Portfolio

2022-2024

QiuTian

INNOVATOR & DESIGNER

283840680@qq.com

+86-18058121726

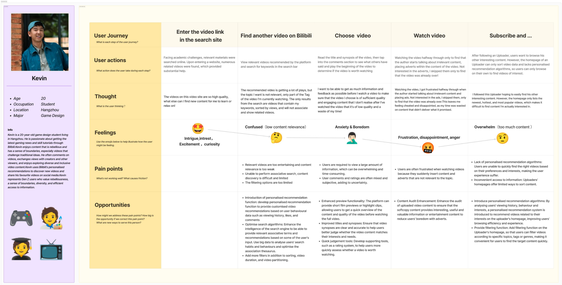
我即将从UAL创意计算机学院的创意产业数据科学与人工智能硕士课程毕业。热衷于数据科学、NLP，以及将其用于新创意体验的可能性。逻辑性强、好奇心强，善于主动学习新知识，善于规划，乐于沟通，有团队合作精神，英语可以作为我的工作语言。拥有工业设计、数据科学和人工智能背景，参与过多个人工智能项目的代码开发和 APP 可视化。热衷于数据科学、NLP、人工智能以及将其用于新的创意体验的可能性。热爱游戏，拥有丰富的游戏经验。

INTERACTION DESIGN　PRODUCT DESIGN　SERVICE DESIGN　USER EXPERIENCE DESIGN　BRANDING DESIGN　USER INTERFACE DESIGN　AI PRODUCT DESIGN　DATA ANALYSE

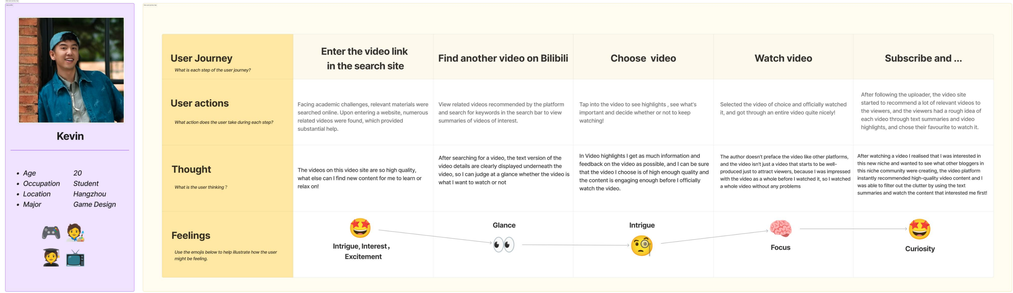
Bilibili AI Recommend

Exploring the use and visualisation of AI in a video search site. Includes the use of ai to personalise video summaries and automated video clips for users with different interest orientations, and to design UI and user interactions.

Journey Map

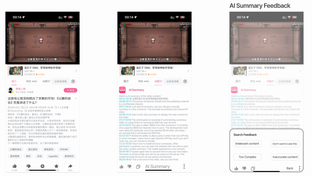


New Journey Map

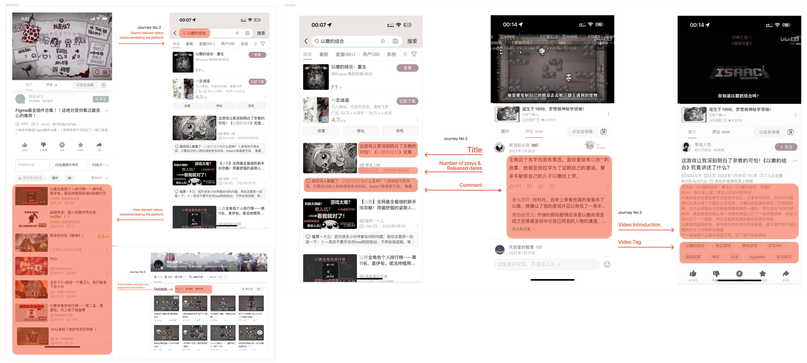


We will provide the option of AI profile on the video page, users can analyse the video by AI by selecting the AI profile and generate the video profile and timestamp, users can jump to the point in time of the video directly based on the timestamp, or they can understand the content of the video more quickly based on the profile. At the same time, users can use the like and dislike buttons to evaluate the AI profile, and they can also give feedback on the AI profile by saying that the profile is too complex, irrelevant, dislike, or don't want to watch, which can help us collect feedback and optimise the AI model to make it more accurate and more in line with the user's needs.

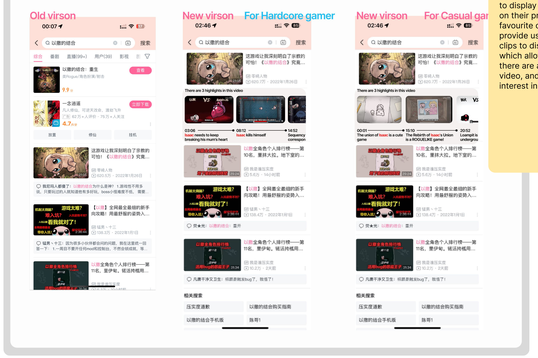
AI Summary



User Journey Detail

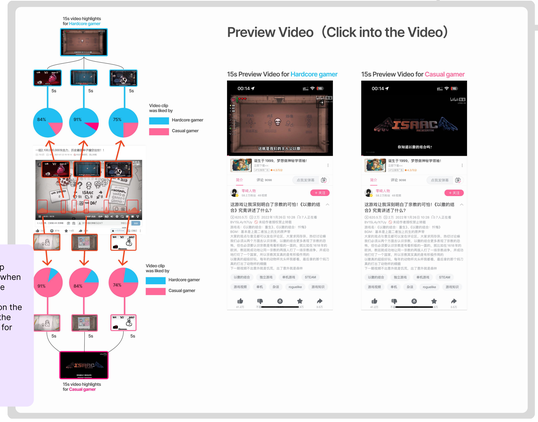


Search the Video



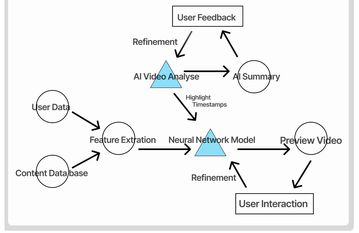
When users are searching for specific content, the content they are searching for to display may be the same, but depending on their preference, they have different favourite clips in the same video, so we provide users with different recommended clips to display based on what they may like, which allows them to quickly determine if there are any of their preferred clips in the video, and quickly increases the user's interest in the video.

Preview Video（Click into the Video）



We will automatically play a preview clip generated inside the video to the user when they click into the video and browse the title, synopsis, and comments. The combination of preview clips is based on the video clips that the user may like, and the video clips generated may be different for different types of users.

Detailed Metadata



Implantable Medicine Monitor

Personal long-term medication management equipment

I noticed that many elderly people around me often forget to take their medicines or don't know which medicine to take. And they are often unaware of the great harm done to their health by not taking their medicines on time. So I started thinking about whether there is a smart device that can coexist with the human body for a long time and automatically inject drugs into the body.

Background Research

1 United States

Top 3 countries that ***spend the most*** on prescription medication for seniors in 2021.

2 Switzerlands

3 Germany

4 Canada
5 Belgium
6 France
7 Austria
8 Bulgaria
9 Italy
10 Korea Republic

The COVID pandemic has increased prescription drug use

Pharmacies fill over 4.5 billion prescriptions annually

everyday medications are critical to sustaining the health and well-being of seniors. It is crucial that medications are taken properly, especially for seniors.

85% adults aged over 6o used prescription drugs daily

81% seniors with disease need to take multiple medication daily.

70% seniors always forget to take medication on time.

55% seniors don't take their medication according to the doctor's instructions.

The Danger of Forgetting or Taking the Wrong Medication

These adverse drug effects occur in any age group. However, seniors are more susceptible to the consequences of incorrectly ingesting medications.

Confusion — Hallucinations — Organ Failure

Symptoms range from mild to severe

66.4% of errors were reported on wards and occurred most often in patients aged older than **75** years old.

Why this is happening

people over **65** take **14** to **18** prescription medications a year.

Hard to manage

Pain Points

Need to be taken at different times of day

Easy to have wrong mixed up or missing

Increases the risk of ill effects

200,000 older adults are hospitalized annually due to adverse drug reactions

Pain Points

Symptoms that don't improve

Having a stronger effect than intended

Inadequate monitoring

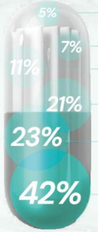
randomly adjust the medication without professional guide

Design Insight

Looking for a smart way to manage seniors' medication taking and reduce the number of reminding to take them.

Questionnaire & Interview Analysis

Type of disease do you have



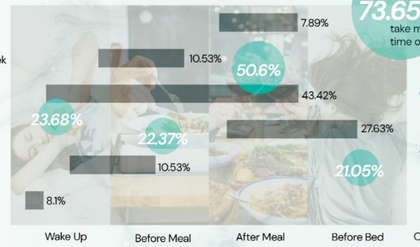
Types of single doses

≥7 — **1.81%** — Mostly older patients who need to take multiple drugs because of serious underlying diseases

4-6 — **17.11%** — Most of them are ordinary patients, who need to take medicine or supplement certain nutrients

1-3 — **82.89%** — Mostly young people taking vitamins

Time analysis of taking medicine in a week time



73.65% patients forget to take medicines, either not on time or missing some treatments.

"I always put multiple alarm to remind me taking medicine on time.

"Each pill have to take in different time, which is very hard to remember.

10%

The ways of taking a long-term medicine

89.47% Oral

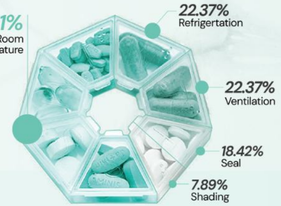
12.89% Injection

"Afraid of hurting & uncomfortable feeling of needle

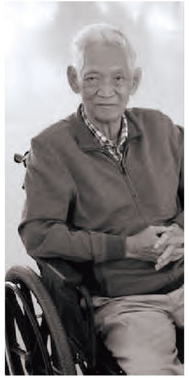
9.89% Topical

"Loss of effect because it is not easy to stay on the skin

The ways of store medicine



Persona & Journey Map



Patient · 75 years old

"I have a bad memory and always forget to take the right medicine on time.

Memory

Health Status

Technology

Medical Care

Demands

Need help to remind me taking the right medicines on time

Can adjust the dosage according to my physical condition in time

Hui Fang

Care Giver · 35 years old

"While working, I can't take an eye on my mom for High blood pressure medicine.

