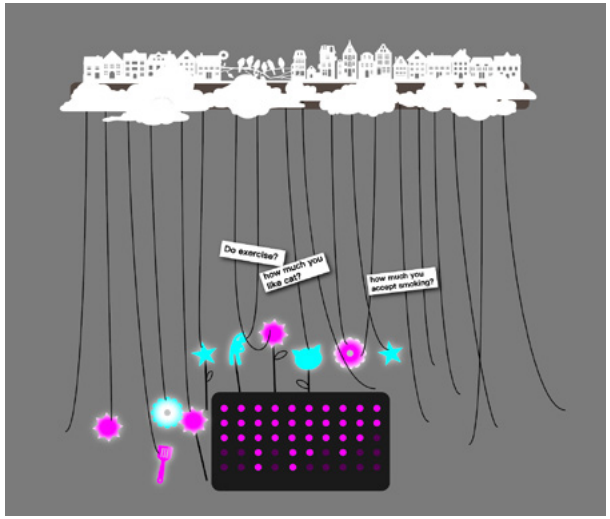
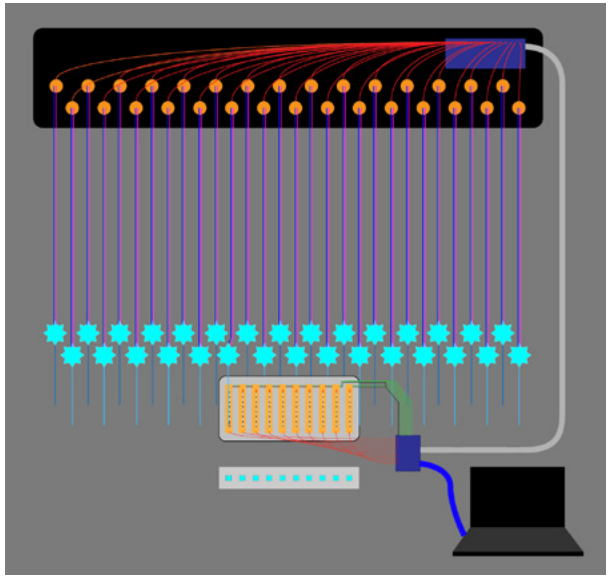
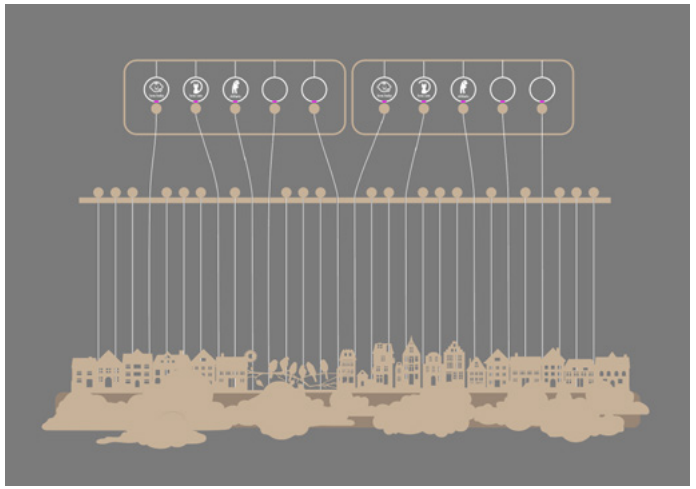


First version

fllowers made by EL panels.



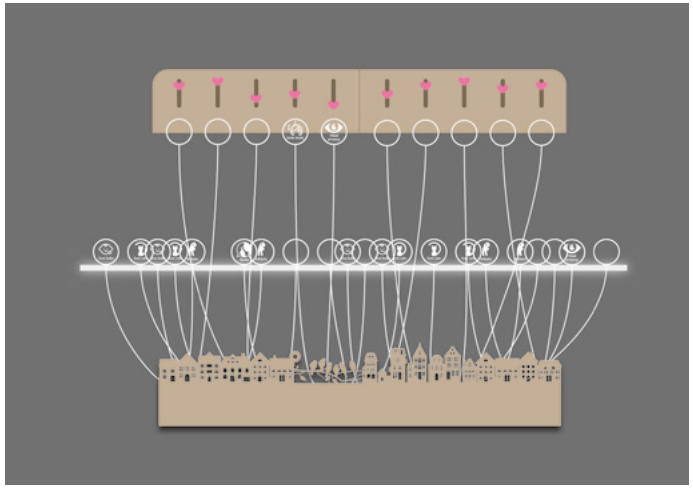
the circuit structure/logic of the first version



