Ody-C

Navigating memories through photos


N
W
E
S
Ody-C
Navigating Memories
Through Photos

Abstract

Ody-C is a smartphone application that allows users to rediscover their static photo collections. Most of us have thousands of photos on our smartphones that we almost never look at; Ody-C is a creative proposal for navigating these images in a new and embodied way, removed from their chronological context. It is based on extensive research about our digital curation and navigation habits.

Inspired by a compass, which helps a person find their way around their environment by always pointing north, Ody-C creates an opportunity to re-explore photos previously buried in one's gallery.

By extracting the GPS coordinates of the images and mapping them to the cardinal directions in which they were taken, they are displayed relative to the user's position. Users are able to rediscover their photos in the real world by physically turning around. Depending on their current location, a different section of their collection is displayed – so the experience is always different.

The photos are displayed as clusters on the interface. By zooming in on them, the user is able to gain more information about the images. As these layers of information unfold, so do the memories.

This immersive approach turns the body into an active navigation tool, which allows the user to familiarise themselves with their environment.

Title: Ody-C – Navigating Memories Through Photos

Authors: Mo Bünzli / Tanja Landolt
Matriculation No.: 21-587-688 / 21-587-738

Date: June 2024
Mentors: Dr. Joëlle Bitton, Verena Ziegler
Editors: Daniel Grohé, Lancelot Amstutz
Typeface: Inter

Ody-C

Navigate your memories

9:41

1500 km

1000 km

N

W

E

S

Continental view

9:41

2022 2023 2024

9:41

3. April 2024

Plemmirio, Italy

Share

Favourites

Hide

Delete

Declaration of Autonomy

All text in this thesis was written by us.

Some sections were originally written in German and then translated into English using www.deepl.com/translator. For these sections, we took great care to ensure the original wording was retained.

In regard to AI usage, we used ChatGPT by OpenAI to assist with code experiments, as described in Chapter 4, Project Development. Each instance of usage is declared in the respective paragraph.

All images were taken by us unless declared otherwise.

Acknowledgements

First and foremost, we would like to thank our mentors, Verena Ziegler and Dr. Joëlle Bitton, for supporting us with our project throughout the process. We would like to give special thanks to Dr. Joëlle Bitton for her consistently helpful advice with this thesis.

We are very grateful to Verena Ziegler, Stella Speziali, and Lisa Ochsenbein for allowing us to participate and conduct a workshop in their 4th-semester interdisciplinary module “Anarchiving Practices”, which was an invaluable opportunity for us early in the process to learn about our users’ needs and guide our process.

We are especially grateful to Florian Wille for guiding us in the area of UX/UI design in a crucial moment of the process, which allowed us to bring the project outcome to another level.

We are also very thankful to all of our fellow graduating students in Interaction Design, who provided valuable feedback and helped us in moments of indecision.

Finally, we extend our sincere thanks to our editor Daniel Grohé and our copy editor Lancelot Amstutz.

Table of Contents

1. Introduction

With the availability of inexpensive and abundant storage space, it is easy to endlessly accumulate digital files. This can especially be seen in the way we collect digital photos. Our smartphones are always at hand, and a new photo can be taken easily without a second thought. In many ways, this is a great thing; more people than ever before have access to high-quality photography tools, and these images can serve many different purposes, for example to aid our memory, to help us communicate, or to document important information.

However, this has also impacted our relationship with photos in a negative way. The easy access to photography often results in a quantity of images that can be overwhelming. We collect a large amount of digital clutter, and the sheer number of photos and their lack of curation might devalue the individual moments we capture. Organising these enormous archives is time-consuming, unrewarding, and contributes to our emerging technological fatigue.

The primary objective of this project was to investigate ways in which we might bring new life to these static photo archives and to renew their relevance in our lives. We were also interested in using photo metadata as a means to this end, as it contains a lot of information about photos already. We believe that it has a lot of potential for creating new, unexpected contexts for these images to exist in. Within the general topic of metadata, we focused specifically on geolocation metadata.

As we learned along the way, our convenient access to the GPS tools incorporated into our smartphones has led to a deterioration of our spatial navigation skills. Therefore, we also aimed to investigate ways of strengthening these abilities while following the existing trajectory of our project.

Through our highly iterative design process, in which we first explored the topic of personal digital collections and then narrowed it down to the intersection of smartphone photo archives and spatial navigation as described above, we were led by the

following, consecutive hypotheses: (1) By designing a tool or framework for personal digital curation, we can generate a positive impact on users' ability to curate and revisit digital content. (2) By using geographical metadata, we can develop a smartphone application that lets the user explore their personal digital photo archives in a new and interesting way.

