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Appendix A. Project Brief

IDE Master Graduation
Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

ⓘ **USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT**
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 ! ⓘ

family name	Li	Your master programme (only select the options that apply to you):
initials	given name Sijie	IDE master(s): (IPD) (★ DfI) (SPD)
student number		2nd non-IDE master:
street & no.		individual programme: ___ - ___ (give date of approval)
zipcode & city		honours programme: (Honours Programme Master)
country		specialisation / annotation: (Medisign)
phone		(Tech. in Sustainable Design)
email		(Entrepeneurship)

SUPERVISORY TEAM **
Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair	Gijs Huisman	dept. / section:	HCD
** mentor	Jeff Love	dept. / section:	SDE
2nd mentor			
	organisation:		
	city: Delft	country:	Netherlands
comments (optional)			

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Procedural Checks - IDE Master Graduation

TUDelft

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair Gijs Huisman date 02 · 06 · 2022 signature _____

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: _____ EC

Of which, taking the conditional requirements
into account, can be part of the exam programme _____ EC

○ YES all 1st year master courses passed

○ NO missing 1st year master courses are:

List of electives obtained before the third
semester without approval of the BoE

name _____ date ___ · ___ · ___ signature _____

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: ○ APPROVED ○ NOT APPROVED

Procedure: ○ APPROVED ○ NOT APPROVED

comments

name _____ date ___ · ___ · ___ signature _____

Initials & Name Li Student number 5191874

Title of Project Using haptic technologies to improve e-reading experience and memory

Using haptic technologies to improve e-reading experience and

project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date   01 · 06 · 2022   27 · 10 · 2022   end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

First of all, my graduation project is to provide people who love reading with a better reading experience, and at the same time enhance the long-term memory of reading content through multi-sensory touch and vision. Today, thanks to digitization, publications are no longer fixed, but dynamic and fluid. The convenience of carrying, the diversity of interaction and the convenience of resource acquisition provided by e-reading make e-reading more and more popular. However, there is still a lot of room for exploration in this field based on the more reading experience brought to readers by electronic screens, and it is also the direction that more laboratories and companies want to develop. For example, Immer's reading software can provide users with a multi-scenario reading experience and fit the current user's fragmented reading habits, etc. (figure 1); and Koninklijke Bibliotheek creates an innovative book library, trying to use AR, VR, 360-degree video and other technical means to display text to attract public attention. There are many interactions and feedback that cannot be achieved in physical reading, such as how to make readers immerse themselves in the scene and truly feel the objects in the book; the reader establishes an emotional connection with the objects described in the book through touch and generates emotional resonance; or through touch senses attract readers' attention, enhance their reading concentration, etc. And these can be achieved through e-reading. That's why in this project, I want to explore how to use haptic technology to bring readers a newer and better reading experience based on e-reading. At the same time, I also hope that this project not only explores how to improve readers' reading experience, but also how to increase readers' long-term memory of reading content through embodied design and Human-Computer Interaction in combination with my own reading experience. Nowadays, many haptic technologies have been applied in e-reading, such as simulating the vibrations brought by real situations or actions through several dimensions (amplitude, frequency, etc.), just like building a sound library. [1] Then, by simulating the situations in the book, readers can better understand and remember the scenes in the book. But it is worth verifying whether this enhanced effect really helps readers memorize reading content. It is well known that memory is divided into short-term sensory design, working memory and long-term memory. At present, there are a lot of articles to study the enhancement of multi-sensory for people's working memory, and in these studies, visual and auditory has been proved to increase working memory, and the results of visual and tactile enhancement of working memory are uncertain. [2] But unlike most studies that explore the enhancement of working memory by haptic [2], in this project, I would like to study whether integrating haptic technology into reading can improve readers' long-term memory of reading content. [1] Israr A, Zhao S, Schwalje K, et al. Feel effects: enriching storytelling with haptic feedback[J]. ACM Transactions on Applied Perception (TAP), 2014, 11(3): 1-17. [2]Rath J H. The effects of visuo-haptic presentation on memory[J]. 2013.

space available for images / figures on next page

introduction (continued): space for images

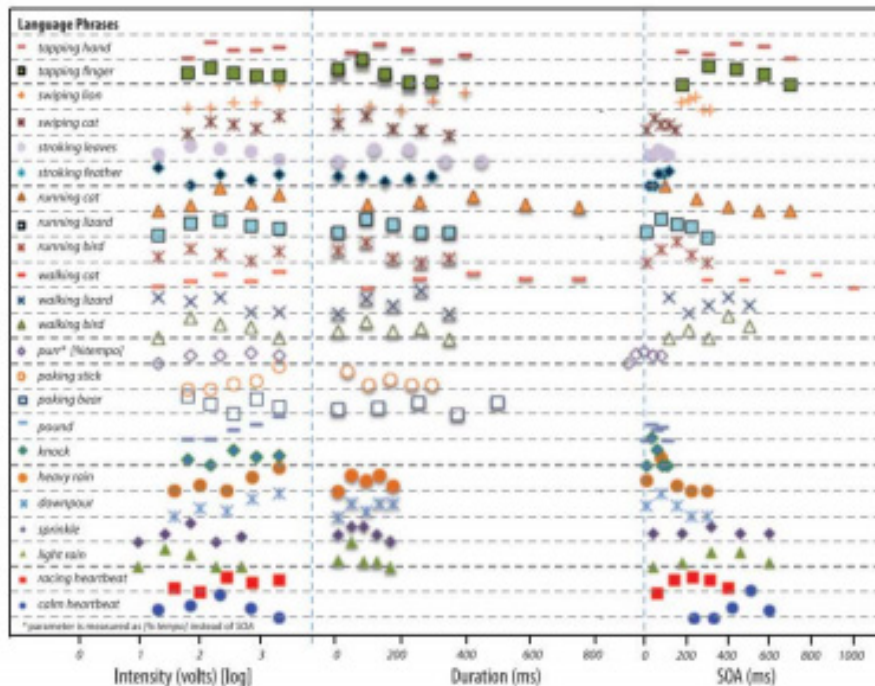image / figure 1:   Immer app interface and its function introduction