Balls version

wooden balls with texture on the surface and magnets inside

People will be guided to select top 10 "flowers" which they care the most and plug them into a glowing "vase" one by one. The "vase" has 10 slots which are prepared for those "flowers". Those flowers are planned to be made in EL PANEL which is a cuttable material for any shape and glowing in different colors. The Arduino MEGA board which is connected on the top can recognize and record which question you selected and write the number into the system. After that, users need to decide how deep they plug each flower in each slot base on to what extent they agree with the topics (how they care). There are 10 slide pots in the system, and they can read the percentage of



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how far you pushed each one. The data will be recorded by Arduino / Processing (software) and automatically create a Nightingale Rose Chart for users. Also, The computer is going to put your own information into the current large database and match you with one or more people who are most similar to you.

A stick with a glowing flower is the connector between users and the product. But after the testing experience, here are some feedback from my teachers and friends:
1, the weight of the flowers is too light
2, the most important information is separated from the flower itself
Through these feedback, we found that this design scheme is not aging-friendly enough. After the analysis, we discovered that a heavier material with some textures on surface could help people to think better.

What's more, the feedback shows that the current layout does not feasible enough because people always like to put the things they care the most in a higher position instead of a lower position. Combining the result and more researches, the project jumped to the next version, which were developed based on real feedback.

The next version of my design is more focusing on the user experience. In this version of design, I got the inspiration from how people playing magnets. I avoided simply using buttons for answering questions because I don't want to force my users to do a "Yes or No" question. And I hope to create a better thinking experience and make my design more user-friendly. I chose to use acrylic with engraved patterns on it and combine the stainless steel sheet for a suitable weight and the better appearance at the same time. The 10 slide pots are still in my design because it gives users more options to choose when they face the questions.

Based on the feedback that the messy wires could be a

problem, I reduced the number of wires and hided most of them into a plywood box. I created a colorful glowing background and laser cut the outline of houses and birds with a big tree which symbolizing an expected retirement life.

My design is assumed to be managed by a company that owns a safe and large database about house sharing (eg: Silvernest). My end user could be anyone who is interested in this product. This tactile interface could be considered as a Plan B for finding a roommate without the experience of using computers (or other smart devices). From feedback of my friends and my own experience, I find that the tangible interface is much easier to access.

The whole using process :

1, Sign-up and provide your basic information to the service people in the office (who manage the product).

2, Choose your top 10 feature-signs based on the type of your ideal roommate.

3, Place all 10 signs to the very top level and then use the sliders to weight the importance of each.

4, We will then match the ideal roommate for you from our current database.