We believe we are contributing a fresh and exciting design proposal to the field of interaction design by suggesting a new way to creatively engage with personal photo archives. According to our research, the area of re-accessing static digital archives is underexplored at this point in time. This is especially true for personal archives.

This thesis is organised as follows: Chapter 2 follows our desk research, which includes our initial user research, three preliminary expert interviews we conducted, a review of the existing literature, and an overview of the art and design field. In Chapter 3, we present the project concept that developed after our research, as well as further details about our intended contribution and the way we included our stakeholders in the process. Chapter 4 follows the development stage, where we made a series of first design investigations into the topic to help us ideate, which eventually led us to our final hypothesis and our final project outcome. Then, we conducted several series of user testing to verify the viability of the product. Finally, in Chapter 5, we evaluate our process and product, and suggest follow-up steps to take after the conclusion of this thesis and project.

2. Research

2.1. Initial Assumptions, Research Questions, Hypothesis

Our initial interest was especially focused on the topic of general digital collecting and archiving. Later we saw great potential for design interventions in this area. We expanded from there to encompass personal photo archives, and eventually, led by the component of geographical metadata in personal photo archives, we introduced the aspect of spatial navigation.

Our initial **main assumption** was as follows:
- Most people store their digital belongings in an inefficient way.

From which we derived these **additional assumptions**:
- The way we capture and store our digital belongings does not sufficiently serve our motivations for doing so in the first place.
- Information fatigue leads to people not wanting to deal with the hoard of data they have accumulated.
- The limitless amount of storage we have available to us is a large part of the problem. Fostering a more prominent element of intention, and purposely decreasing our available storage space, will encourage more mindful digital collecting habits.
- We are less selective with the things we keep now (compared to when storage space was scarcer).
- We amass so many files (and then do not delete them) due to our lack of ability to visualise them.

We set out to answer the following initial **research questions**:
- What are motivations for collecting things?
- What are motivations for taking photos in the smartphone age?
- What are the reasons for our limitless amassing of digital photos?
- Is our access to infinite storage space detrimental to our user experience of digital tools?

We were able to answer these questions quite early in the process, as detailed in our workshop summary and our literature review. However, our project outcome developed beyond just these questions.

We then settled on four actionable **“How might we?”** questions that summarised the two directions we could see ourselves going at this point.

- How might we bring new life to our static photo archives and make them relevant today?
- How might we reorganise our photo archives to tackle their overwhelming size?
- How can we design a tool or framework for personal digital file management, and what impact could it have on the user’s ability to curate and revisit digital content?
- How might we utilise user-generated metadata that is already attached to personal digital photos to enable new connections within our personal digital photo archives?

Throughout the process, our initial assumptions and research questions remained relevant, as the challenges that come with storing and organising digital photos are a subsection of the challenges involving personal digital objects in general.

Finally, our initial **hypothesis**:
- By designing a tool or framework for personal digital curation, we could generate a positive impact on users’ ability to curate and revisit digital content.

And our updated, more focused **hypothesis**:
- By using geographical metadata, we can develop a smartphone application that lets the user explore their personal digital photo archives in a new and interesting way.

Interestingly, while we feel our research came a long way throughout the process, and we specified our focus significantly, our initial hypothesis still applies to the final outcome.

2.2. Methods to Verify Hypothesis

In order to verify our hypothesis, we employed a number of different methods. Overall, we utilised a general Design Thinking approach as described in Figure 1, which is characterised by its non-linearity. Throughout the process, we redefined our problem as we gained more insights from users, for example in our workshops and user testings.

In order to empathise with our potential users, we first conducted quick interviews, then a digital survey with over 100 participants, and finally a workshop to gain an understanding of the problem. We also reviewed existing literature and browsed through many studies to cover as wide a ground as possible.

To define the problem, we abstracted our findings into two key problems and three possible areas of solution (See Figure 21 – Understanding the Bigger Picture). Later on, we also created personas, different scenarios, and user flows to help us get closer to our users' specific needs.

In order to quickly ideate, we used a number of methods introduced to us in the concept seminar: namely, the 20 ways of description, defining the qualities, parameters, and values of our project, and 50 sketches of design. Later on, we used the creative speed-dating method. This is detailed in Section 4.1, Ideation Methods, of Chapter 4, Project Development.

During the prototype phase, we created a series of design investigations into our research topics as a means of rapid prototyping. These ranged from brief coding experiments over paper prototypes to wireframes. Finally, we combined our findings from these investigations into a more advanced screen-based prototype.