Memory

Health Status

Technology

Medical Care

Demands

Remote to remind seniors taking medicines on time

Can prepare the medicine in advance for seniors

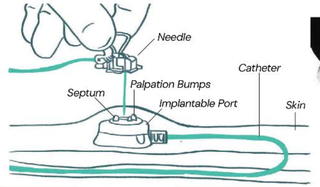
Taking an example of insulin injection experience to analysis the possibilities about using smart device to achieve automated medication intake.

Stage	Wash Hands	Take Out Device	Pressurized	Installation	Input the Medicine	Injection	Clean Up
Actions	Hand sanitizing ensures clean and sterile hands.	Remove the syringe, dispenser and insulin bottle from the bag.	Rotate the syringe to apply pressure in preparation for insulin injection	Install the connection, medicine fetching interface and the insulin bottle.	Take a certain amount of medicine according to your needs	Aim at the injection site and press the safety button first, then injecting	Put away used instruments.
Time	■■□□□	■□□□□	■■□□□	■■■■□	■■■□□	■□□□□	■■□□□
Mood							
Pain Points & Chances	Need always keep their hands clean when operating the syringe Restrictions on environmental requirements Nursing skills required	Difficult to carry around due to the complicity of device attachments Always need a big bag for certain temperature Hard to know all parts	Seniors not have enough strength to pressurized the device Don't have automatic process or support for it Need to have point of application	Require a lot of manipulation and are too delicate for the elderly to be friendly Don't have enough instruction of grouping To many parts to remember	Hard to figure out how much is needed because some take oral drugs at same time No specific amount remind for seniors Didn't adjust in real time	The old can not choose the right place to inject the insulin. It might inject at a wrong place, loosing effect It is hurting sometimes	Need to store many parts to satisfied the daily usage of self injection Covid-19 make this part very hard to follow Device is disposable
	"Need clear instruction for patients to create the clean area for injection.	"Simplify the package and accessories need for insulin injection.	"Pressurize the syringe in an automatic manner.	"Simplify the drug collection flow, which can be loaded directly into a syringe.	"Create more visual elements to help seniors look at data more clear.	"Provide enough hints of the injection area to senior during preparation.	"Simplify the collection processes and create sustainable accessories.
	Body Implantation Create a device that can ***stay on the body*** for a short period.		***Auto Button*** Come processing can be ***summaries*** into a automatic button.		***Dashboard*** ***Real-time data analysis*** for health condition & medicines.		***Reusable Device*** Create devices that can use for ***multiple time.***

Technical Case Study

Implantable Venous Port

an intravenous (IV) line that is completely inside the body



Advantages

Very visible and easily felt, resulting in more efficient access

Permanent and used as long as it is needed

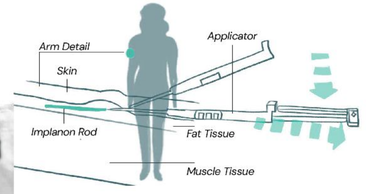
Can remain accessed with a needle up to 7 days

Disadvantages

If the port is not being used at least every four weeks, it must be flushed to keep it safe for use.

Port placement requires a surgical procedure; IV access does not.

Contraceptive Implant



Advantages

Very inexpensive method of long-term contraception

Easily removed in most cases to allow pregnancy to occur naturally

High effectiveness of up to 99% within 7 days

Disadvantages

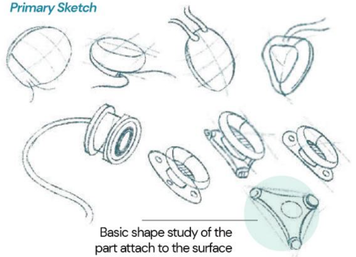
Immediate protection may not be available

It offers no protection against sexually transmitted infections

Interaction with certain antibiotics may occur

Concept Sketch

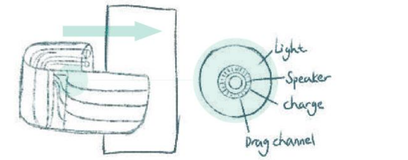
Primary Sketch

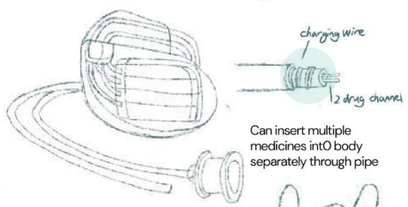


Basic shape study of the part attach to the surface

Body Attachment & Interaction Sketch

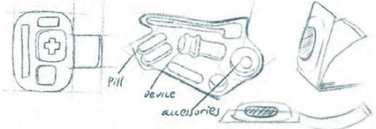
Caught on clothes



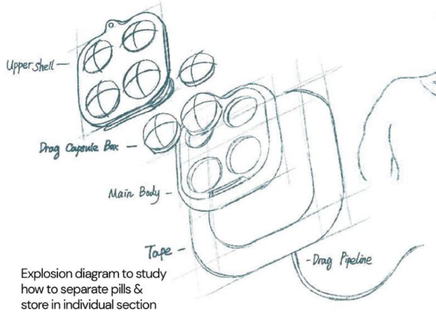


Can insert multiple medicines int0 body separately through pipe

Package Idea Sketch

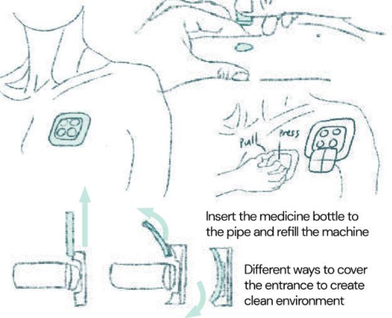


Product Sketch Refine



Explosion diagram to study how to separate pills & store in individual section

Medicine Refill Sketch Refine

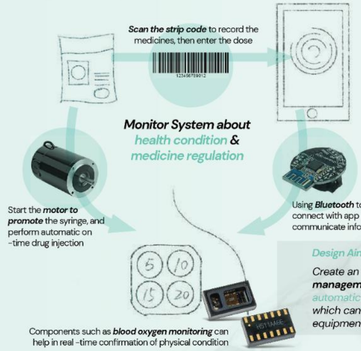


Insert the medicine bottle to the pipe and refill the machine

Different ways to cover the entrance to create clean environment

Concept Prototype

Logic Analysis

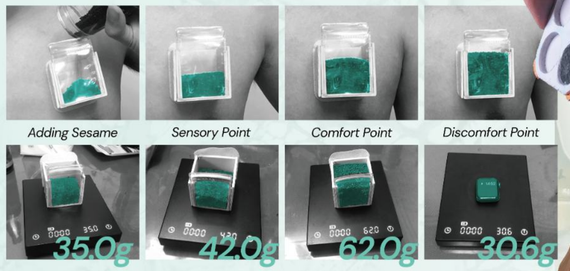


Design Aim

*Create an **intelligent management system** that can automatic injection of medicines, which can real-time monitoring equipment reactions of patients.*

Ergonomic Test

An empty box is attached to the chest using sterile stickers and black sesame seeds are gradually added to it, weighting at the sensory, comfort and discomfort points.



*The weight of a device on the chest is best at 35-42g, increasing to **65g in extreme cases**. With a smart watch weighting 30.6g, it is possible to make a smart injection device at 42g or less.*

Part One Prototype

Storage for all kind of medcines

Based on the type of pills to design typical package for it then all medicine can have a package for consistent style

Part Two Prototype

Implantable part on the body

To create a device that can stick on human body as a long-term place to insert the medicines & monitor the health conditions

Poduct Rendering

***Step 1** - Fully sterilized*

***Step 2** - Paste the device on the skin with medical adhensive tape*

***Step 3** - The device will be covered by a protection screen*

Product Interface Design

The digital screen of smart injection device will have ***3 kinds of interfaces*** for different condition of senior patients.

Remian Medicine Screen

Will get warning on low storage of medicine

Injecting Screen

Speed of injecting will be recorded in real time

Action Screen

Can call emergency when detecting unwell condition

Monitor App Design

Wireframe

Icon Design

Med Bank

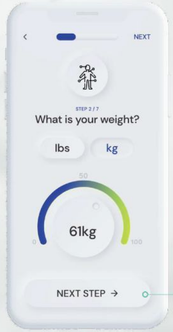
*Meds Bank is an Mobile App that using data **analysis of the user's physical condition** in real time through the monitoring of the mobile app, so as to achieve the purpose of **timely taking medicine** and **adjusting the dose** in a timely manner.*

01 · Connecting Device

Using bluetooth to find the device attach to the body

02 · Sign In / Sign Up

User can sign in with their medical ID, so all treatment can have a record



03 · Basic Information

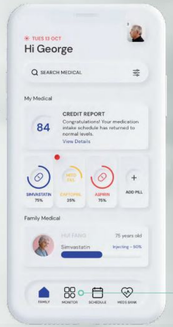
Enter some physical facts of user that can customise the experience of auto injection

Injection Device

For the first time installation can be done at **hospital**, then the refill can be done easily for the future

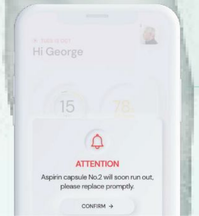
04 · Home

Listing user's medical condition, can adding family members to the app, so can monitor remotely



05 · Medicne Monitor

Same data as the device on the body, can remind user to refill the medicine on time



Other Application of Interface

The dark version UI design & iWatch UI design can fit into more devices for better experience

06 · Medicne Schedule

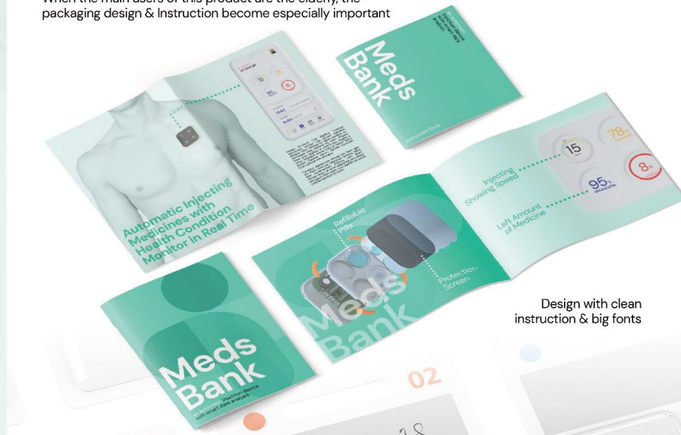
With a week of data anaylsis, users can adjust the amount at anytime and anywhere

07 · Med Bank

Credit can be stored in here if take medicine on time, to encourage users have a better life attitude

Package Design

When the main users of this product are the elderly, the packaging design & Instruction become especially important



Design with clean instruction & big fonts

WORDS OF THE SOUL

Re-learning system for patients with aphasia

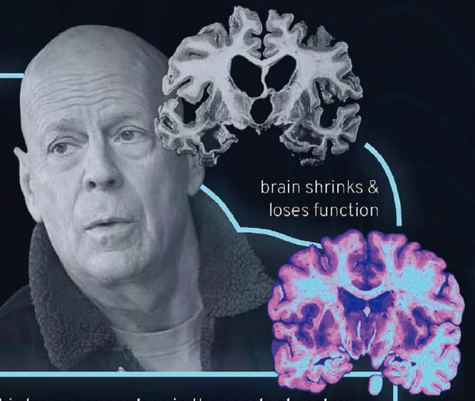
I explored how language & emotion system work in our brain, which possible can help to translate what is in the mind into the simplest visual elements. For people with aphasia who cannot express through language, it is possible to express, and to create the possibility of language re-learning for them.