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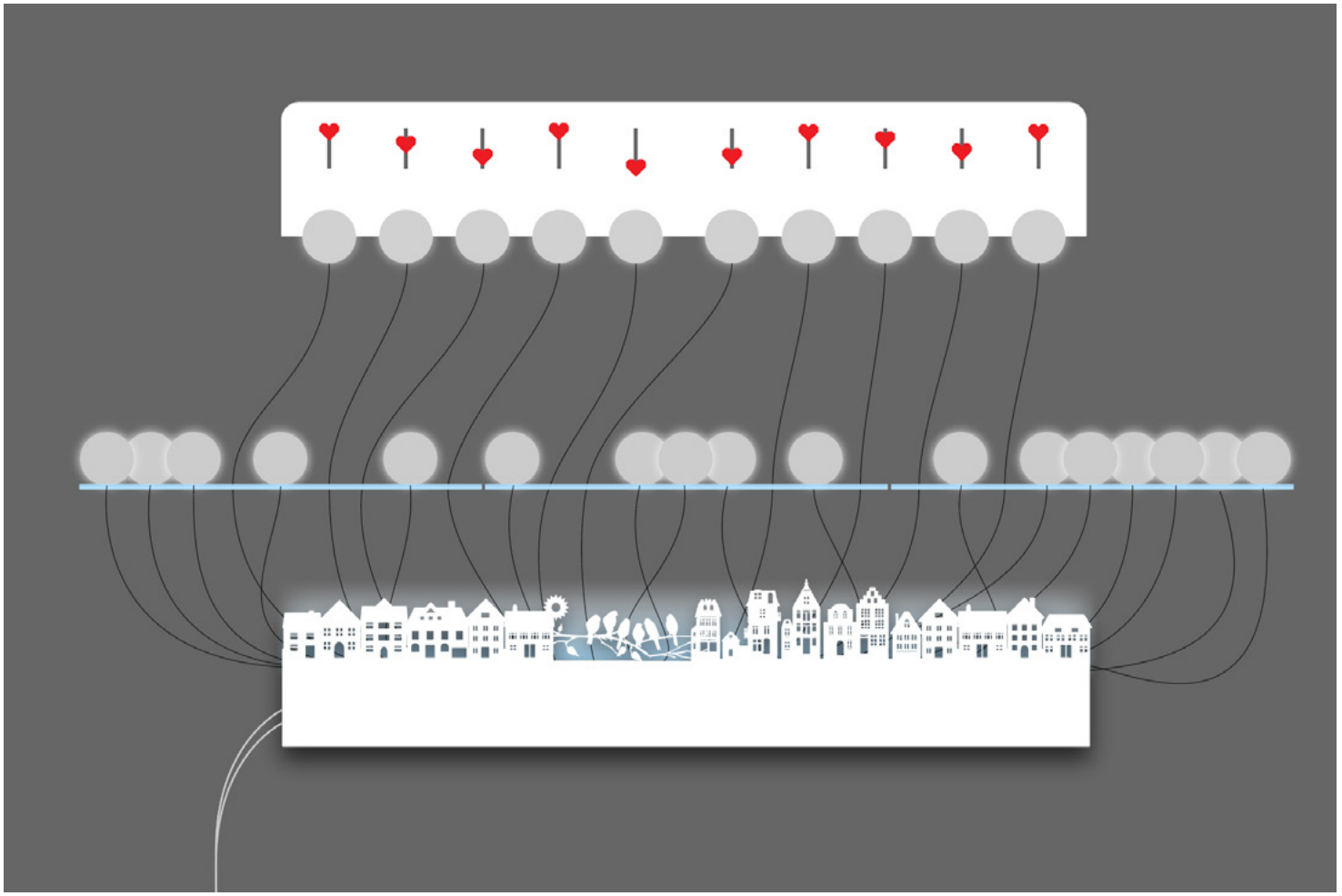
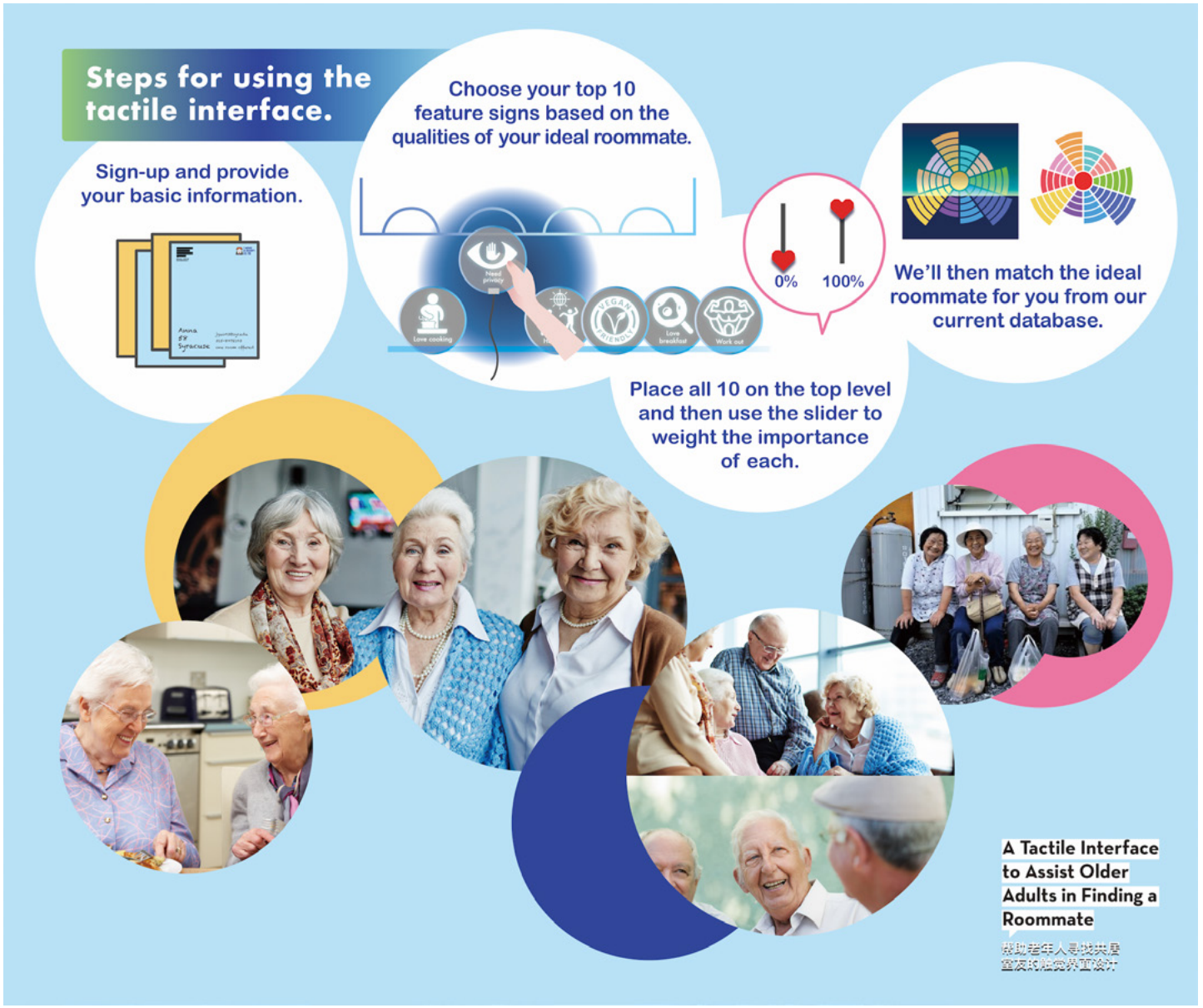