Ultimately, we tested our advanced iterations with users. We conducted A/B testings to help us decide between different ways to implement features.

Note.
From the article "Design Thinking (DT)" by the Interaction Design Foundation. © Interaction Design Foundation. Retrieved from www.interaction-design.org/literature/topics/design-thinking

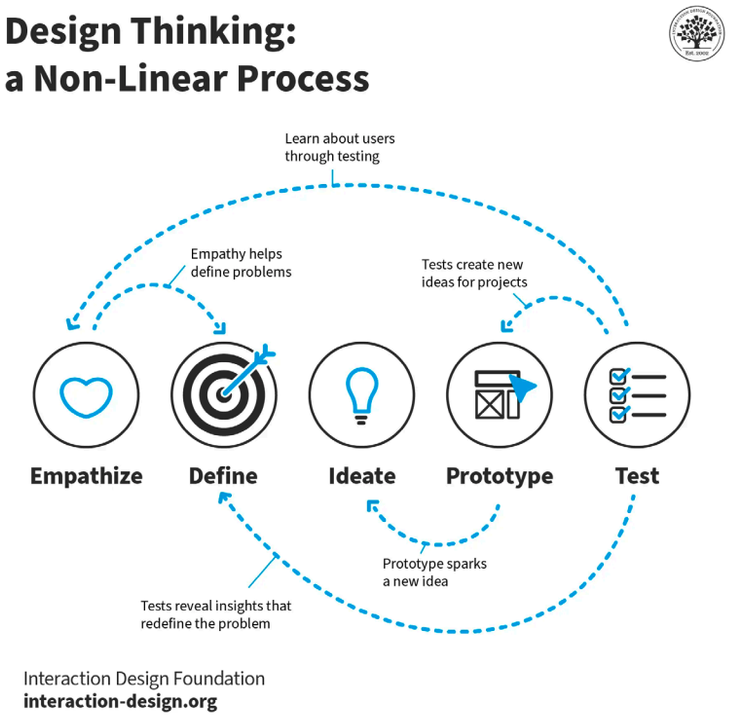


Figure 1: Design Thinking: A Non-Linear Process

As we worked and learned more, we continuously redefined our problems. It was very much a non-linear process, as early prototypes helped us with additional ideation, and early user feedback helped us with our early prototypes, and so on. Sometimes, we felt that the process was a bit too non-linear, as we were thinking more broadly in the beginning, but the more information we gained and the more we ideated, we were able to narrow down our subject area. We kept adding to our assumptions, answered our research questions and checked our hypotheses as we went through the process.

In addition to the Design Thinking method, we were also inspired by the Research through Design (RTD) approach, which combines doing research – "Work done with the intention to produce knowledge for use by others" – with doing design – "Work done with the intention to produce a feasible solution to improve a given situation". The term generally denotes the goal of generating knowledge through design and evolving past an expected approach; by creating an artifact that embodies the design problem at hand, it represents an interrogation with the problem itself (Stappers & Giaccardi, n.d.).

2.3. Intended Contribution

With our research and the development of our project, we aim to design a new framework that showcases the potential of metadata, specifically geolocation data, when it comes to digital images. We also aim to question the naturalness of people relying on guided directions by means of GPS technology in our smartphones, which has resulted in a decreased ability for spatial navigation. Our goal is to encourage people to think critically about the way they navigate the world, and how they exist in relation to their geographical environment.

In this way, we aim to address the problem of navigating and organising large personal digital archives, which has not been sufficiently addressed yet, according to our research.

Most of us have enormous digital photo galleries and rarely look at them. The way these images are stored, organised, and navigated is not optimal for users' needs.

With our project, we propose a creative way of navigating one's data by investigating previously static personal photo archives in an embodied way. We aim to create an experience that offers users a more contextually and spatially aware way to interact with their images.

2.4. Personal Motivations

Mo: I have been a collector since childhood and still find great joy in the maintaining my collections today. I do not necessarily understand collecting as the act of curating physical objects, but also as organising information and data: gathering information, records, and objects. Llearning how they relate to me and those around me has always been my way of sense-making.

I find the problem of digital hoarding uniquely interesting because, although modern information technology makes it possible to collect data at higher quantities and better qualities

than ever before, it often fails to showcase them in a meaningful way. One of the most obvious examples are photo galleries. Despite big software companies like Apple or Google encouraging people to create more meaningful connections to one's personal photo archives – by showing the user a more or less random series of photos on a daily basis –, they do not quite achieve their goal, in my opinion. While this randomised approach is certainly a start, there are possibilities for more systematic, profound design interventions.