Fig. 4.   Distribution of parameters selected by participants in Study 1. The horizontal grids are 10 counts apart.

image / figure 2:   'haptic library' by simulating real-world haptic sensations through amplitude, vibration frequency

PROBLEM DEFINITION **
Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

In the process of reading, because the reading medium is mostly limited by paper books, most people memorize the contents of a book by sight, except for some auxiliary tools, such as bookmarks or dog-earing pages. But with the development of e-reading, readers can have more forms of interaction with e-books, not limited to visuals; at the same time, e-books can also provide more feedback modes. At the same time, will this multi-sensory reading mode provide new opportunities for people's long-term memory of reading content?

Therefore, the purpose of this project is to provide people who love reading with a better reading experience, and at the same time improve the long-term memory of reading content through multi-sensory touch and vision.

This project will focus on the following research questions:

1. Under the background of the rapid development of electronic reading, what are the new reading needs and new reading habits of readers?

2. What changes have occurred in people's reading environment, and will this change bring new opportunities for design?

3. How to apply some interesting and interactive haptic technologies on electronic screens to help people who love to read, provide them with new reading feedback, and improve their reading experience?

4. Can readers improve long-term memory of text in e-books through haptic feedback or haptic technology?

ASSIGNMENT **
State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, …. In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

First, a new reading experience based on haptic technologies is designed for readers:
①It is convenient for users to quickly understand the content of the text.
②It allows users to quickly establish a connection between the sense of touch and the text.
③This connection can also help the user's long-term memory of the text.

- Analysis of haptic technology: A report describing the haptic experience and possible applications of various haptic elements.

- User Analysis: An overview of new needs of readers, ways to produce a good reading experience, and techniques for memorizing text content when readers are doing digital reading.

- Design proposal: An interactive prototype made with haptic elements that can be connected to an electronic screen.

- Other deliverables: Visualization of the final design (picture or video)
        Graduation report

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 1 - 6 - 2022   27 - 10 - 2022   end date
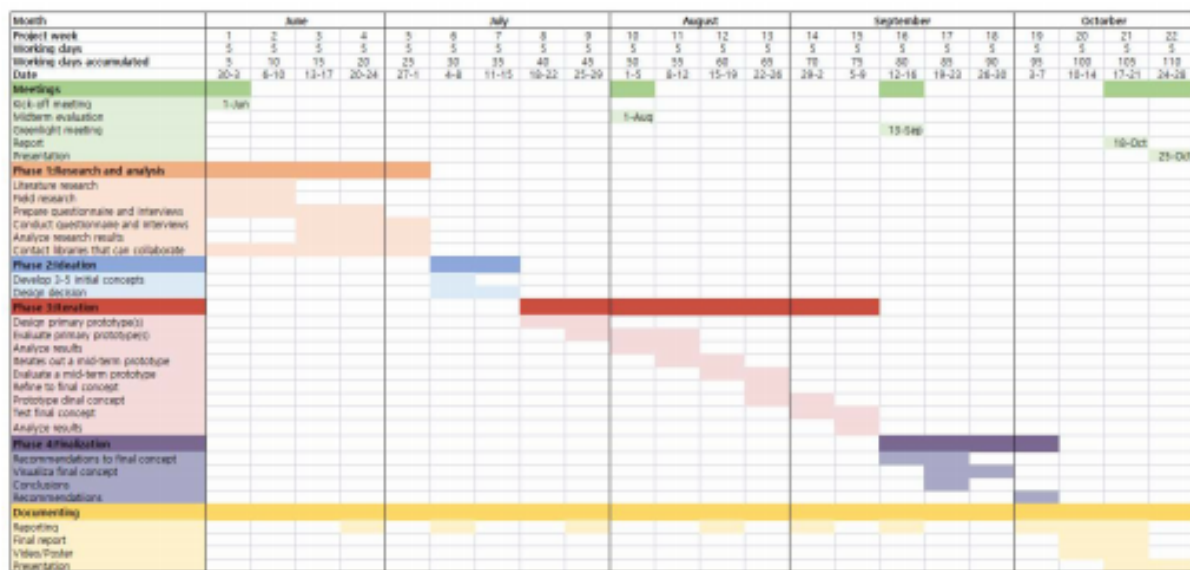
I will work on the project 5 days a week. This project is divided in 4 main phases. 1: Research and analysis, 2: Ideation, 3: Iteration & 4: Finalization.