Developed version（2018.05）

A three levels wooden model with 27 pieces

which made by acrylic and stainless steel sheets



Poster in the gallery

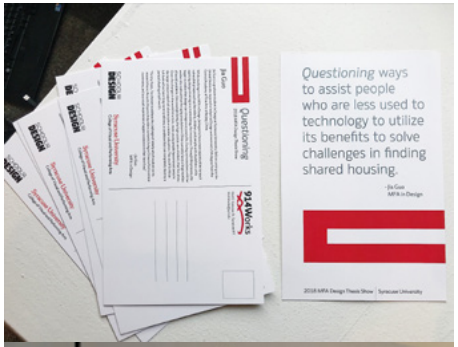
Poster shows visitors the way of using the tactile interface visually.

40

Model in the gallery

Visitors were testing my design under my guide and they all gave positive feedbacks.

(the Social Desirability Bias should be considered here)



Conclusion

Instead of traditional ways of searching house-renting information online, as a new concept, my thesis project is a tactile interface that is designed for everyone, especially seniors to find an ideal co-living roommate by matching their personalities. The design result creates a positive and comfortable experience that face the elderly user group.

Through my thesis project, I learned that a high-quality teamwork is very significant to a design project because it needs a variety of cross-field knowledge. Interdisciplinary collaboration is an important and efficient method for solving problems. By the stage of mocking-up, I found that I need to collaborate with someone who is majoring in interaction design and another one who knows electronic technology well. Fortunately, two of my Chinese friends (Xiang Gao and Xinyan Wang) who live in the US became the team members of my thesis project. Xinyan is a graduate student who is studying interaction design at Pratt Art Institution and Xiang is a graduate student who majoring in EE at Lehigh University. We worked together for around 5 days, and I learned a lot of programming languages and the logic of codes writing.

Through the communication, we solved many technical problems and made a great effort to achieve the functions. This was my totally first time to come into contact with coding, programming, and even programming softwares, like Arduino and Processing. I learned how to use programming logic to solve problems from this experience. Furthermore, I organized and connected all of the circuit board by myself and even made Dupont wires of suitable length.

I chose to use silicone to make the handles of sliders to achieve a better touch feeling since the tactile concept is very critical to my product. After that, I learned the skill of Silicone molding through many failed attempts. My skill level

of woodwork, metalwork and acrylic processing were also increased via my model-making process. For my poster and booklet design, I also tried to use empathy to figure out what is the best way to communicate with people who are either not designers themselves or have never heard about your design before.

To some extent, my thesis project solves the problem that older adults are not proficient at using computers or other smart devices. But, there are also lots of limitations with my design and final prototype. Firstly, the technical barriers are the most difficult parts of my thesis. Theoretically, there are many different kinds of sensors and brand new interaction technologies that I can use. All the solutions should be considered earlier and some experts should be found to give suggestions on my design. Paul Gelling is a professional in this field who lives in Syracuse. He provided me many great ways to achieve my idea and I learned the newest technologies of interaction design which I can use to develop my future design.