It is an interesting logistical and even philosophical problem. Why are our digital belongings not more tangible for us? Are they less important to us because we cannot grasp them in this way? What does it mean for a digital object to be so removed from a context of time and space we can understand?

Through our research, we have learned that there is much potential for design exploration in this area. While it is not our aim to conclusively solve this problem, we are very interested in proposing a meaningful solution for it, and to engage with it in a deeper way.

My great interest in this topic, my position as a personal digital collector and curator as well as an interaction designer all make me a suitable investigator.

Tanja: The idea of collecting only crossed my mind when I heard about the topic from Mo. I then asked myself questions like: Are there things that I collect? What exactly does my collecting behaviour look like in the digital realm? Are there differences between how I collect digitally and analogue?

Keeping track of my collections in the real world is quite simple. My book collection, for example, is organised very visibly on three different shelves; it is directly available if I want to take a closer look at it and interact with one of the books. However, my digital collecting behaviour and organisation is somewhat different. I have countless files and do not have an overview of them. Throughout our research, we realised that this is also the case for many others.

This is particularly evident in the way I deal with my photo gallery. Personally, I would describe myself as a hoarder of digital photos – there are currently over 22,658 pictures dating from 2016 to the present day on my phone. I also do not particularly interact with this dormant archive, which is the case for many others, as our field research has revealed and confirmed.

We discovered that many of our users would like to interact more with their archives. However, this takes far too much time and is not really feasible due to their size.

So I ask myself questions such as: How can we organise the contents of these photo archives better? Are there ways in which we can make this activity more interesting and less overwhelming for the user?

I think I am a great investigator to dive into this topic, as I am aligned with our users' needs and interests, and want to investigate how we could bring more context and relevance to our dormant picture archives.

2.5. Initial User Research

2.5.1. Rapid Field Research

To get a quick idea of the field, we decided to approach potential users in public to learn about their needs. We did this in tandem with our literature review and interviews, so we could cover as wide a field as possible.

During our BA Concept seminar, we first aimed to find out more about the way people deal with their personal digital collections, as meeting users' needs was very important to us. We approached various individuals for interviews – mostly students and people in the student age category, so in their 20s, as those people were closely and easily available to us during this preliminary round of field research. We interviewed a total of

ten people who work in various fields such as interdisciplinary studies at ETH Zurich, music, art education and design.

We asked our interviewees the following questions:

- How much available storage do you have on your computer or smartphone?
- How do you organise your digital belongings, for example photos or other downloaded files?
- What is stopping you from being more organised (if you do not already have a sufficient level of organisation)?
- Do you ever tidy your digital belongings by e.g. deleting some files?

These were our overall takeaways from these interviews:
Many people stated the organisation of their digital files was not a priority to them. As long as everything works and there are no points of irritation in their digital ecosystem – for example, their storage space being full –, they do not feel the need to change anything.

As for reasons why they are not more organised, people cited a lack of time and motivation; if they have a bit of free time, they simply prefer to do other things – organising their digital files is not a particularly interesting task. Having to look through all their files and, for example, delete one photo at a time. What we took away from this is that it might be worthwile to look into AI-supported filtering and grouping options, which might address the inconvenience aspect.

Different students also have very different needs when it comes to their file organisation related to their studies. For example, we spoke to a music student who has to keep different digital scores and recordings of the pieces he plays. He desires a better organisation system for this specific problem.

This rapid field research method turned out to be a useful approach as it allowed us to get to know different users' needs. Our initial main assumption (Most people store their digital belongings in an inefficient way) seemed to be correct. While many of our interviewees were not satisfied with the way their

files are set up, they lack the time and motivation to deal with them. Thus, they do not prioritise personal digital organisation.

However, two of our interviewees represented the opposite. Both people had a very structured organisation system and were able to tell us immediately how much storage they had available. Personal digital organisation was very important to them, and they stated that they decluttered on a weekly basis. So it is important to keep in mind that, while a lacking organisation of personal digital files is a widespread problem (most people we asked were not satisfied), some prioritise their organisation and do not consider it an issue.

2.5.2. Workshop Anarchiving Practices

The “Anarchiving Practices” course, an elective module for 4th-semester students, took place from the 20th of February to the 15th of March 2024. It explored what new forms of transformative, adaptive archiving might look like, also investigating the possibility of implementing AI, extending the archives’ static past of only filing and storing without re-accessing.

Verena Ziegler, Stella Speziali and Lisa Ochsenbein gave us the opportunity to join the course on selected days, to hold a workshop (Figure 2) and visit the final exhibition of the module. We considered this a suitable opportunity as we thought the people who signed up for the Anarchiving Practices module might share an interest in digital archives, thus being suitable potential users.