During phase 1: ① Understand the user's memory method in the process of reading, as well as the scientific memory method. ② Explore what situations and emotions users may be in when reading, and whether these factors lead to changes in memory. ③ Read the literature and various written materials to learn more about haptic technology (the corresponding sensors and how the technology is implemented). ④ Explore needs in their emotional context through interviews and observations with target groups and other stakeholders.
In phase 2: ⑤ Integrate this information into a workable design vision. ⑥ Prototype several haptic augmentations of digital reading materials, and compare their effects, pick the most suitable one or two.
During phase 3: ⑦ Combining with previously explored tactile technologies to explore a viable multi-sensory (visual and tactile) reading experience. ⑧ Create and iterate interesting design concepts with stakeholders (may require at least 2-3 prototyping and testing, concept iterations). ⑨ Integrate all the information to create a final concept and let users experience and test it in a specific scenario.
Finally in phase 4: ⑩ The feasibility and future development direction of the multi-sensory combination of touch and vision in reading is proposed.

Meeting Dates:
Kick-off meeting 01-06-2022   Greenlight meeting: 13-09-2022
Midterm meeting: 01-08-2022   Graduation presentation: 25-10-2022

TU Delft

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, … . Stick to no more than five ambitions.

First of all, as a dfi student, I am looking for an opportunity to combine what I have learned in my master's program, such as how to improve the user's experience in a certain process, how to analyze user needs, how to realize user needs, how to integrate All stakeholders in a process, how to achieve interactive feelings and so on.

During my graduate studies, I often focused on improving digital solutions and user interfaces. But I have to say that human computer interaction and embodied design are areas that I rarely touch. Although it is also closely related to the user's experience and interaction, this is still an area that I am weak but I really want to challenge.

Then, the problem of this research has always troubled me, that is, how to improve people's long-term memory of words, so that people can more easily remember the key content of the book for a long time. So I'm sure the process of exploring this answer will be fun.

At the same time, this project inevitably needs to learn a lot of haptic technologies and technical applications. I need to explore and compare these technologies, apply them scientifically in design concepts; And how to iterate on concepts, how to make prototypes, and how to test prototypes are all areas that I lack but want to strengthen.

In this project, I also want to devote more time to the process of product prototyping, testing, result analysis and then iterating, so that my product can be more "landing" and feasible, rather than a concept product. It is hoped that it will have more clear and accurate data support for the gain effect of the user's experience.

Of course, the audience of this project will lead me to cooperate with libraries or museums. The preliminary research and the later design and testing are inseparable from the target users. It will also make me feel more about reading and tactile senses in the process, which is very interesting.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Appendix B. Participant Information Form

Age	Nationality	Possess electronic reading devices and have e-reading experience	user research	the first iteration	the second iteration	the final evaluation
25	Chinese	✓	✓			
28	Chinese	✓	✓			
24	Chinese	✓	✓			
23	Chinese	✓	✓			
25	Chinese	✓	✓			✓
24	Chinese	✓	✓	✓		✓
26	Chinese	✓	✓	✓		✓
27	Chinese	✓	✓	✓		
25	Chinese	✓	✓			
25	Chinese	✓	✓	✓		
28	Chinese	✓		✓		
27	Dutch	✓		✓		
26	Dutch	✓		✓		
22	Dutch	✓			✓	
23	Dutch	✓		✓	✓	
24	Dutch	✓		✓	✓	
25	Chinese	✓		✓		✓
24	Chinese	✓		✓		
27	Chinese	✓				✓
25	Chinese	✓				✓

Appendix C. User survey questionnaire

What do you usually use to read?

- [ ] printed book
- [ ] ipad
- [ ] phone
- [ ] e-reader such as kindle
- [ ] 其他: _____

Are you proficient in using some tools of e-reading? such as making comments

- ( ) yes
- ( ) no

What methods would you use to help you read and remember?

	take notes	sticky notes	highlight keywords	underscore keyword	write comments	set bookmarks	recap after watching a paragraph	pos readi
printed book	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
ipad	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
phone	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Comparing these three reading ways, which reading experience is better?

- ( ) printed>ipad>phone
- ( ) printed>phone>ipad
- ( ) ipad>printed>phone
- ( ) ipad>phone>printed
- ( ) phone>printed>ipad
- ( ) phone>ipad>printed

Read the news, what are the contents that need to be memorized?

After reading the news, retell the general content of the news

您的回答

Which part of the whole news impressed you the most?

您的回答

What parts of your reading do you think are important and worth remembering?

您的回答

How did you feel during the reading process?

您的回答

Read the story, what are the things that need to be remembered?

After reading the story, retell the general content of the story

您的回答

Which part of the whole story impressed you the most?

您的回答

What parts of your reading do you think are important and worth remembering?

您的回答

How did you feel during the reading process?

您的回答

Appendix D. Memory Ability Test Article

India's mysterious gateway to the stars

By Shabha Barla31st May 2022

Created 300 years ago, Jaipur's Jantar Mantar is an outdoor complex filled with gargantuan astronomy tools designed to be used by the naked eye – and they're still accurate.