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The rebuiled model

For the further design development, the tactile interface in my design should be developed via newer technologies, the whole experience should be designed easier to understand(even without any introduction) and the details(colors and foams) could be developed to be more reasonable. For the next version, I am expecting to use a softer material in my design and trying to get rid of using wires. What I hope to see in the future of

my design is that the product can not only be used for house-renting issues but also can be applied to any other websites to make them more aging-friendly.

Until last May, the feedbacks of my design was not rich enough. Only my teachers and friends had the chance to experience my product and offer feedbacks. Although the limited feedbacks were very helpful to me, my design still needs to be more credible through a wide-range testing by older adults who are my end users.

In order to achieve a more complete design and reach the earliest target of the project, I need to test my design in China to make sure this project is reliable and valuable. Because of the super high international shipping cost, I rebuild my product again in Luoyang city (my hometown) in China. My mother helped me to invite 10 of her friend who are over 60 years old to be my testing customers. The whole process of testing was recorded by my mother and me, they talked a lot base on my thesis topic and provided many useful feedbacks.

Chinese version flyer

The content is the same and translated in Chinese

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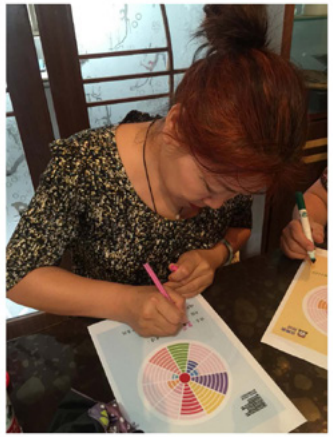
Feedbacks from Chinese older adults

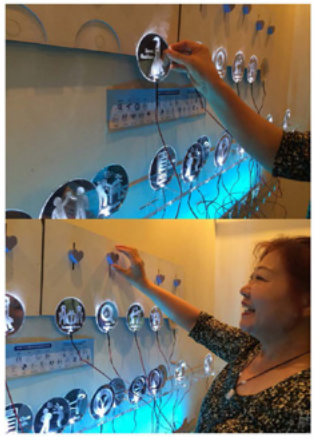
Participants

name	gender	age
Suxiang Shi	F	58
Aiqing Hou	F	61
Shuili Lv	M	59
Xiaoning Li	F	69
Qiang Chen	M	63
Guoke Liu	M	62
Fang Wang	F	60
Li Wang	F	60
Cuilan Wang	F	61
Yang Wang	M	63

Participant 1

Suxiang Shi *Female* *58 years old* *Luoyang City*





She said:

"In general, it looks good, but ..."

"If you want to launch it on the real market and let people to use it everyday, it is better to have a wireless version. And you should make it better in quality. I want to make sure every light is glowing."

"You can put the same type words together.For example, singing, dancing and drawing are for one type. Need privacy, keep quiet and separate personal items are for another type..."

Participant 2

Aiqing Hou *Female* *61 years old* *Luoyang City*

She said:

"I like it , the experience is quite interesting. If you ask me for suggestions, I will say ..."

"I also look forward a wireless version, it will be more convenient."

"In addation, I think you could add some options for the most unbearable thing. For me, I really care if I live with someone with body odour, so you should find a way to let me avoid it."

Participant 3

Shuili lv *Male* *59 years old* *Luoyang City*

He said:
"I like this design work, Yes, I want to find a roommate like this(base on his selection). For me, it is good enough, hope to find a roommate who I can get along well with."

Participant 5

Qiang Chen *Male* *63 years old* *Luoyang City*

He said:
"It's good, I like it. But..."

"Why I cannot find a sign means love meat? I don't like vegan, I love meat! I love seafood!"

"Wine is so important for me! I would like to find a guy who can drinking with me. "

"I like dancing playing chess and playing mahjong, I can't find these options from the signs provided."

Participant 4

Xiaoning Li *Female* *69 years old* *Luoyang City*

She said:
"I pretty like it! These options is enough for me to find a roommate."

"This light is broken? It looks like doesn't work... I am kind of worried about if the system works if one led light is off ."

Participant 6

Guoke Liu *Male* *62 years old* *Luoyang City*

He said:
"It absolutely is a big thing and it's a sunrise industry! Actually I do thinking about this Co-living way to spend my retirement life."

"You should add some Chinese style activities such as drawing ink painting, playing chess and so on."

"My favorite thing is traveling, you could put traveling into it."

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Participant 7

Fang Wang *Female* *60 years old* *Luoyang City*

She said:
"In general, it's pretty easy to use."