BACKGROUND

Bruce Willis

At age of 67, he announced he was retiring from acting after being diagnosed with **aphasia**.

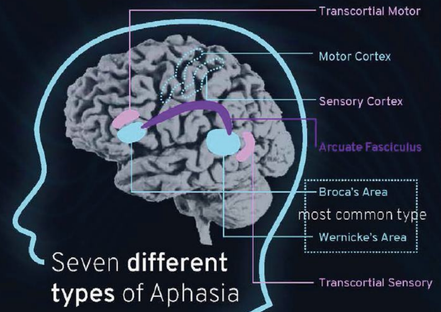
This is actually the first time I notice this group of people.



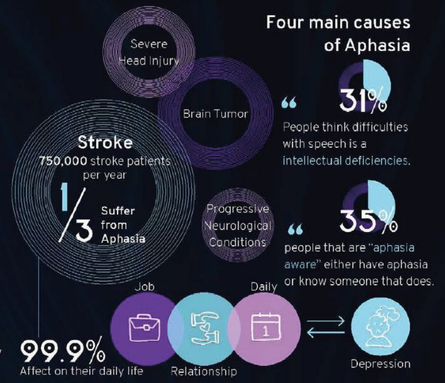
Aphasia has start to damage his **language centres** in the **cerebral cortex**. He is facing with **expressive** and **receptive** language, including:

SYMPTOMS

PATIENTS' RESEARCH



Seven **different types** of Aphasia



Different **damage** to specific brain regions can cause different **inability to comprehend or formulate language**

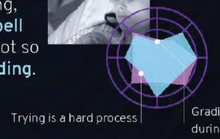
PERSONA

Life status of patients and their families based on **emotion**, **technlonical ability** and **treatement**

Mr. Salamanca
70 years old
Having **Stroke** for **8** Years

"He can't say anything, we let him **use the bell** to express, but we got so many **misundestanding**.

Miss. Clarke
30 years old
Traffic accient and had Asphasia for **1 week**



"In my worst moments, I wanted to pull the plug. I asked the medical staff to **let me die**.

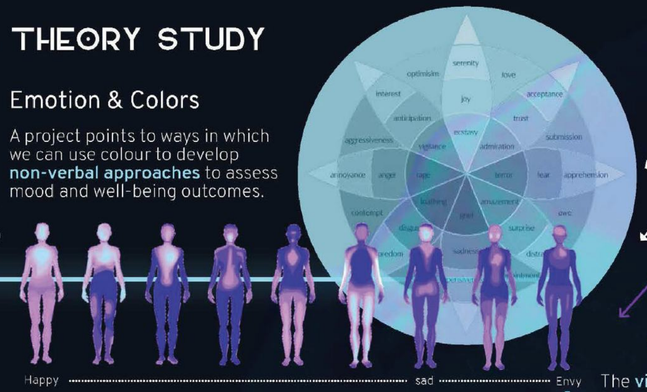
SCIENTIFIC THEORY STUDY

"**Colours**, like features, follow the changes of the **emotions**.

by artist Pablo Picasso

Emotion & Colors

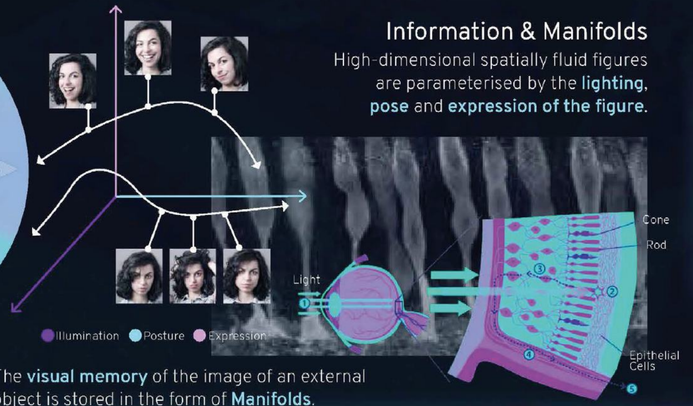
A project points to ways in which we can use colour to develop **non-verbal approaches** to assess mood and well-being outcomes.



Like on a heat map, **increased** activity corresponds with **warmer colors** (Red & Yellow), while **decreased** responses correspond with **cooler colors** (Green & Blue).

Information & Manifolds

High-dimensional spatially fluid figures are parameterised by the **lighting, pose** and **expression of the figure.**



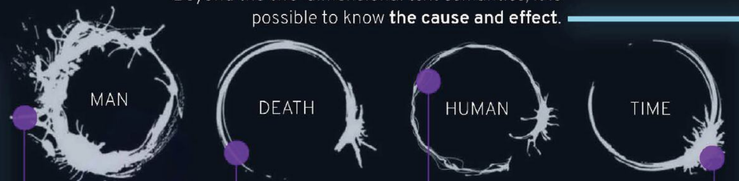
The **visual memory** of the image of an external object is stored in the form of **Manifolds**.

INSPIRATION

Arrivals 2016

The first ever **linguistics** related science fiction film

Beyond the two-dimensional text semantics, it is possible to know **the cause and effect.**



As an interaction designer, I start to question myself

IS THERE A SYSTEMATIC WAY CAN HELP PEOPLE WITH APHASIA TO SPEAK VISUALLY?

- In languages, ease of learning is not the dominant force.
- Understand **experience & mood of the interlocutor** to understand all **behavioral explanations without barriers.**

Writing & speaking might be unnecessary

CONCEPT

Potential design gap - **Lower-dimensional neural manifolds** can be better studied and analysed in this project.

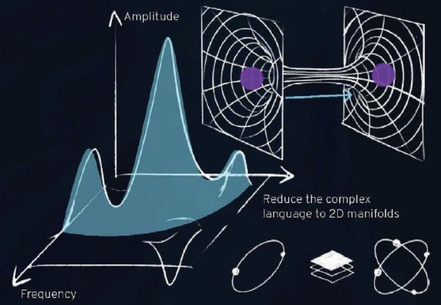
3D Manifolds
Involve too much space for people with Aphasia

2D Manifolds

1D Manifolds
Where we should focus

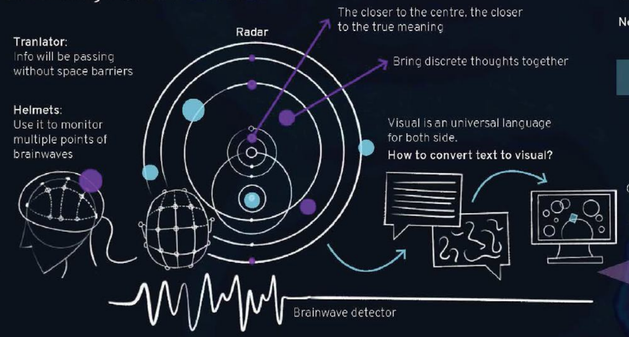
Humans have been able to record data on the activity of hundreds of neurons in real time.

Mindmap - Possible way this can happen through some devices



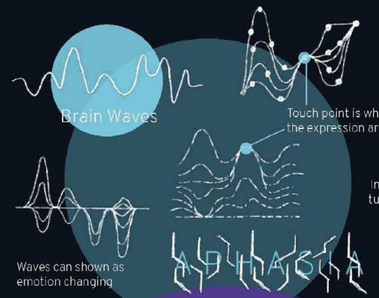
Tranlator:
Info will be passing without space barriers

Helmets:
Use it to monitor multiple points of brainwaves

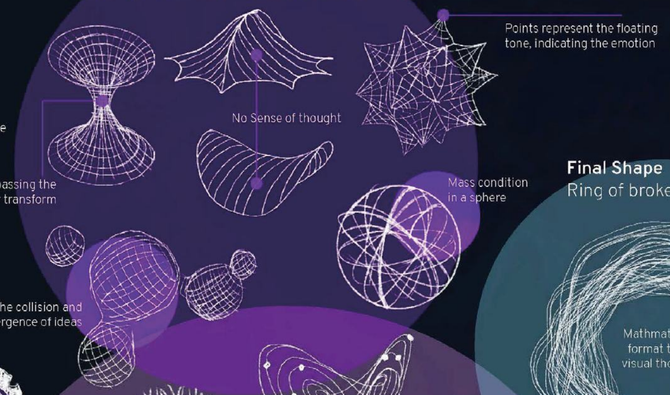


Case Study - Different meaning behind the **emotions**

VISUAL EXPERIMENTS

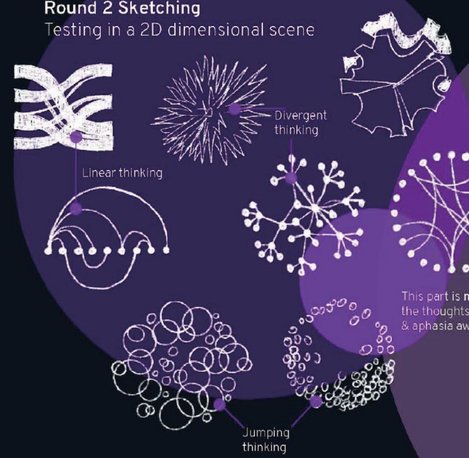


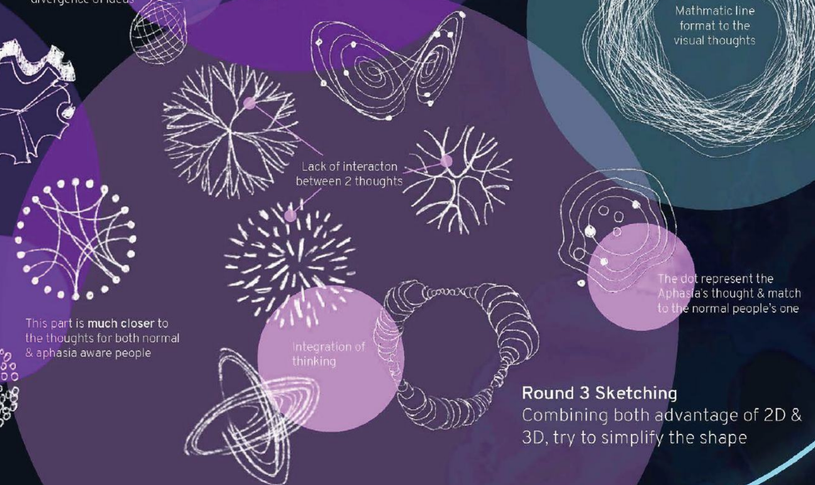
Round 1 Sketching
Testing in a three dimensional scene



Final Shape
Ring of broken wires

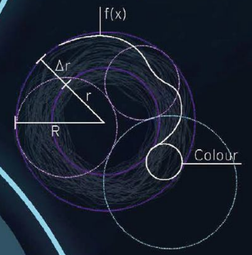
Round 2 Sketching
Testing in a 2D dimensional scene





Round 3 Sketching
Combining both advantage of 2D & 3D, try to simplify the shape

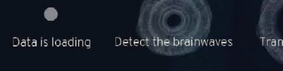
How the visual will be formed by coding?