It was a week after the spring equinox, on a cloudless and hot afternoon. Perhaps a wrong time to venture out for sightseeing in Rajasthan's desert capital of Jaipur, but a perfect one to measure time with shadows cast by the sun. I strode through the frenzy of the Johri bazaar, the city's main market – its coral walls, delicate lattices and Mughal arches sweeping by as I headed towards the Jantar Mantar, India's mysterious gateway to the stars.

At first glance, this open-air complex filled with strange triangular walls and stairways to nowhere seems out of place: it's neither ornate like the City Palace that surrounds it nor intricate like the revered Govind Dev Ji Temple and Hawa Mahal nearby.

The site – a 300-year-old collection of 20 scientific sculptures called yantra that can measure the positions of stars and planets, and precisely tell the time – had bemused me since my childhood here in Jaipur, when the structures seemed like giant versions of the delicate tools I kept in my school geometry kit. But years later, as a professional architect, I could better comprehend their use. They are ingenious architectural solutions to understanding the mechanics of astronomy, as well as key tools for traditional Hindu astrologers to craft birth charts and forecast auspicious dates.

In 1727, when the region's king, Sawai Jai Singh, conceived Jaipur as his capital and as the country's first planned city, he wanted to design it based on the principles of Vastu Shastra, which draw on nature, astronomy and astrology to inform architecture and placement. He realised that to perfectly align Jaipur with the stars, aid in astrological practices and predict key weather events for crops, he would need instruments that were accurate and accessible.

However, after sending research teams across Central Asia and Europe to collect data based on the knowledge of Islamic and European scientists, Sawai Jai Singh found discrepancies among the readings of the brass instruments that were widely used at the time. To increase accuracy, he scaled up the size of the tools, stabilised them by reducing moving parts and made them resistant to wear and weather by fashioning them out of marble and local stone. Then he used these innovations to build five outdoor observatories in the Indian cities of Jaipur, Delhi, Ujjain, Varanasi and Mathura.

Four Jantar Mantar survive (Mathura's was demolished), but the one in Jaipur, completed in 1734, is the biggest and most comprehensive. Today, it is a Unesco World Heritage site, not only because it's the best-preserved observatory of its kind in India, but as the Unesco inscription explains, it represents innovations in architecture, astronomy, and cosmology, as well as learnings and traditions from Western, Middle Eastern, Asian, and African cultures.//

In Sanskrit, jantar means instruments, and mantar denotes calculator, so each of the yantra in the complex has a mathematical purpose: some are sundials to tell the local time and pinpoint the sun's position on the hemisphere; while others measure constellation and planetary movements to detect zodiac signs and guide forecasts.

The most prominent of all is an enormous equinoctial sundial called the Samrat Yantra, a 27m-high triangular wall with two thin, semi-circular ramps that radiate like wings from its sides. Standing beneath it, my guide pointed out the shadow on one of the ramps as it moved precisely 1mm every second and indicated the local time within an accuracy of two seconds. Another yantra, the Jai Prakash, measures the sun's trajectory through the Indian Vedic zodiac signs to determine horoscopes. Its bowl-shaped structure, which is set into the ground, is like an inverted map of the sky, and a tiny metal plate suspended on a crosswire casts a shadow to show the position of a chosen star or planet.

"I used these instruments in my two years of the master's programme quite often," said Neha Sharma, who now holds a doctorate in Jyotish Shastra (Vedic astrology) from Rajasthan University. "Learning to read and calculate from these instruments is still a compulsory part of the curriculum for anyone who wants to pursue astrology as a career option."

However, most of the modern scientific world viewed the Jantar Mantar observatories as a novelty until renowned Indian astrophysicist Dr Nandivada Rathnasree argued that the structures were still pertinent. In her role as the director of Delhi's Nehru Planetarium (from 1999 until her death in 2021), she encouraged students to gain hands-on experience of positional astronomy at the various Jantar Mantar, and pushed for their academic and international recognition. "It was Nandivada Rathnasree who got Jantar Mantar into the limelight in the scientific fraternity," said Rima Hooja, an archaeologist and consultant director of the Maharaja Sawai Man Singh II Museum in the City Palace. "She also played a pivotal role in getting Jantar Mantar Jaipur recognised as a Unesco World Heritage site."

The Jantar Mantar continues to garner fame, not only for its architectural ingenuity but for its classical style. "Superficially, Jantar Mantar may not look like an indigenous architecture," said Kavita Jain, a conservation architect based in Jaipur. "But when you look at it closely, the high-rise sundial is made stable by creating voids in the form of arches. The Hindu canopies crowning the instruments, the marble and the stone used in the construction are all reminiscent of local architectural values."

Today, students, scientists and tourists from many disciplines and cultures across the world understand that Jaipur's Jantar Mantar is much more than a historical monument. Situated at the core of a thriving ancient city of forts and palaces, its monolithic structures continue to mirror the cosmos and create a lasting legacy.

Ancient Engineering Marvels is a BBC Travel series that takes inspiration from unique architectural ideas or ingenious constructions built by past civilisations and cultures across the planet.

Chapter 1 My first home

The first place I can remember well was a pleasant field with a pond of clear water in it . Trees made shadows over the pond , and water plants grew at the deep end . On one side was another field , and on the other side we looked over a gate at our master's house , which stood by the roadside . At the top of our field were more tall trees , and at the bottom was a fast-running stream .

While I was young , I lived on my mother's milk , but as soon as I was old enough to eat grass , my mother went out to work during the day and came back in the evening .