It was interesting to see how all the participants developed projects in different directions and chose different forms of expression, such as the use of AI as well as more analogue ways of addressing the topic.

The goals for our workshop were to involve the participants in a dialogue about their personal digital photo archives, to find out more about their digital collecting habits and to ideate on

Figure 2: Photo taken at Anarchiving Practices workshop

future possibilities of photo archives. We chose the Miro platform for our workshop because of its extensive features for digital collaborative work. The intended timespan for the workshop was 1 hour, consisting of 40 minutes of exercises and 20 minutes dedicated to sharing and feedback.

To prepare for the Anarchiving Practices workshop, we ran it once in advance with six Interaction Design students.

Findings Workshop
Exercise 1: Find 5 Favourite Photos
The task of this exercise was to review one’s own photo collection and select five pictures that stood out as favourites. Afterwards, the participants were asked to reflect on the chosen photos, note what the images depict, and describe why each photo is meaningful for them.

Many participants chose pictures with people who are important to them. The characteristics of the chosen pictures were friends, family, good memories, cute animals, calm and visually pleasing nature, tasty food, and nostalgic but feel-good moments.

A key difference between the Interaction Design students – who are very familiar with us – and the Anarchiving Practices students was that those we already knew were much more

comfortable sharing the photos themselves and uploading them into the Miro, whereas the other students had more inhibitions.

In the Anarchiving Practices group, everyone copied the sample response layout and arranged the notes in the same way (Figure 3). This was a learning moment for us as we realised the importance of subconscious design language.

Exercise 2: Questions
The aim of this exercise was to reflect on personal interaction with photo galleries and answer four different questions:

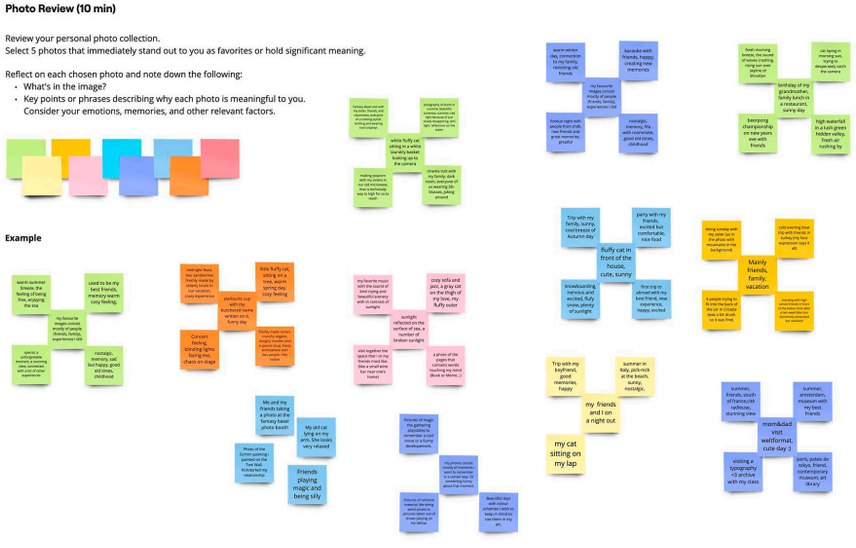
How do you search for and find your favourite photos in your gallery and separate them from the rest?
Most participants found their favourites by using the favourites function on their devices. They also deliberately used text searches to find their memories or scrolled through the timeline.

When it comes to your personal photo archives, is there a moment where you organise or group them, create patterns? Why/why not? Which ones?
Almost all respondents stated that they did not use categorisation. Only in individual cases did they create extra folders for certain events, people or trips.

Describe some criteria you use to decide whether to keep or delete a photo.
The following answers stood out: “Delete: several same photos, don’t want to remember them – Keep: good memory, nostalgia, for future need”; “I am somewhat of a hoarder”; “I don’t delete, but instead pay for a cloud service”; “If it was a quick screenshot of some sort of website, article, Reddit post and so on, it will most likely get deleted afterwards, but I don’t delete other photos I took.”

How would you say your approach to taking images has changed since smartphones became widely available?
Generally, people stated that they take a lot more pictures nowadays than before they had access to a smartphone. They

Figure 3: Exercise 1: Find 5 Favourite Photos



also stated that they are much more spontaneous with their picture-taking as the device is always accessible. This shows that photography has become a much more accessible and spontaneous activity.

However, they were also critical voices: “I feel like I’m over-taking and owning them. It’s nice to have many, but somehow it’s also overwhelming”; “The feeling [of taking or having a photo] is not that valuable anymore”; “My mother had a huge amount of photo albums, while I only know the usage of smartphones.”