A person's mind is composed of multiple sets of data, and each dynamic generation in this graph has meaning as below:

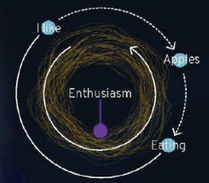
f(x)	Represent user's **coherence mind**
R	Degree of **relation**
r	Degree of **concentration**
Δr	How **active** the user is
Colour	Changing of **mood**

People with Aphasia are more prone to confusion



How to enhance mutual understanding?

Example: I like eating apples



Normal express

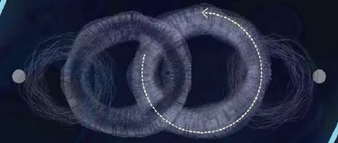
Aphasia express

People with aphasia are **unable to organise** the sequence of their language.

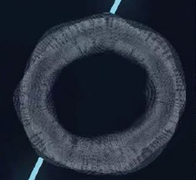
Graphic language is **non-linear** and can enhance the ability of others to understand the words of people with aphasia.

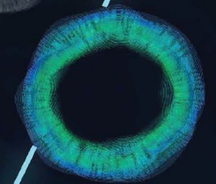
How to interactive with the visual?

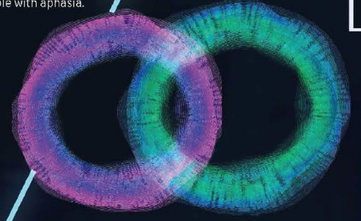
Rotate & get close to match



Matching to see whether both participates are on the same step.







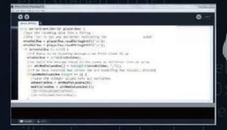
CODING PRODUCTION

Step 1 - form a simple 2D model
The function is used to reduce the dimensional data of the manifold.

Processing

Use mouse to represent the mind, when it change, the circle is recessed

Step 2 - form visual brainwaves
An invariant images are generated by randomly generated array input to processing.



Processing

Test on the amount of lines, reducing amount a little bit.

Step 3 - Generate random colours by emotions
Generate colours for images to show the mood of the user. By generating dynamic and changeable colours to show how the user's mood changes during the presentation.

```
float R = random(255);
float G = random(255);
float B = random(255);
```

By define the color range, using formula to match the right color range to the certain mood.

Step 4 - Optimised graphic for better visual
Optimised graphics to make each feature line easier to distinguish. By matching brainwaves that represent mood, thoughts, we can know if the discussion is on the same page.

Arduino

Connecting to the braindwaves and formula the final two manifolds for interacting.

Device Sketching

How to get mind wave in real time

Device Form exploration

Device Making

Real time visualise the mind wave on projection

Step 1: 3D Modeling Making

Use 3D print to build the device

1. Each people have a set of mind wave detector
- 1A Flexible Sensor
- 1B Ear Clip Sensor
2. Central Controller for collecting the data
3. TGAM1 module

PROTOTYPE MAKING

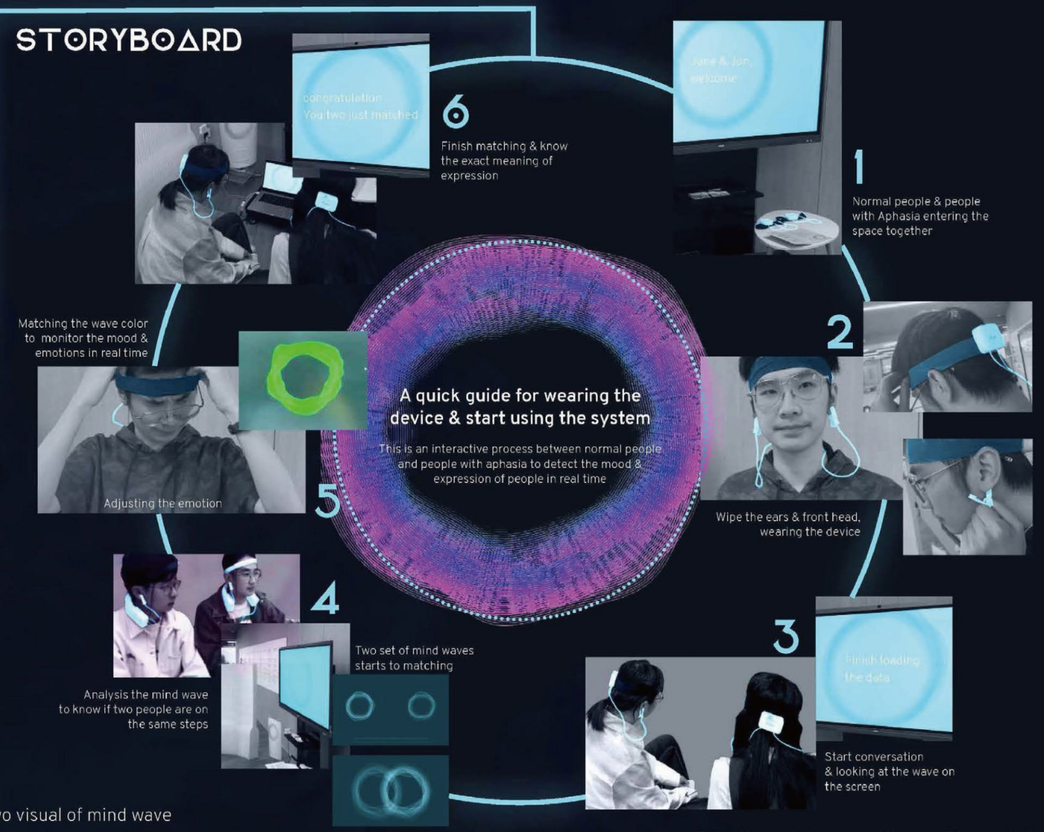
Step 2: Wiring & Coding

Make the detecting of mindwave function working

Testing Processing

Trying to match the two visual of mind wave

STORYBOARD

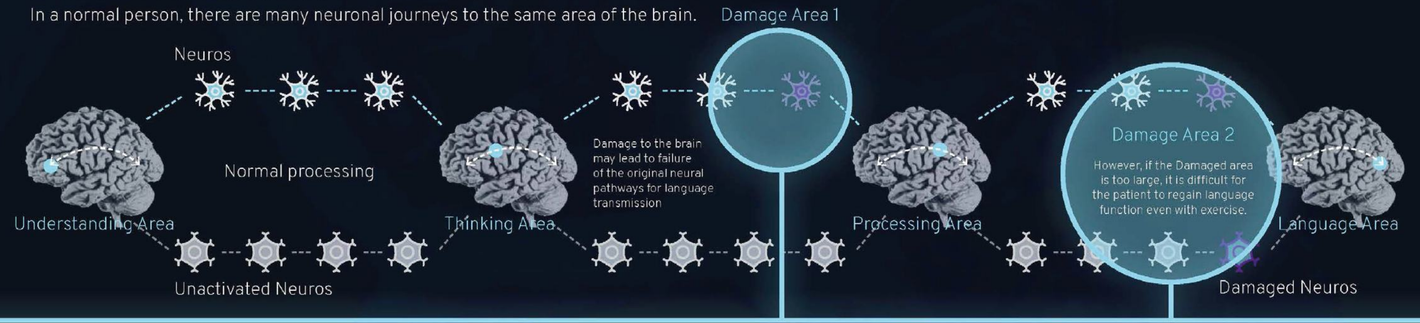


Demo Video: https://www.youtube.com/watch?v=34HD0VIWUBg

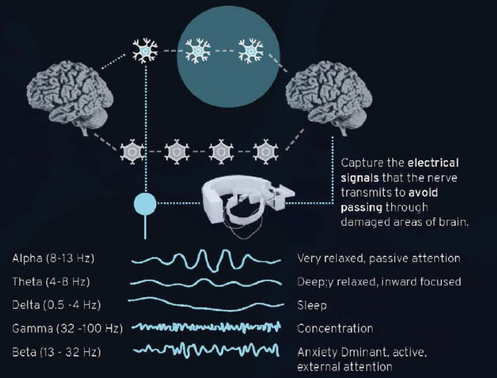
Demo Video Link: www.youtube.com (Placeholder)

SYSTEM FURTHER APPLICATION

In a normal person, there are many neuronal journeys to the same area of the brain.

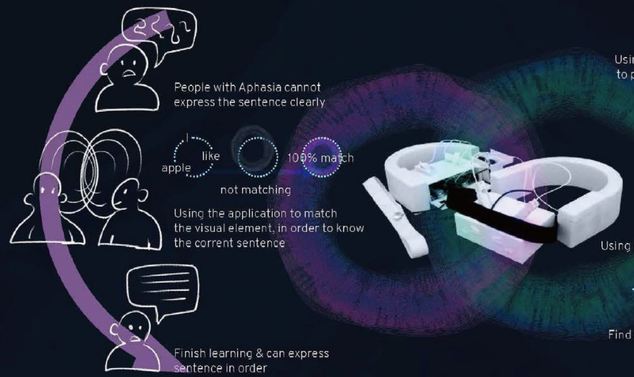


With the new language system, we can try **different approaches** with people who has Aphasia, either making exercise plan to recover their language skill or using as a tanslator base on their **condition of the brain damage's degree**.