There were six other young horses in the field , although they were older than I was . We all galloped together round the field , and had great fun . But sometimes the others would kick and bite .

'They are young farm horses and haven't learned how to behave . 'my mother told me . 'You are different . Your father is well known , and your grandfather twice won the most important race at Newmarket . Your grandmother was quiet and gentle , and you have never seen me kick or bite , have you ? I hope you will grow up to be gentle and a willing worker , and never bite or kick . '

I have never forgotten my mother's advice . She was a clever and sensible old horse . Her name was Duchess , but our master often called her Pet . He was a good , kind man , and my mother loved him very much . Whenever she saw him at the gate , she trotted across . He used to pat her and say , 'Well , old Pet , and how is your little Darkie ? 'I was a dull black colour , so he called me Darkie . He sometimes brought a piece of bread for me , or a carrot for my mother , and I think we were his favourites .

When I was two years old , something happened which I have never forgotten . It was early spring , and there was a light mist over the trees and fields . I and the other young horses were feeding at the lower end of the field when we heard the distant cry of dogs .

The oldest among us lifted his head to listen . 'There are the hounds ! 'he said , and immediately raced off . The rest of us followed him to the top of the field , where we could see several fields beyond .

My mother and another old horse were standing near . 'They've found a hare , 'said my mother , 'and if they come this way , we shall see the hunt . '

Soon the dogs were all racing down the field next to ours , making a loud'yo-yo-yo-yo ! 'sound at the top of their voices . After them came men on horses , some in green coats , and all galloping as fast as they could . Suddenly , the dogs be-came silent and ran around with their noses to the ground .

'They've lost the smell of the hare , 'said the old horse . 'Perhaps it will escape . '

But the dogs began their'yo-yo-yo-yo ! 'again and came at full speed towards our field . Just then a hare , wild with fear , ran towards the trees . The dogs jumped over the stream and ran across the field , followed by the huntsmen . Six or eight jumped their horses over the stream , close behind the dogs . Be-fore the hare could get away , the dogs were upon her with wild cries .

We heard a terrible scream , and that was the end of the hare . One of the men picked her up and held her by the leg . She was covered in blood , but all the huntsmen seemed pleased .

I was so greatly surprised that at first I did not see what was happening by the stream , but when I did look , I saw a sad sight . Two fine horses were down , one in the stream and the other on the grass . One rider , who seemed unhurt , was climbing out of the water , but the other lay quite still .

'His neck is broken , 'said my mother . 'I can't understand why men are so fond of this sport . They quite often hurt them-selves and ruin good horses , all for one hare that they could get more easily some other way . But we are only horses , and don't know why men do these things . '

They carried the dead rider to our master's house , and I heard afterwards that it was George Gordon , the only son of a local landowner , and a fine young man .

A man from the village came to look at the black horse on the grass . The animal was in great pain and one of his legs was broken . The man began to feel the horse all over , then he shook his head . Someone ran to our master's house and came back with a gun . Soon after , there was a loud bang and a terrible cry , then all was still . The black horse did not move again .

My mother was very unhappy . 'I've known that horse for years , 'she said . 'His name was Rob Roy . He was a good brave horse . 'She never went near that end of the field again .

Not many days after , we heard the church bell and saw a long , strange black carriage , pulled by black horses , they were taking the body of young George Gordon to the churchyard to bury him . He would never ride again . I never knew what they did with Rob Roy , but it was all for one little hare .

Appendix E. Ideation session result

Simulate real-world dynamic haptics through haptic sensors,
so as to achieve a more immersive effect for readers.

Interact with people and convey emotions

"Touch" with people who have read the same book and even "touch" with the ancients

If you are a traveler, back to ancient times?

Puzzle interactive wall to help people remember and feel history?

Play a video of the same content as the article before reading, simulating the scene to vibrate, allowing people to quickly understand the background of the story

AR/VR library

Read with ar or vr

With background music, simulate a real scene

Use different kinds of tags to categorize books, and every time you read a new book, there will be vibrations corresponding to the tags

When turning a page, will it give a tactile feedback to the fingertips? Simulate book pages swiping your fingers or something?

mobile library

White noise with matching vibration

Build a library of vibrations that simulate the haptic effects of real objects

Put the haptic behaviors that only exist in
reading printed books into the e-reading process

When turning a page, will it give a tactile feedback to the fingertips? Simulate book pages swiping your fingers or something?

Simulate the appearance of turning pages of books with different materials through vision and touch

Allows readers to set an alarm clock-like program

When readers read a new book, the e-book will also appear similar to the plastic film packaging, increasing their sense of ritual

When the reader reads the same book for the second time, the text marked by the reader in the last reading will appear.

own history book

Each year, choose the historical event you think is most impressive to you to create a history book for a country or region. Clip art?

Make history clip art by yourself from various materials (corresponding to the history book you are reading)

Help people effectively remember historical events by pulling the timeline

Through the interactive feedback of the vibration expression system, it is communicated that the electronic device has received the user instruction.

Give readers a slight vibration feedback every time they turn a page

Whenever the reader uses the apple pen to perform a new operation, the pen will vibrate slightly as a reminder

Sharing information between users who read the same history book or observe the same cultural relics through tactile interactive sensors (such as vibration sensors)

Set a reading goal before reading. After completing the goal, you will be notified by vibration that you have completed the goal.