Exercise 3: Photo Organisation
This exercise was carried out in groups of 3 people. The aim was to organise the 50 images provided according to their own criteria and to identify connections.

The students overall used quite obvious sorting principles. They all defined categories that reflected the context of the photos, for example whether there were people in the pictures or whether they depicted a certain activity, like nightlife or sports. Completely abstract classification systems such as sorting by colour, file size or other were not used.

Exercise 4: Design Fiction Methodology – Speculative Design
This exercise consisted of two parts. In the first part of the exercise, the task was to think about one's personal photo archives and how they could change in the future, and to think of at least one "What if?" question relating to them. The second part was about choosing one of the "What if?" questions and thinking about how this could work and look. This idea was to be presented as a sketch (Figure 4/5).

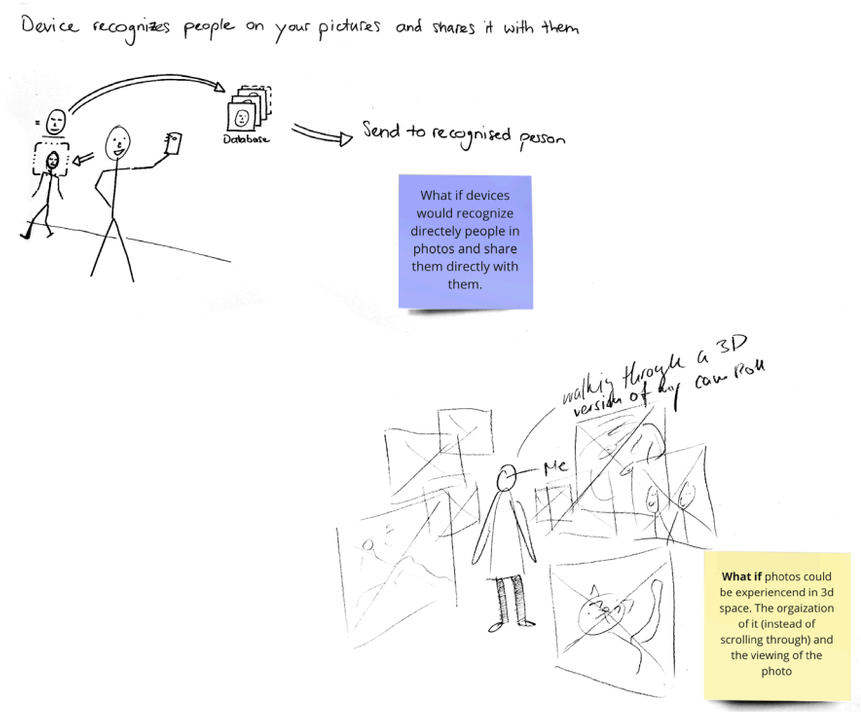
Some highlights of the generated "What if?" questions were: "What if I could take pictures with my eyes"; "What if your phone could read your mood and show you images based on that?";"What if no photo is ever saved?"; "What if cameras were never invented?"

During the second phase of the exercise, the participants sketched concepts. One proposed concept was an app that sends you a push message one week after taking a photo asking whether you really want to keep it. Another idea was that all pictures are sent directly to social media without any ability to delete or edit them.

Overall takeaways from the workshop
Already, all of our initial assumptions were reflected in these participants' use habits. We learned that finding images is context-based; people rely on the images that come chronologically before and after to find the ones they are looking for.

Exercise 3 taught us that people are already used to familiar categories such as people, places, and food. They do not think outside of the box in this sense, which is reasonable. Their goal is to find photos easily again, sorting by colour, for example, might be fun, but it is not very useful.

The participants seemed to share our feeling that being able to take a lot of photos all the time slightly devalues them. Also, many of them labelled themselves as hoarders of digital images, and they stated that they were not as in control as they would like to be.



Figures 4/5: Exercise 4: Design Fiction Methodology – Speculative Design

As for technical aspects, we were reminded that phone/computer manufacturers (e.g. Apple) trap you in their ecosystem; switching to another service if you have all your photos synced via iCloud is inconvenient. This makes it difficult to effectively combine photo archives across different devices if they were made by different manufacturers.

2.5.3. Online Survey: Personal Digital Photo Archives

After the workshop, we conducted an online survey via Google Forms. Our goals were to verify our assumptions and gain some technical insights regarding actual hard- and software people used so we could take this information into consideration while prototyping.