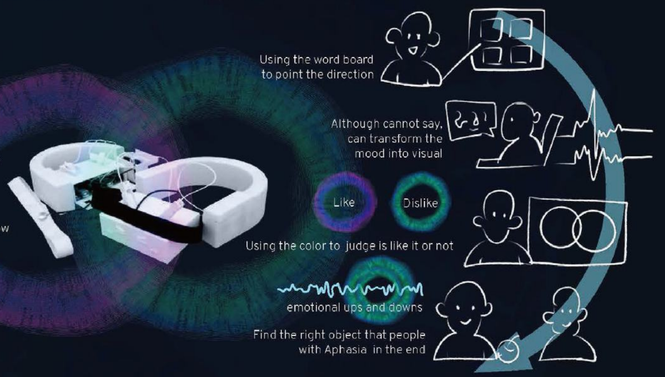
APPROACH 1

Can be apply to the damaged area 1.
The transmission of linguistic information through new neural pathways is difficult. But it **can improved through exercises**.



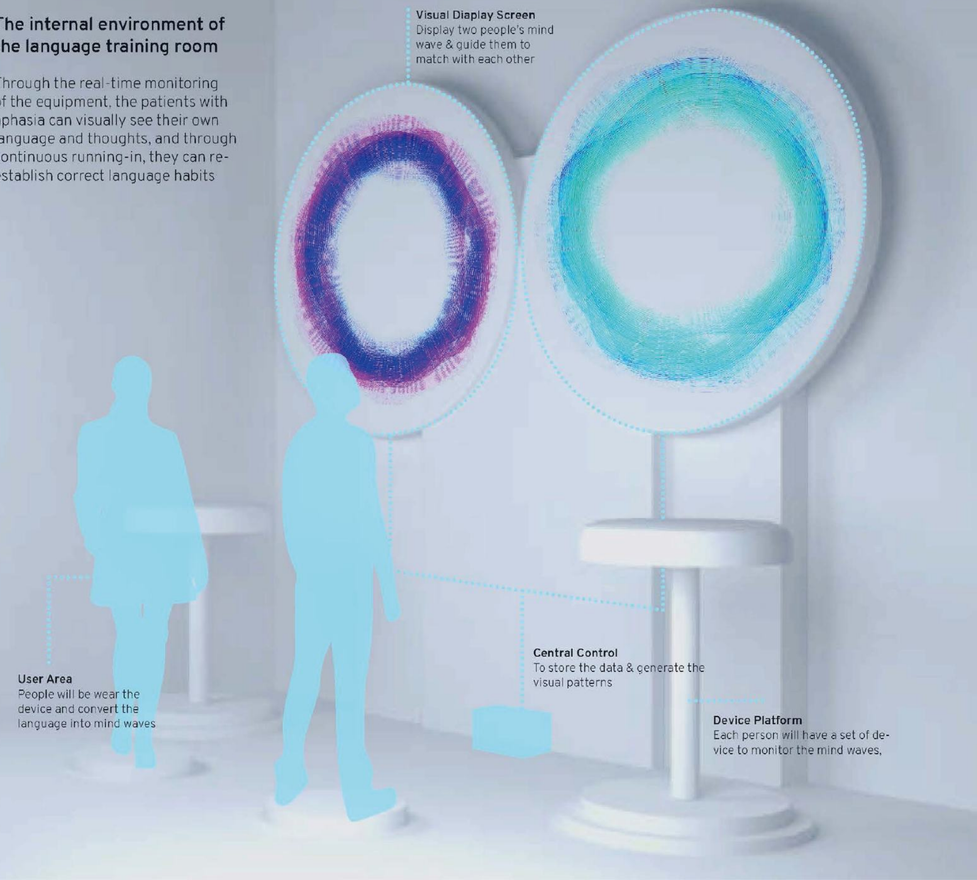
APPROACH 2

Can be apply to the damaged area 2.
This device will turn into a daily translator to help patient **express their reaction**, even for the exact meanings.



The internal environment of the language training room

Through the real-time monitoring of the equipment, the patients with aphasia can visually see their own language and thoughts, and through continuous running-in, they can re-establish correct language habits



Unmasked Mind

A wearable device that can view someone's thoughts to determine if they are lying

In our lives, we often deception from others and misinformation can lead to people making bad decisions. In this project, we envisage an anti-utopian society where the central government misuses this device to spy on people's minds. We imagine a future where a technological device is created that can view people's thoughts to explore whether it can increase social trust and people's happiness.

Inspirations

Why I start this project

Chengdu City Closure Scam

In consumer life

A netizen with the ID "Tropical Rainforest" in Chengdu, China, warned that the city would be closed for five days, prompting many Chengdu residents to grab and stock up on vegetables. The netizen was **subsequently placed under administrative detention** by the Public Security Bureau for fabricating and spreading rumours. But two days later the city was closed and **the rumour became a reality**.

Film Restriction Scam

In culture life

A film about a couple from the lower class in the north-western countryside has been shelved for "**exaggerating misery**" and "**destroying harmony**". It was because the National Day was coming up, and it was not a film that should be in cinemas. Those who saw the film scored it 8.5 out of 10 on Douban. The realistic rural area was recognised by most people, yet it was **taken down for improper**, even **fabricated, reasons**. The same goes for many other films, even Halloween parades.

UK Brexit Scam

In political life

In 2016, Boris Johnson, probably the most famous of the Brexit lies, preached a bizarre and fraudulent promise on his **'vote fake' bus**.
The claim that "we are sending £350 million a week to the EU" is incorrect, the true **figure is much lower** (around £250 million) and the cost of Britain leaving the EU **far outweighs these contributions**.

In our ordinary social life and online life we are all fed too many lies by society

Even with independent self-examination, **incorrect or misleading statements** of events can lead us to different conclusions and make some poor decisions about our lives. lead us to draw different conclusions and **allow us to make some poor decisions** about our livesety

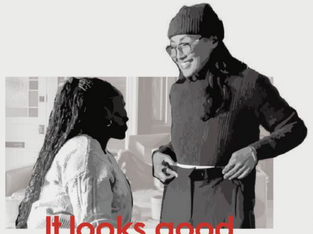
People hate to be deceived, but it is people themselves who are deceived...

Why Lies

Research
Background of this project

People Lie Unconsciously

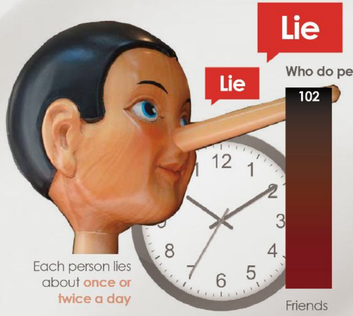
If we could **suddenly discover all the lies**, life in countries where infidelity, homosecuality or certain religious beliefs are illegal **coule be threatened**.



It looks good

I am satisfied

> “It’s very **common**, so we just don’t notice them.
>
> By Michael Lewis, American Scientist



Each person lies about **once or twice a day**

Who do people lie to?

In a lying experiment, greater than **95%** of people admitted to lying.

Top 3 reason why do people lie

21.89% Avoid others

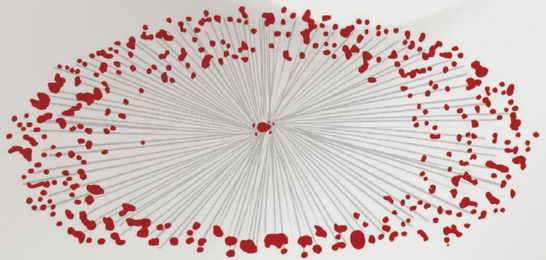
20.17% Humor or a joke

14.24% Protect one’s self

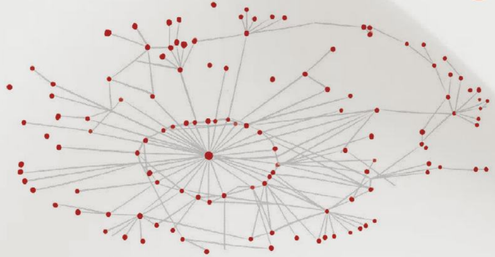
How to determine whether people are lying

Determing the faake news through retweet data

Most people retweet real news from a centralised source. And fake news is spread by people retweeting other retweeters.



A typical Twitter fake news network with 199 nodes



A typical Weibo real news network with 215 nodes

Bad Results

People need to **rely on the information they’re given** from candidates to make an informed choice on polling day.

Having a large number of **misguided** people in a society, especially in the news, is absolutely devastating and **very difficult to deal with**

Determinng the lies through Lie Detector

Lie detector are still used today in a variety of plaaces. Byt they’re never been proven to work

Technical Support

What kind of technology can support the design

Case Study

Misleading commercial advertising is criminalised in South Australia. This has been successful in industry **self-regulation**. The next possible legislative provision will probably be applied to political advertising.

Political ads on show at the National Library of Australia in Canberra.

84% of Australians support truthful political advertising laws.

Commercial Ads

In Reality

Misleading ads can attract more customers, so businesses often **use lies to beautify their slogans**, but the actual effect is not so good.

Eliminate Lies

Hypothesis

People's brain waves can be collected and transcribed, and people can see what others are thinking in their entirety (including lying itself)

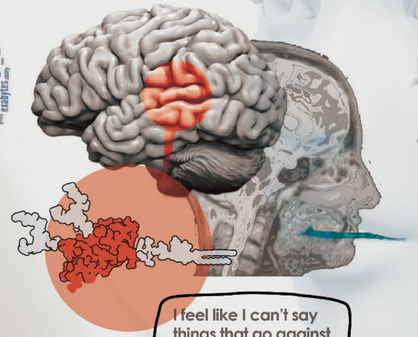
Potential Solutions

Big Data

Using big data to determine whether people are lying

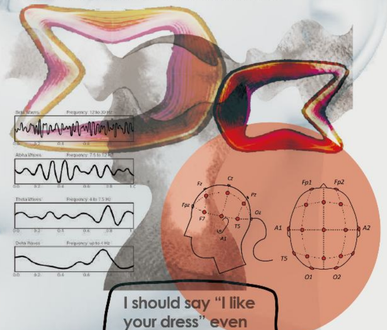
New Type Prison

New type prion destroys specific areas of the brain, infected humans lose the ability to lie



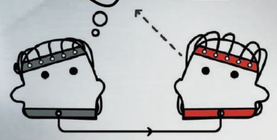
Brain Waves Visualisation

People's brain waves can be collected and transcribed and people can see what others are thinking in their entirety (including lying itself)



Scenario

Reliability: **5%**



Disadvantage

Current not having enouh data

The **accuracy** of defining whether an individual's behaviour is lying through big data is **poor**

Not sure about the real effect

The area of the brain responsible for lying is damaged when humans are infected with **Nguyen virus**, but this may be **irreparable**

Emotion is hard to have a certain anlysis

Lies are **not bipolar**, they are not all wrong, and by looking at other people's thoughts you get a better picture of the truth and **the whole story**

Storyboard

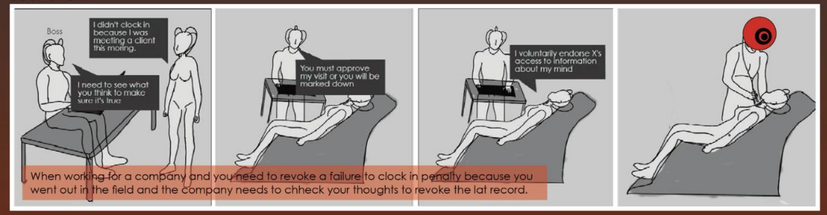
How this will work

The people has no right tp demand that the powers that be display ideas. Instead, they may be monitored for ideas.