Add a little emotionality by vibrating when they're marked

When you mark emoji, the corresponding sound effect and vibration will appear

Create different haptics Or formulate different haptics to stimulate people's tactile memory

Or attract readers' attention with different touches

Test the reader's reading speed

According to the reading speed, arrange the corresponding vibration rhythm to prompt them to read

Use touch to implement only some of the help memory tricks that appear in the print text

Use touch to interpret the meaning of unknown words, like a translation software

Writing   highlight   set bookmarks

Different content marked in different ways?

Use different pressures brought by different writing postures to switch tools?

Or switch tools at different positions of the grasping pen, and the positions are distinguished by different materials?

Use vibrations to describe and mark people, times and places

Click on some words, the corresponding vibration and sound will appear

There will be a time axis, and the time axis is the mark of the vibration effect, and then assists people's secondary memory

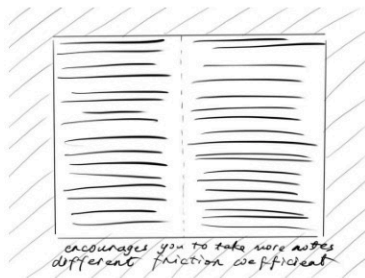Vibrates to remind readers to review after each chapter is read

refutation of the idea of a timeline

in World War II, different countries started at different times. Using a timeline to summarize history is a relatively rudimentary approach.

Others

encourages you to take more notes
different friction coefficient
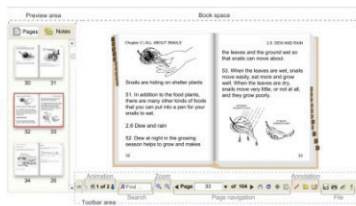
Pressure and Gesture Recognition Objects

Read in a fixed vibrating rhythm to keep the reader focused, just like timed page-turning software
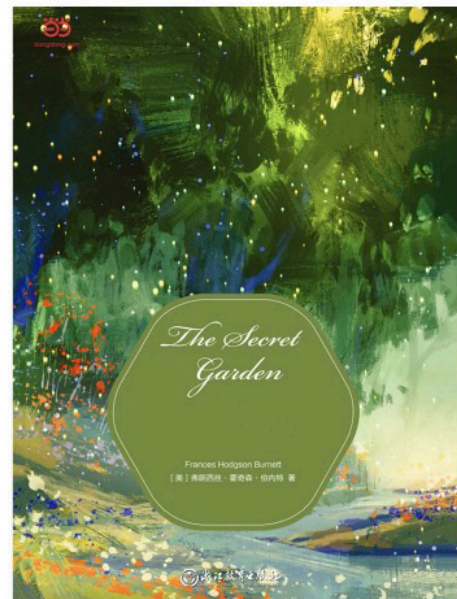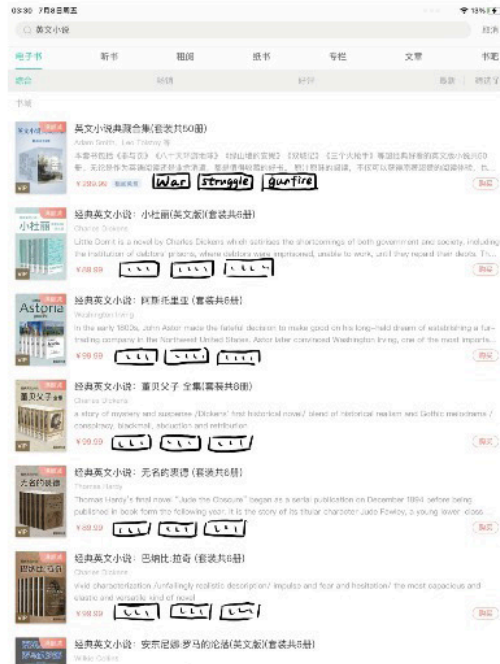
Reduce the space of the text part, leave more places for writing, change the friction coefficient of these places, and encourage people to write notes

Appendix F. Idea selection in Miro board

before reading

1. priming a mindset
2. Create a sense of ritual before reading

during reading

1. take notes
2. Highlight or underscore keywords
3. set bookmarks
4. some touch feeling
. Practice Testing
. Social Annotation
. other methods

When reading this book for the first time, some labels will appear next to the book, and the labels are set for readers who have read the book before. When readers click on it to start reading, some pictures and vibration effects (animation or something) corresponding to these words will appear, allowing readers to enter the initial reading state.

BEFORE READING
> Examine the front and back covers (books)
> Read the title and any subtitles
> Examine the illustrations
> Examine the print (bold, italics, etc.)
> Examine the way the text is set up (book, short story, diary, dialogue, article, etc.)

As you examine and read these, write questions, and make predictions and/or connections near these parts of the text.