We distributed the survey widely among our different groups, including ZHdK students, friends and family members as well as members of our local communities. This way, we were able

to cover all age groups. Additionally, the survey was available in both German and English so we could include a large variety of respondents (Figure 6).

At the time of writing this, we recorded 121 responses. As the survey was conducted in English and German, we calculated the averages from both languages for any percentages reported.

See below each question we asked, the answers we received, and our learnings from them.

How many photos are in your smartphone's photo gallery vs across all devices? (Figures 7/8)
Smartphone: Answers ranged from 50 to 45,000. The average was 10,612 photos.

All devices: Answers ranged from 50 to 500,000. The average was 29,095.

For the smartphone, most people seemed to be in the 1,000–20,000 picture range. As for overall, that number was higher – while the peak was still in the 10,000-20,000 range, many people had close to 30,000 photos. Also, there were outliers who had up to 500,000 photos; The volume of photos suggests these might be professional photographers.

Do you use a backup for your digital photos?
If so, which service?
For cloud-based storage services, Google Photos and iCloud were the top contenders. 39% of participants stated they use iCloud, 30% use Google Photos. 87% of all participants also stated that they keep a local back-up of their photos, either storing them on their computer or on an external storage unit.

How often do you use your smartphone for the following activities
- To capture a memory to keep for yourself
- To share something with someone else
- To document information
- To share on social media

Figure 6: Age groups that filled out our survey (German)

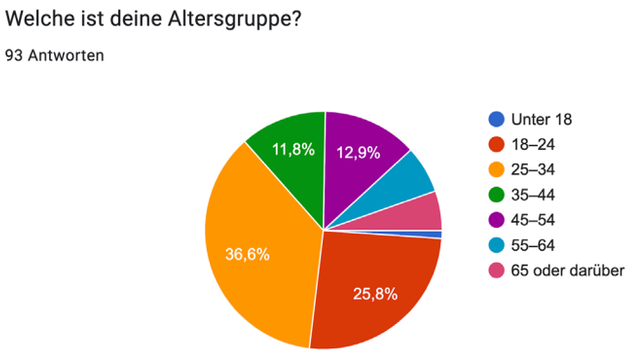


Figure 7: Amount of photos on smartphone

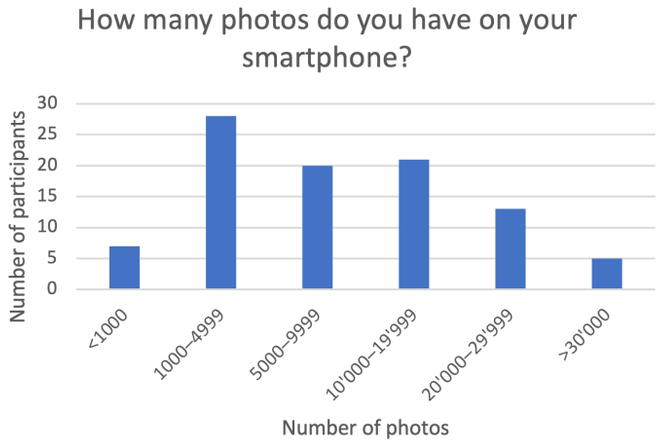
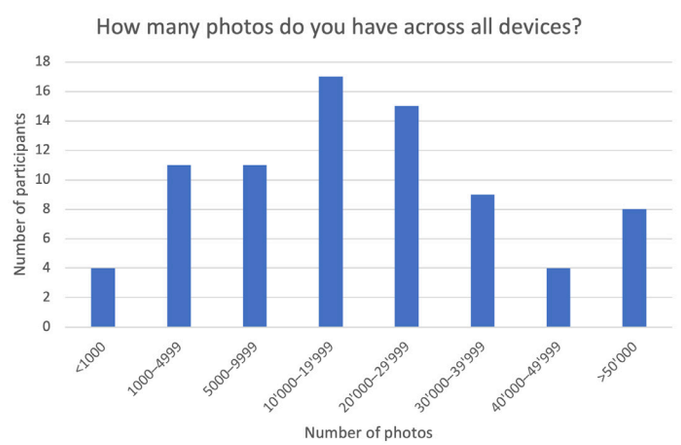


Figure 8: Amount of photos across all devices



No particularly surprising insights here – capturing memories was rated highest on the frequency scale. 43% of participants stated that they use their camera “very frequently” to document information. As for sharing things with others, almost no one stated that they never did this – the affirmative answers were evenly distributed between 2, “rarely”, and 3, “very frequently”. Sharing pictures to social media was less of a priority overall.

This effectively answered our research question (2).