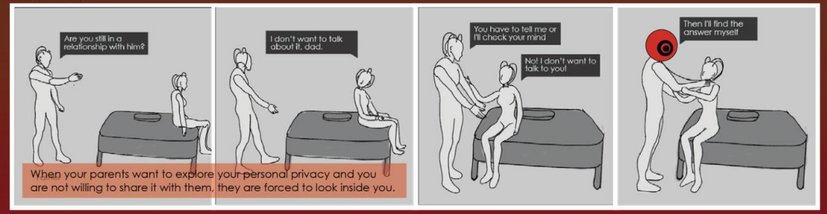
Three scenario are listed in which vulnerable grouos may be subjected to psychological aggression after viewing the thoughts of others

Scenario 1

Scenario 2



Scenario 3



Concept

What I can design

Problems

01 Reduced Opportunities for people to expresss goodwill

Consider the consequences of telling your partner that you think her new shirt is suitable as a rag.
Some things jus don't need to be revealed.

A man was doused with petrol and set alight by opposition protesters

Bruno burned to death for supporting heliocentrism

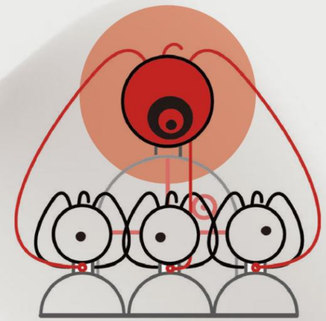
02 More Severe Persecution of Vulnerable Groups

If we could **suddenly discover all the lies**, life in countries where infidelity, homosecuality or certain religious beliefs are illegal **coule be threatened**.

> **Thoughtcrime is the root of all other crimes**

By George Orwell, 1984

Invasion



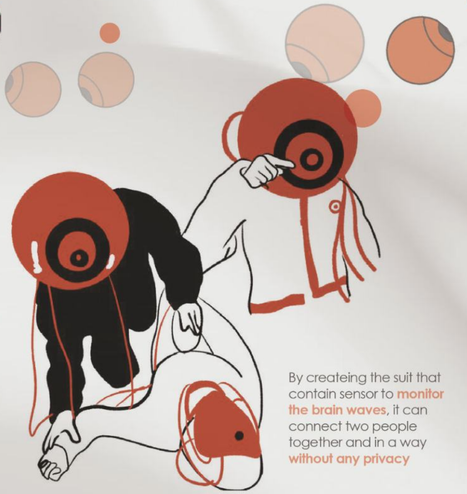
Introspection

When new technology emerges, it must first serve those in positions of power.

> **To protect their power, they will do whatever it takes to control the advantages.**

This is inevitably an **invasion of the person's privacy**, and in the process it may be active, but of course more often than not it may be **forced**.

The visualisation of the project using the **behavioural features** of **"rape"** is an eye-catcher symbol and a good visualisation of one of the possible directions for the future without lies.



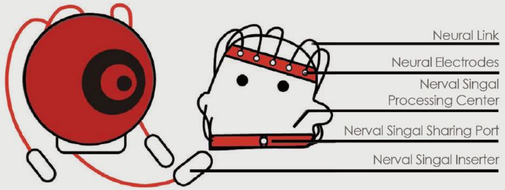
By createing the suit that contain sensor to **monitor the brain waves**, it can connect two people together and in a way **without any privacy**

Prototype

How I make this design

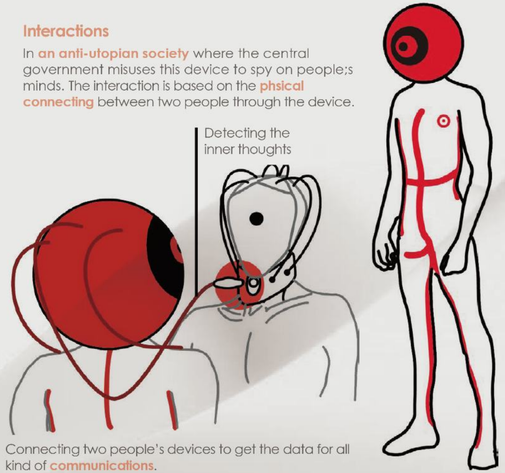
Sensor Introduction

Based on the **Neuroscience**, by analysising the activities of brain waves, the inner thoughts can be transform into **a more concrete language**, including sounds, splashing lighhts and other visuals.

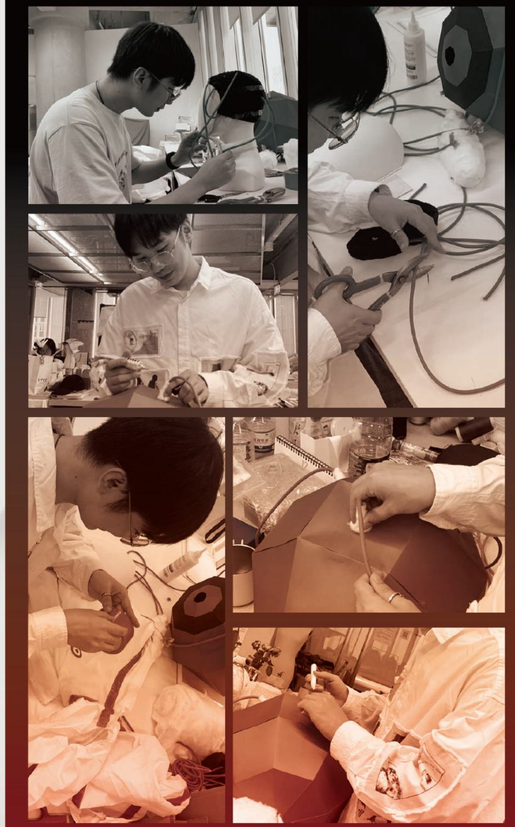


Interactions

In **an anti-utopian society** where the central government misuses this device to spy on people;s minds. The interaction is based on the **phsical connecting** between two people through the device.



Connecting two people's devices to get the data for all kind of **communications**.

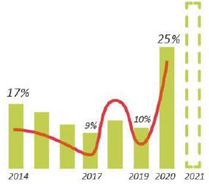


FINAL DESIGN

How I present the product

Tecchnoloy will be used by those in power to protect their power...

Trend Analysis



HIGH growth rate of PC game market

Between 2020, 25% of UK adults had ever played games through a PC, laptop of netbook. This is an increase of **150%** compared to 10% last year due to **COVID-19**.

$37 BILLION worth PC Hardware Market

PC is still the most popular platform for game developers. It's estimated that the PC gaming hardware market will be worth $37 Billion by 2022.

HIGHEST consumer desktop PC demand

COVID-19 coupled with consistent consumer demand created tremendous growth opportunities for PCs throughout the year. The **demand for desktop computers**, which are not easy to carry around, is increasing at a faster rate due to long periods of **working from home**.

Market Trend

The Evolution of Lianli O11D Series

Lianli's case is one of the best selling cases on the market

30% reduction of volume

Lianli's iteration of the case is gradually moving towards a smaller size, probably because most people use the footprint of the case as one of the criteria for their choice when buying a case.

3 types of appearance

Users can choose to place the graphics card vertically or horizontally when installing it. The cooling unit can be placed above, below or to the side of the case. The chassis can be positioned forward on the left hand side or upside down on the right hand side

3 modular accessories

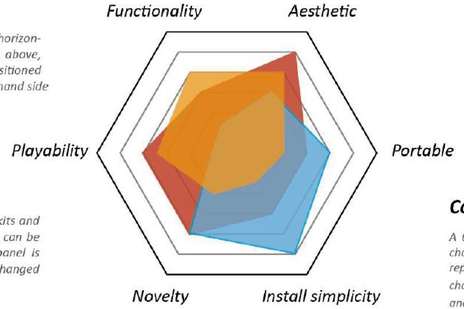
Underneath the chassis users can purchase their own IO kits and install them in a modular way. Also the front side panels can be replaced with IO panels in a modular way. The front panel is compatible with both glass and mesh panels and can be changed at will via the modular interface.

Market research

Market Positioning

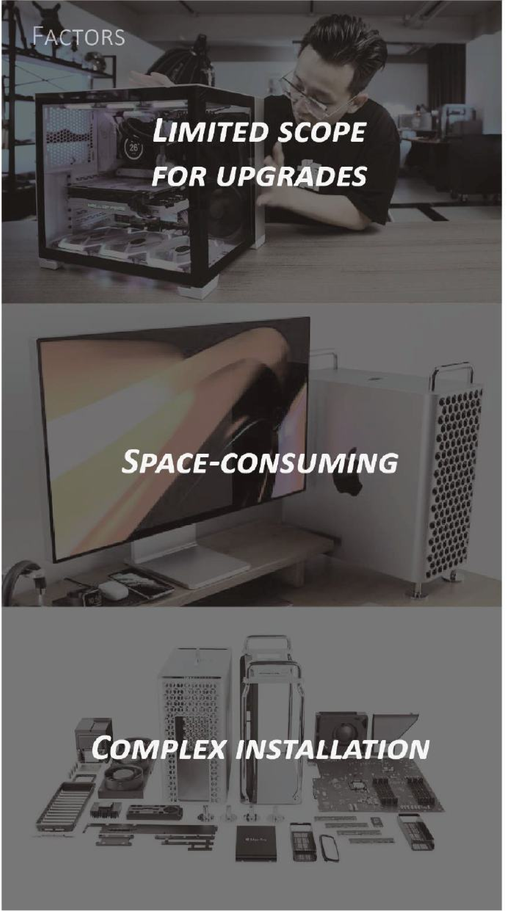
There is a shortage of highly expandable, low installation difficulty products on the PC case market and there is scope for design in this area

6D radar map of PC case



Competitor Product Analysis

A 6D radar map was used to evaluate the 2 types of chassis on the market with high sales volume and good reputation. Different iterations of the same type of chassis were also analysed. Users prefer **better looking** and **easier to install** cases when evaluating them.