"But where is the sign of Chinese calligraphy? I like it so much. You only provide love singing and love music, actually it is not enough."

Participant 8

Li Wang *Female* *60 years old* *Luoyang City*

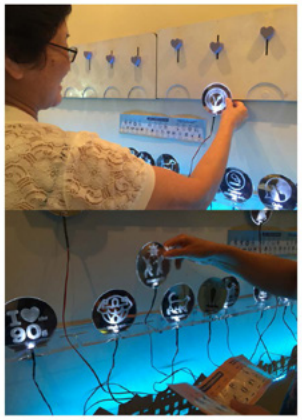
She said:
"I don't have any suggestion. I like it."

"I love fashion, I want a co-living roommate love fashion as well, so we can go shopping together."

"Can I chose the gender of my roommate?"

Participant 9

Cuilan Wang *Female* *61 years old* *Luoyang City*



She said:
"For now, I can't come up with any idea to improve it."

"It is already not that easy for you to achieve it to this level."

Participant 10

Yang Wang *Male* *63 years old* *Luoyang City*

He said:
"It's good to use, but..."

"There are many things I can't find. Such as Chinese calligraphy, acting opera, playing chess..."

Through the testing process, I did find something interesting facts. For example, participants highly accept the new co-living way of old-age care. They feel excited of trying something new like this and it deeply surprised me.

Most of the participants mentioned that they want a wireless version of my product since they are wondering if the wires are safe and stable. Base on my observation note, the material acrylic is not attractable enough for them to touch since it might be too thin, cold and too new as a touching material for them.

For the size of the product, they gave me some suggestions base on the current Chinese social situations. They do not think the old care organizations are mature enough in small cities in China so that the installation of my product might be a real obstruction to prompt this project. As a result, a smaller and more flexible shape is considered as the next development of my design.

What is so interesting to me is that they paid more attention on the contents on those pieces instead of the touch of them. They do not ask for perfect tactile feelings but they do care about finding the keywords they want. In a word, they are more serious about the result instead of the process.

Feedback conclusion

- wireless
- easy to move & install
- more options they want
- showing their dislikes
- easy to hold
- warm/familiar material
- choose the gender first

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Developed design base on feedbacks in China 2019

New version guide users divide elements into three categories

Chinese version

English version

before use

after use

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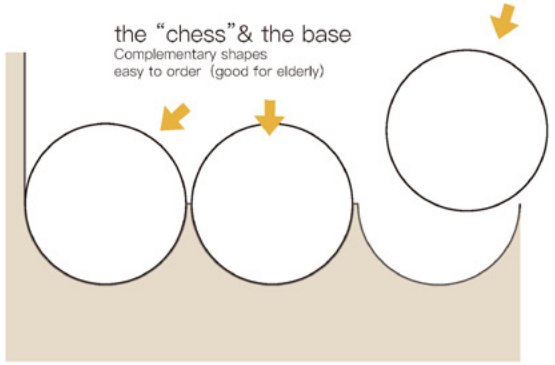
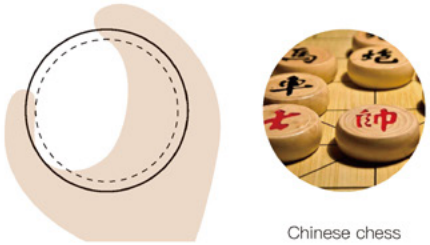




the “chess”
size：4×4×2cm
(the size of Chinese chess)
easy to hold & familiar tactile impression for elderly