DURING READING
Mark in the text:
> Characters (who) ○
> When (setting)
> Where (setting) □
> Vocabulary ∼∼∼∼
> _____ Important information

Write in the margins:
> Summarize
> Make predictions
> Formulate opinions
> Make connections
> Ask questions
> Analyze the author's craft
> Write reflections/reactions/comments
> Look for patterns/repetitions

AFTER READING
> Reread annotations—draw conclusions
> Reread introduction and conclusion—try to figure out something new
> Examine patterns/repetitions—determine possible meanings
> Determine what the title might mean

Use the "After Reading" strategies to write a notebook entry.
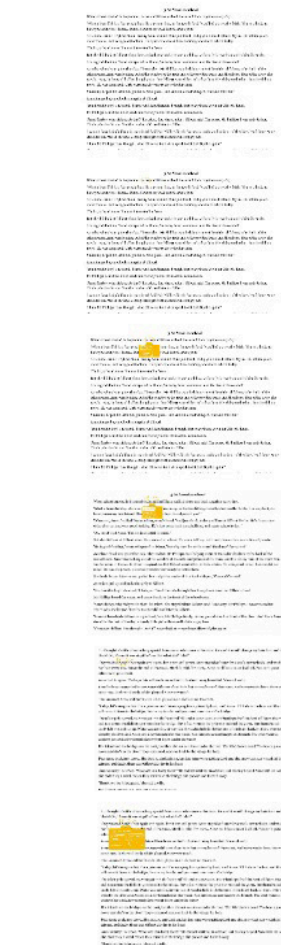
1. Readers mark the names of different characters with circles of different colors.
2. After the name is circled, the page will automatically jump out of the verbs that appear before and after the name.
3. The reader chooses among these verbs what the character does.
4. After selection, the sound and vibration corresponding to this verb will appear at the same time (refer to lofelt studio)

5. If the name appears again after a period of time, the system will automatically circle it for you with the same color, and when the reader clicks on it, it will automatically emit the previously saved sound and vibration.
6. At the same time, you can also re-edit new actions into it.

The time and place are the same, just framed instead.

The wavy line draws out key words or some proper nouns, and these underlined words can be made into a word book.

The reader can directly underline the sentences he deems meaningful.

When you see interesting emotional content, readers can double-click to record and share their emotions, and then the screen will respond with vibration

The Secret Garden

Frances Hodgson Burnett

1. recap after watching a paragraph
2. write a mind map

Every time you finish reading, all characters will form a character book, which records all the marked behaviors of this character, and clicking on this behavior will automatically link to the original text at the marked place.
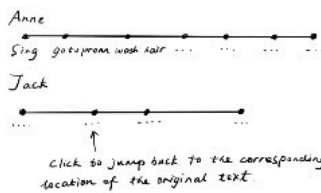
The framed time will be made into a timeline, a location or a map. Clicking on a specific time and place will send out corresponding vibrations and sounds to remind readers of the corresponding things. Type or write to fill the timeline and map)

Vocabulary will be combined into a word book, all words will become a word index, linked to the corresponding Wikipedia, and pictures can be added automatically.

Character

Anne

Sing gotoprom wash hair ...   .

Jack

....

Click to jump back to the corresponding location of the original text.

These records may be recorded by the way when reading, or they may not be recorded when reading. There is only one sound and vibration here, with this prompt designed for readers after reading
An answer sheet to have them follow this prompt to complete this timeline

Timeline

1941   1942.9   1969   2002.2   2002.5

Map

xxx house   xxx School
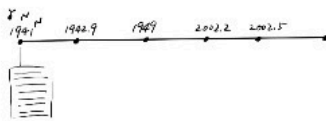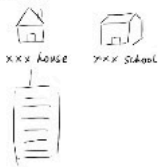
If the map is a real location, it can also be directly imported into Google Maps as an identification

Map

Vocabulary book

brass instruments

ak.m.wikipedia.org

When you read the book for the second time, when you click on the book, the meaningful sentences you underlined the last time will appear one by one, accompanied by pictures, corresponding vibrations and sounds, to help readers recall the last time the book was read. content and feelings.
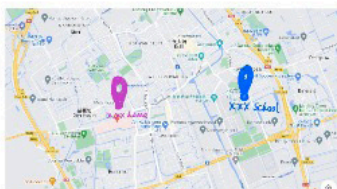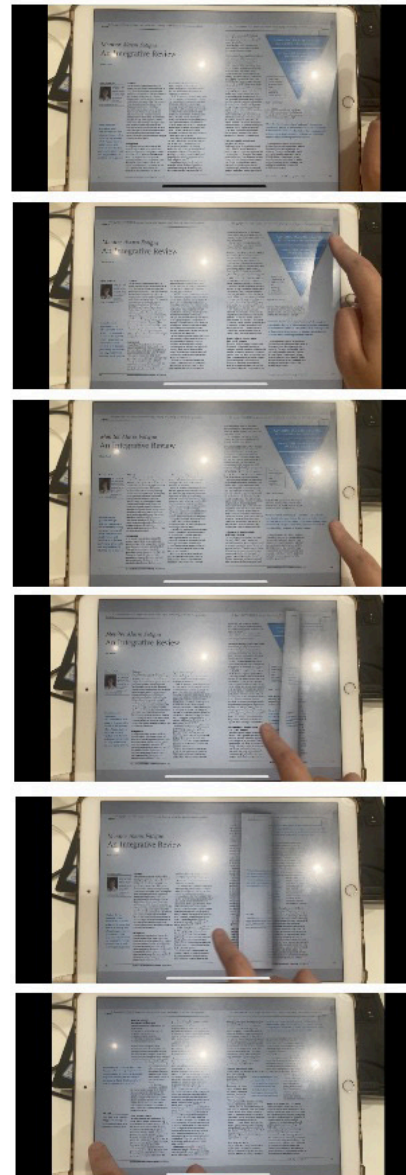
When flipping the book, the more you turn to the back, the shorter the vibration time, the smaller the frequency and amplitude

Appendix G. The first iteration of the questionnaire

haptic reading prototype test

thatphonograph0911@gmail.com （未分享） 切换帐号

Have you had any experience reading with an ipad before?