OBSERVING

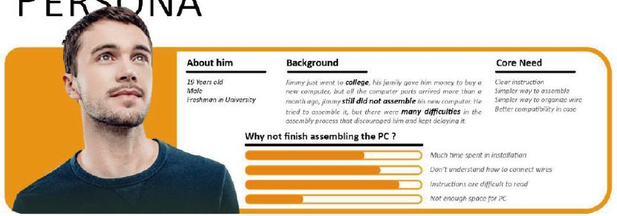
Video

Comments

Further comments from people on the video site about problems ***they have encountered during the installation process*** *reveal that many people have had problems* ***connecting and organising the power cables*** *when installing the mainframe.*

INTERVIEW

PERSONA



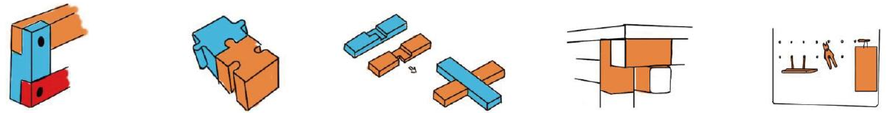
Unclear Instruction
Difficult Installation
Complexities in Wire
Low Expansibility

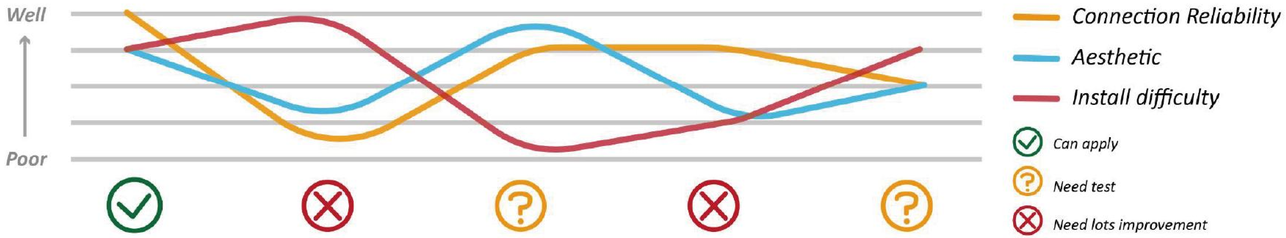
PAIN POINTS

Clear Instruction book
Geometric Installation (Like LEGO)
Hidden wire point to point connecting
Modularization PC case

SOLUTION

MODULARITY RESEARCH



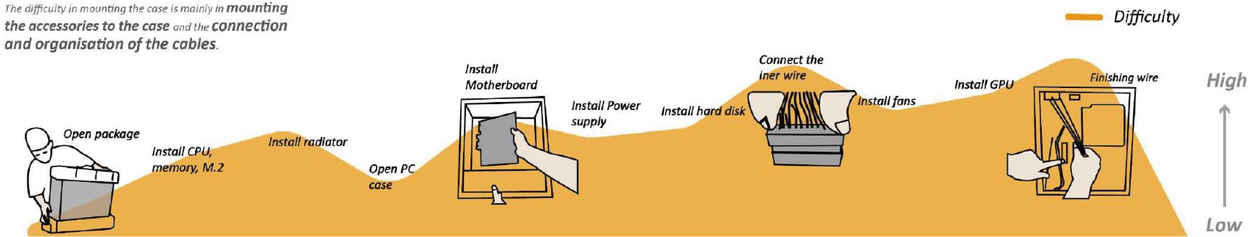


ASSEMBLE FLOW

Difficulty identify

The difficulty in mounting the case is mainly in ***mounting the accessories to the case*** *and the* ***connection and organisation of the cables****.*

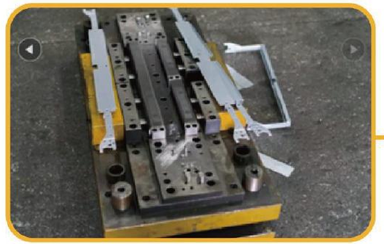
Design opportunity *A fully modular case that can be assembled at will.*



MATERIAL RESEARCH

Disadvantages in metal PC case

The materials for making traditional cases are generally metal and plastics, which generally use a variety of processes, and need to make tooling abrasives.
Typically, 60 to 70 tools are needed to make a ***case mainly made by metal****, and all in all, the* ***cost of designing tools*** *for a case is about* ***$150,000****.*



▲ *A 'tooling' used in PC cases manufacturing.*

▲ *Drill pilot holes for later assembly*

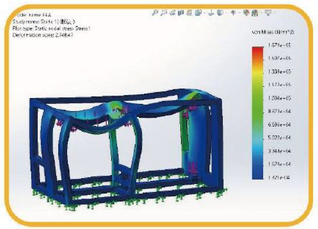
▲ *One of the toolings creates in a PC panel*

▲ *Screwing in the back panel of the case*

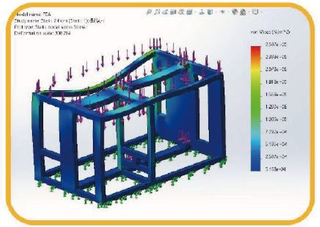
Therefore, I will position the original method of manufacturing the PC cases in ***3D printing****. 3D printing does not require molds, and the modularization of the PC cases will A lot of parts are produced, and if each part needs to make a mold, then the initial investment cost will be very high.*

Structural strength test of plastic case

Under the same structure, metal has a higher structural strength than plastic, so although a plastic case, is lighter in weight than a metal case, it may not have the structural strength required to protect the electronic components inside the case well.
So I have used ***Finite element analysis (FEA)*** *to test whether the plastic case can achieve the desired structural strength.*

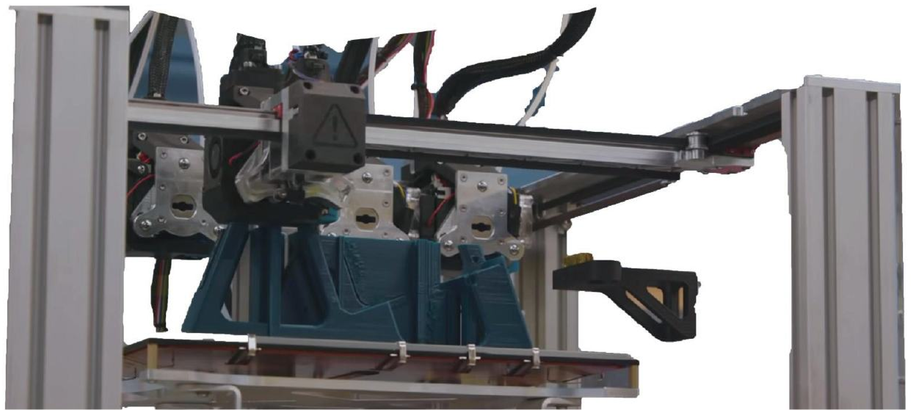


▲ *Basic condition FEA analysis*



▲ *Limit condition FEA analysis*

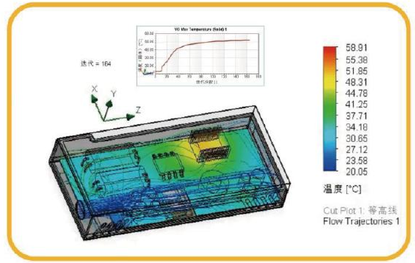
After an FEA in solidworks for the base and limit cases of the plastic chassis, ***the structural strength of the plastic was proven to be adequate.***



Temperature test of plastic case

The melting point of a traditional metal chassis is high, even the extreme temperature of the electronics of a computer (105°C) does not reach the melting point of the metal material of the chassis, but the ***plastic may soften or even melt*** *because of the interior of the chassis. So I will simulate the extreme temperature of the case in solidworks.*

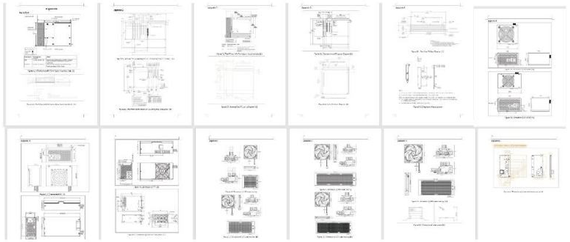
By simplifying the electronics inside the case and performing an extreme temperature test, we can obtain a ***temperature limit of around 60°C*** *inside the case. So the cheap PLA (heat deflection temperature 53°C) is a safety hazard, so it was decided to use* ***ABS*** *(heat deflection temperature 95~118°C) as the preferred material.*