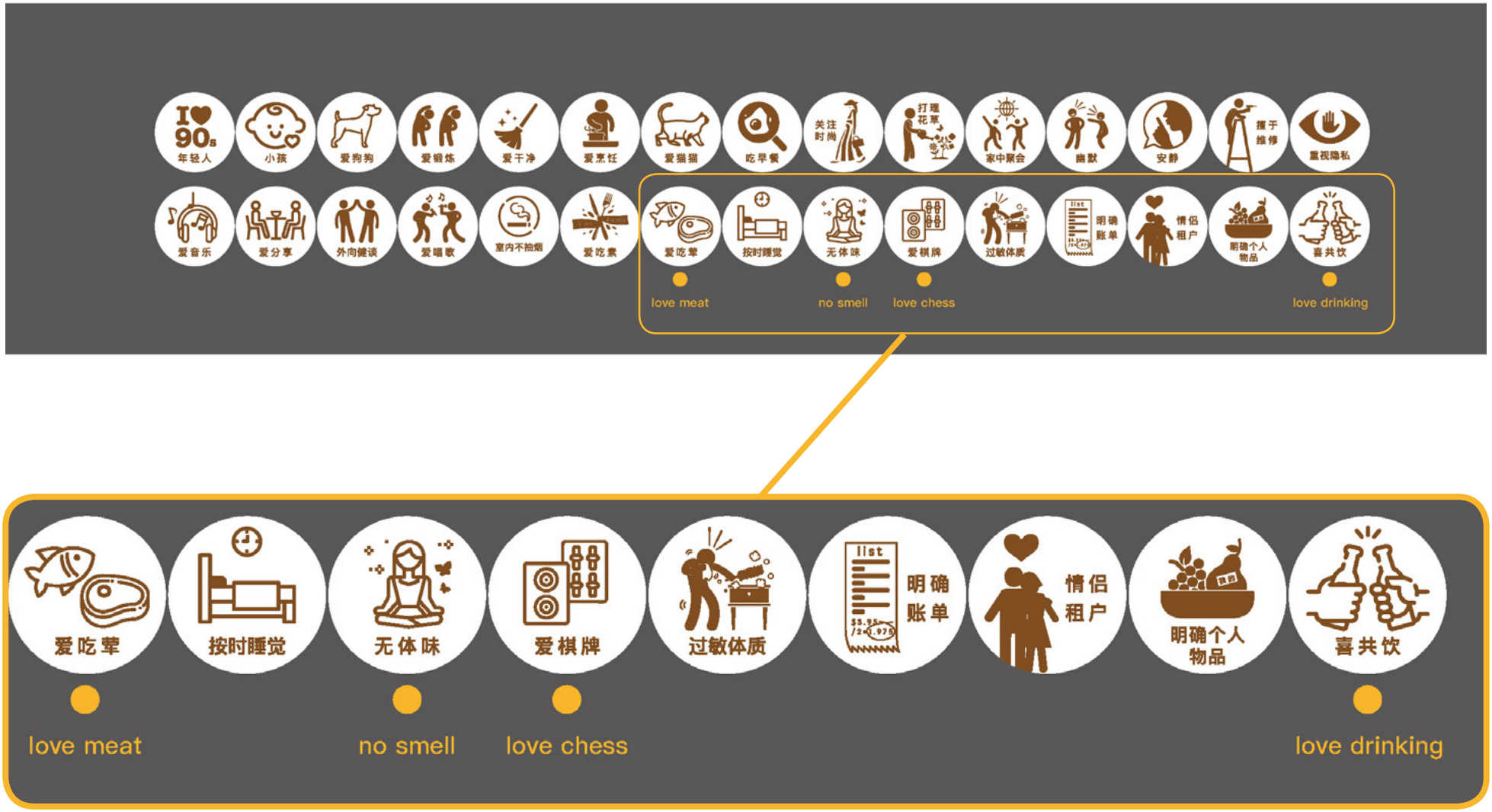
Induction sensor

wooden base

the “chess”
size：4×4×2cm
(the size of Chinese chess)
easy to hold & familiar tactile impression for elderly