○ Yes

○ No

○ sometime

haptic reading prototype test

thatphonograph0911@gmail.com （未分享）切换帐号

Concept 1 vibration

What do you think is the purpose of this interaction?

您的回答

How useful does this vibration curve seem to you on a scale from 1 to 5?

	1	2	3	4	5	
useless	○	○	○	○	○	useful

How logical was the order of the steps in this prototype for you, on a scale from 1 to 5?

	1	2	3	4	5	
illogical	○	○	○	○	○	logical

Do you think the process of using this prototype is easy, on a scale from 1 to 5?

	1	2	3	4	5	
uneasy	○	○	○	○	○	easy

Would you use a vibration curve to help you read? Why(not)?

您的回答

Do you think vibration curve will improve your reading experience? Why(not)?

您的回答

Do you think this vibrational curve will improve your memory of the content? why (not)?

您的回答

Where do you think the vibration curve could be improved?

您的回答

Appendix H. SUS form for evaluation test

	SUS	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I think that I would like to use this website frequently.	☐	☐	☐	☐	☐
2.	I found the website unnecessarily complex.	☐	☐	☐	☐	☐
3.	I thought the website was easy to use.	☐	☐	☐	☐	☐
4.	I think that I would need the support of a technical person to be able to use this website.	☐	☐	☐	☐	☐
5.	I found the various functions in this website were well integrated.	☐	☐	☐	☐	☐
6.	I thought there was too much inconsistency in this website.	☐	☐	☐	☐	☐
7.	I would imagine that most people would learn to use this website very quickly.	☐	☐	☐	☐	☐
8.	I found the website very cumbersome / awkward to use.	☐	☐	☐	☐	☐
9.	I felt very confident using the website.	☐	☐	☐	☐	☐
10.	I needed to learn a lot of things before I could get going with this system.	☐	☐	☐	☐	☐

Source: UIUXTrend.com

Appendix I. AttrakDiff form for evaluation test

Assessment of **Explore the haptic e-reading experience**

With the help of the word pairs please enter what you consider the most appropriate description for **Explore the haptic e-reading experience**.

Please click one item in every line.

human*	○	○	○	○	○	○	○	technical
isolating*	○	○	○	○	○	○	○	connective
pleasant*	○	○	○	○	○	○	○	unpleasant
inventive*	○	○	○	○	○	○	○	conventional
simple*	○	○	○	○	○	○	○	complicated
professional*	○	○	○	○	○	○	○	unprofessional
ugly*	○	○	○	○	○	○	○	attractive
practical*	○	○	○	○	○	○	○	impractical
likeable*	○	○	○	○	○	○	○	disagreeable
cumbersome*	○	○	○	○	○	○	○	straightforward

Please click one item in every line.

stylish*	○	○	○	○	○	○	○	tacky
predictable*	○	○	○	○	○	○	○	unpredictable
cheap*	○	○	○	○	○	○	○	premium
alienating*	○	○	○	○	○	○	○	integrating
brings me closer to people*	○	○	○	○	○	○	○	separates me from people
unpresentable*	○	○	○	○	○	○	○	presentable
rejecting*	○	○	○	○	○	○	○	inviting
unimaginative*	○	○	○	○	○	○	○	creative
good*	○	○	○	○	○	○	○	bad

Please click one item in every line.

confusing*	○	○	○	○	○	○	○	clearly structured
repelling*	○	○	○	○	○	○	○	appealing
bold*	○	○	○	○	○	○	○	cautious
innovative*	○	○	○	○	○	○	○	conservative
dull*	○	○	○	○	○	○	○	captivating
undemanding*	○	○	○	○	○	○	○	challenging
motivating*	○	○	○	○	○	○	○	discouraging
novel*	○	○	○	○	○	○	○	ordinary
unruly*	○	○	○	○	○	○	○	manageable

Appendix J. AttrakDiff results

Description of word - pairs

	Word pairs
PQ	technical - human
	complicated - simple
	impractical - practical
	cumbersome - strightforward
	unpredictable - predictable
	confusing - clearly structured
	unruly - manageable
HQ-I	isolating - connective
	unprofessional - professional
	tacky - stylish
	cheap - premium
	alienating - integrating
	separates me - brings me closer
	unpresentable - presentable
HQ-S	conventional - inventive
	unimaginativ - creative
	cautious - bold
	conservative - innovative
	dull - captivating
	undemanding - challenging
	ordinary - novel
ATT	unpleasant - pleasant
	ugly - attractive
	disagreeable - likeable
	rejecting - inviting
	bad - good
	repelling - appealing
	discouraging - motivating

www.attrakdiff.de

-3   -2   -1   0   1   2   3

■ Product:Explore the haptic e-reading experience (n=6)