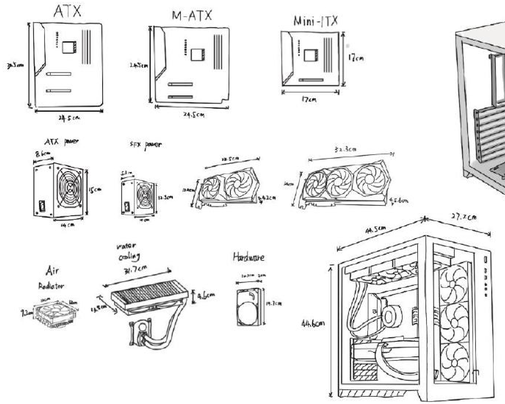


▲ *Limit condition temperature analysis*

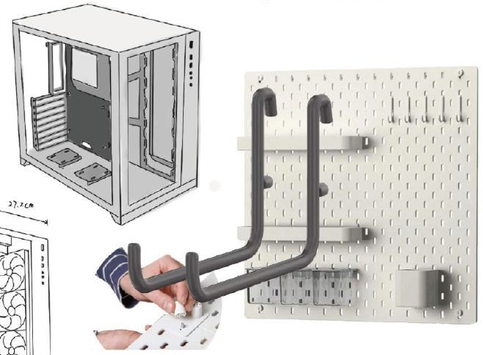
IDEATION & ANALYSE

COMPONENTS SIZE RESEARCH

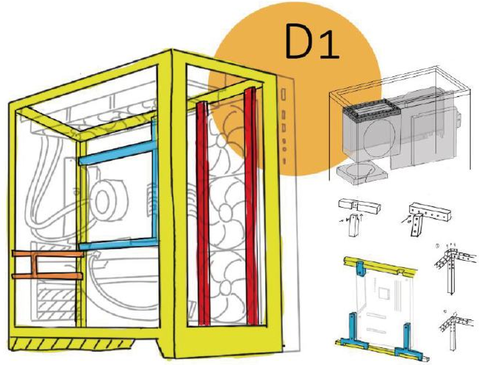




MOODBOARD

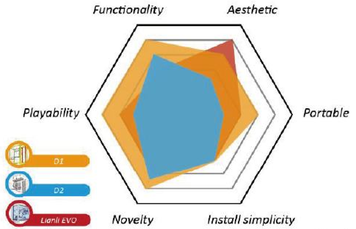


D1

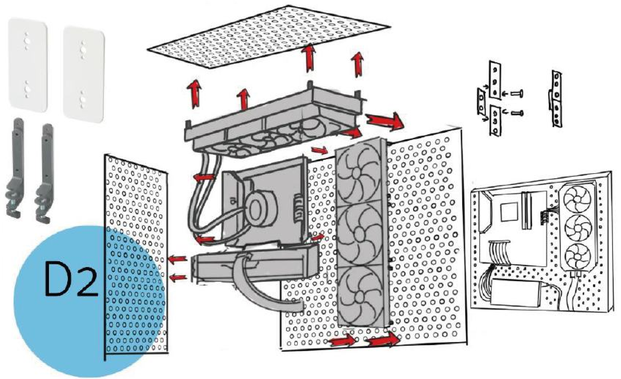


Could be more possibility

Think more functional than the D2 and Lianli cases, with the possibility of adding the required accessories by means of building blocks. There are ***more possibilities*** *in block construction that* ***need to be explored*** *to optimise this solution.*



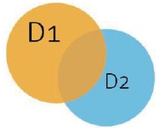
D2



Space Wasting & Low Playability

Although the Pegboard construction is more "intuitive" in terms of installation, the board is ***redundant*** *in terms of space in order to accommodate all the parts and its* ***customisation*** *exists* ***only on a flat surface****. It is also less portable than a building block structure.*

Ideation of



Collection of disadvantages

Combines the disadvantages of directions 1 and 2. Although this solution is easier to install compared to D1 and more portable compared to D2. However it is bulkier, less structurally strong and less expandable.

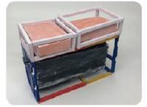
Sketch model

Multiple modular connection options

The same several modules are connected to each other in different ways to obtain a different geometry of the chassis.

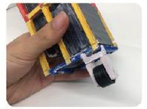
Wire connections need to be considered

When adding new accessories (such as hard drives), you will need to use cables to connect to the motherboard, and if you connect them directly, the cables will be messy.



Framework structure needs improvement

Although the one-piece frame structure is very material-saving, reduce costs and weight, it does not well reflect the characteristics of modular chassis can be combined at will. The center base part cannot be changed, and the strength of this frame structure is weak.



Need for additional accessories

The initial design to the chassis wheel accessories, handle accessories, etc. to assist the movement of the chassis. But these accessories may be able to be used by certain groups of people, but for most people are not necessary. Need to make trade-offs for these accessories.

Development

Fixing with screws

*1.The screws are **easy to remove** and facilitate the maintenance of the internal electronic components. 2.The screws are **more stable** and make up for the instability of the plastic frame. 3 **Reducing the complexity** of the case and it reducing costs*

Wires connected to the case

The addition of new modules to the main-frame requires very complex operations to "connect" them to the mainframe. Wire connections for electronic components done through the chassis frame can solve the problem of wire connections in modularity

Partitioning strategy for wire connections

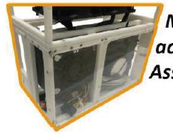
***Breaking down the wire connection problem** into smaller sub-problems: connecting electronic components to their own modules via wires, and then geometrically connecting the modules to each other to make the final connection can reduce the user's confusion about connecting wires.*

Prototype test

Stable enough

Modularity design
Saves desktop space

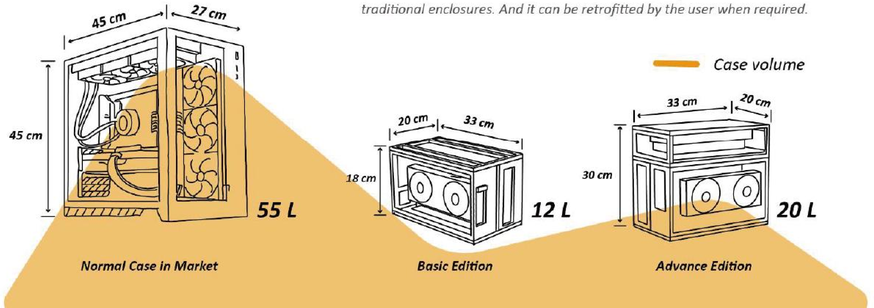
Modular replacement
of electronic components
High Extensibility



Magnet adsorption
acrylic plate
Assemble easily

Size Definition

The modular case is far smaller than a conventional case (88% less volume). This is because modular enclosures remove redundant space that is not needed in traditional enclosures. And it can be retrofitted by the user when required.



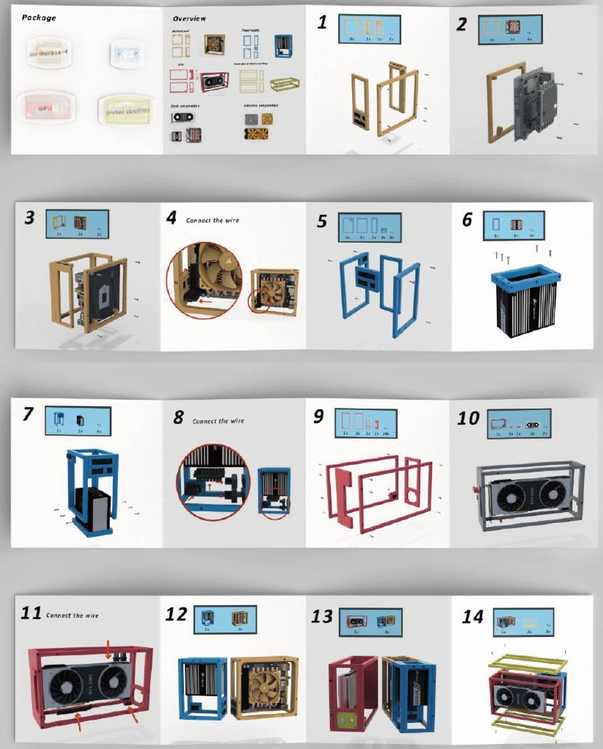
Details

Magnet adsorption
acrylic plate

Compatibility with
multiple frameworks

Customize I/O panels

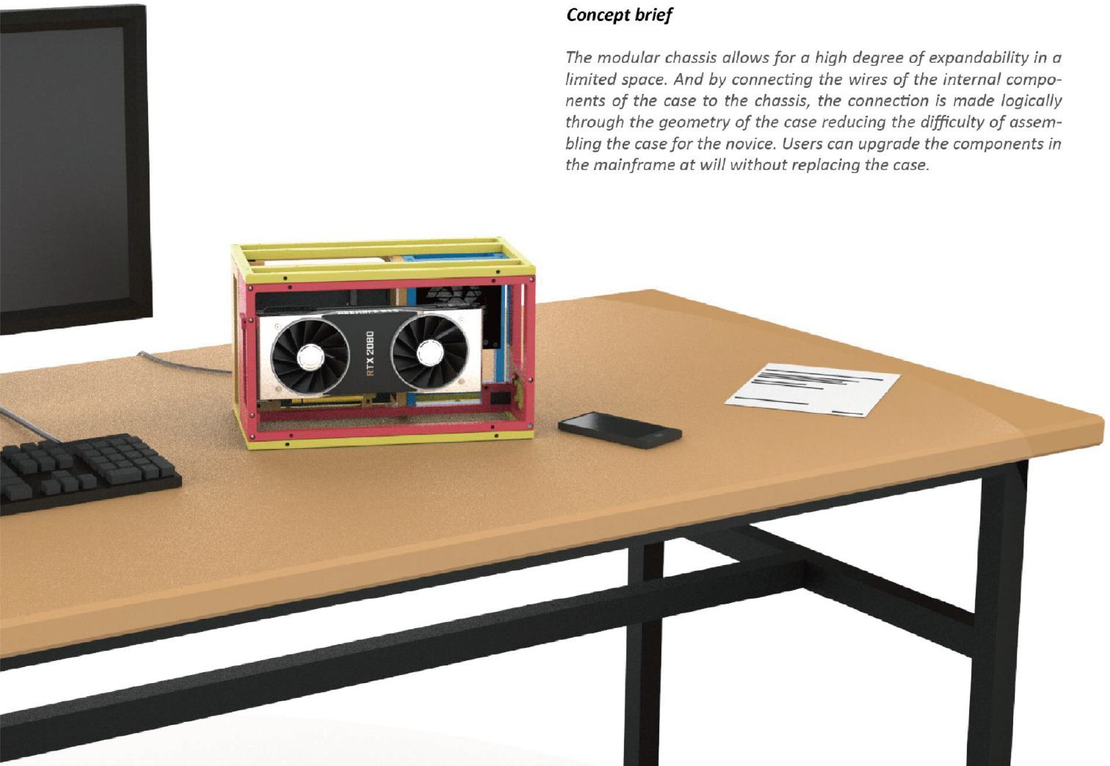
Instruction Book



Rendering

Concept brief

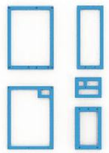
The modular chassis allows for a high degree of expandability in a limited space. And by connecting the wires of the internal components of the case to the chassis, the connection is made logically through the geometry of the case reducing the difficulty of assembling the case for the novice. Users can upgrade the components in the mainframe at will without replacing the case.



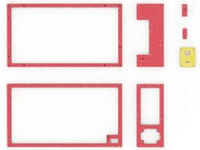
Modular Overview

Motherboard

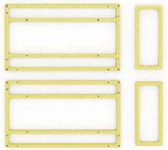
Power supply



GPU



Hard disk & Water cooling



Assembly Options

and more...

Reflection

This project pays special attention to the problems people encounter when choosing and installing enclosures, and reflects on the construction of the enclosures and the way they are installed. Through user experience and interviews, we experienced the obstacles in installing traditional cases and looked for ways to reduce the difficulty of installing cases. The process of installing a chassis was optimized by modularizing the chassis and fracturing the problem, creating a new and easier way to install a custom mainframe.

I think this project may be further developed to design more different modules, such as split water cooling modules, to provide more playability for DIY-loving users.