52

More options provided based on FEEDBACKS in China



Details

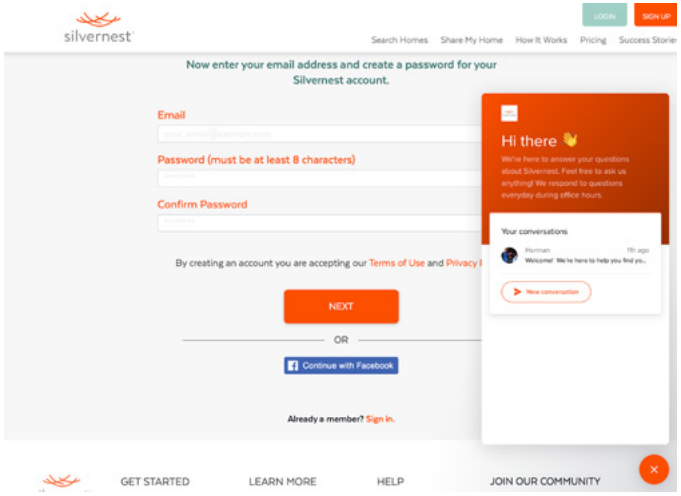

爱分享
小孩
爱干净
爱烹饪
一定要
吃早餐
打理花草
安静
最好能
擅于维修
爱狗狗
爱锻炼
爱猫猫
关注时尚
家中聚会
幽默
明确账单
情侣租户

54

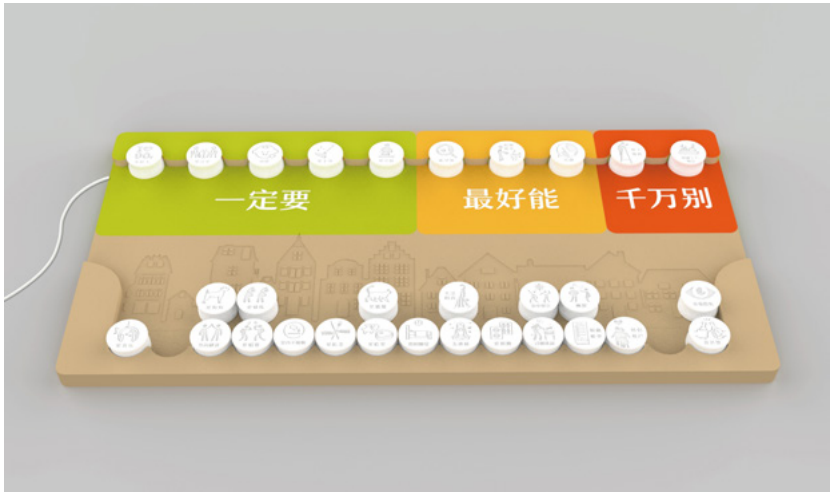
Conclusion

The improved design could be an ideal extension product of Silvernest which can link to the matching function to make the website more friendly to everyone. It also could be explored to other similar websites to provide a more attractive experience.

For the future, I believe that more and more GUI will be used combined with existing websites or applications to create a more user-friendly experience.



GUI
not clear
need to type
can not touch
yes or no ?



TUI
clear
use like playing
tactile
flexible answers

About my IRB

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February 27, 2018

Dear ORIP Board,

I am a School of Design student in the the MFA Design program. This semester I am working on a thesis project that focuses on how to help elderly find a co-living roommate. This is important work because almost all of the systems or products for roommate finding in market rely on digital devices. But, the elderly are a big population of people who are not proficient at using computers. The design intervention I am developing is a tactile interface (physical interface) for finding a roommate. To properly develop my design to be functional and user friendly, it is important that I get feedback from people. I am going to ask for feedback from as many adults that I can find (at least 15).

To gather information from people, I am going to have them "play" with a prototype that simulates the product as if it is fully functioning (will not be linked to the data base). Here are some sample questions that I am thinking about asking people:

- What do you think about the design?
- Do you think it is easy to understand how to use this product?
- Do you feel like the questions would connect you with the right person?
- Are the parts easy for you to hold?
- How do you feel the experience compares with other systems or products on the market?
- Are there any aspects of the design that make you feel confused? Uncomfortable?
- What would you change about the design, and why?

In addition, here is a URL to some videos I took during a recent test process. These are not the final design, but they might help you to understand my project better.
https://vimeo.com/257791019

I believe that I do not need to submit an IRB application for my design project. My hope is to verify this by contacting you. If you can provide me a letter back confirming this, I can report back to my Thesis Committee.

Sincerely,
Jia

RE: IRB Questions

Syracuse University Office of Research Integrity and Protections <orip@syr.edu>

周三 2018/2/28 8:25

收件人:Jia Guo <jguo03@syr.edu>;

抄 Jody Nyboer <jlnyboer@syr.edu>; Syracuse University Office of Research Integrity and Protections <orip@syr.edu>;
送: Jeanne D Diederich <jddieder@syr.edu>;

Hi Jia,
Because the research design described in your memorandum focuses on product design and does not ask questions 'about people', it does not meet the definition of human subjects research requiring IRB review and oversight.

Although IRB review is not required for this study at this time, should any of the questions be revised and/or changed to be more about the personal feelings of the individual (e.g.-"Are you lonely without a roommate?...or something similar) and not about their feelings as they relate to the design/use of your product (e.g.- How do you feel about the product, it's design, ease of use, etc.), please re-contact the IRB for guidance.

Please let me know if you have any additional questions.
Best wishes,
Jeanne

Jeanne D. Diederich
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Syracuse University

From: Jia Guo [mailto:jguo03@syr.edu]
Sent: Tuesday, February 27, 2018 5:30 PM
To: Syracuse University Office of Research Integrity and Protections <orip@syr.edu>
Cc: Jody Nyboer <jlnyboer@syr.edu>
Subject: IRB Questions

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resume

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Education Background:

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