How do you organise your photos?
The most popular answer was “I don’t really organise them” – 57% of participants selected this answer. The following options were also popular:

• I group them into folders (38%)
• I mark them as favourites (44%)
• I delete unneeded photos (33%)

How difficult do the following factors make organising your photos
• Lack of time
• Lack of motivation
• Overwhelming volume of photos
• Uncertainty about best organisation method
• Technical limitations
• Photos being distributed across different devices

“Overwhelming amount of photos” was the most frequent response with 57% of participants deeming this as “very difficult”, followed by the motivation factor (46%). “Lack of time” was regarded as a moderate to severe difficulty factor across the board.

On the other hand, “technical limitations” and “photos being distributed across different devices” were the least relevant factors, with 40% and and 35% of participants respectively rating these a 1 on the difficulty scale.

Some participants provided additional answers: Many participants mentioned that they did not see the need to organise their photos. One participant stated that deciding what to keep and what to delete is in itself a difficult process. After all, it is impossible to tell now which photos will be relevant to us in the future.

Findings from the Survey
Our findings about people’s organisation methods were congruent with our desk research – meaning that most people make somewhat of an effort to organise their photos, but still feel that this is not enough to consider their photo archives to be truly organised (Marčetić, 2015). Our assumptions were further confirmed.

The participants do have the technical knowledge to manage their photos. While we expected their archives being distributed across different devices to be a challenge, according to them, it is not. They have the tools, but they are limited by the overwhelming size of these archives and the time it would take to organise them, therefore lacking motivation. Our first three assumptions seem to be correct.

One significantly valuable insight we gained was that many participants posed the question of what they should do with their photos once they are organised. What could be the purpose of re-accessing these static archives, and what might be the reason for that? This impacted our future design choices as it opened up new possibilities for us. Rather than strictly coming up with a solution for organising images, we had the chance to develop something more exciting, a new proposition for what to do with personal image archives – which is what we ended up with in the end.

2.6. Expert Interviews

To ground our design practice, we decided to conduct interviews with traditional archivists. This way, we hoped to learn

about archiving methodologies we could then apply to our project. We were particularly interested in how they differentiate between content that will be relevant for the future and content to discard, and what their strategies are for dealing with and managing masses of digital data.

At this stage, we were interested in the idea of creating a new organisation system for our personal digital archives, namely photo archives. By talking to these professionals, we attempted to learn about organisation systems we could then apply to the personal context. It had also been suggested in some of our reading materials that there might be potential for a design intervention on the personal scale by borrowing from professional archiving methodologies (e.g. Jaillant, 2022).

We interviewed Philipp Oettli, responsible for product management at ZHdK's media archive, and Christine Baur, head of the ZHdK Archive. We also had a written exchange with Nicole Graf from the ETH Zurich E-Pics Image Archive. During the interviews, we took notes and summarised what we had learned below.

We conducted these interviews in February 2024, so at the very beginning of our process. At this point, we had decided on our focus area of personal digital photo archives and were approaching our initial hypothesis.

2.6.1. Interview Philipp Oettli

Philipp Oettli is responsible for the product management of the media archive of ZHdK. We contacted him to find out more about archiving and its processes and challenges. Philipp Oettli let us know that the archive is a digital platform, which allows communal work, sharing and the archiving of projects. The specialised database focuses on linking media, users, and topics. The MIZ (media archive) is used as a media repository and is later published on the various ZHdK information platforms; the system is managed by the archive, and the different departments are responsible for submitting the content. The collection of final theses is also an important part of the media archive. Last year, a new regulation was set up, stating that all final theses must be recorded in the MIZ. The final product must be available and accessible.

He further stated that this is straightforward for born-digital content but challenging for older media, because the quality can diminish over time, or they may no longer be available. For example, a cassette may exist in the archive, but it is no longer playable today or there is no playback device available. Video formats are particularly challenging, as they have changed a lot over time and require different devices.

As we were especially interested in the criteria according to which archivists accept objects into the archive and sort them, Philipp referred us to Christine Baur.

2.6.2. Interview Christine Baur

Christine Baur is the head of the ZHdK Archive. She generously spoke with us and even showed us the physical archive in the basement of the ZHdK (Figures 11–13).

The archive's task is to make its contents available for the future and to ensure physical and digital access. Christine Baur shared that the archive consists of three different areas (Figure 9): the current archive, the dormant archive (interim archive) and the (long-term) archive. All objects are stored in the dormant or interim archive for 10 years. They are then evaluated and either discarded or transferred to the long-term archive.

The physical archival material is commonly used for museum exhibitions, whereas digital contents can be publicly retrieved via the eMuseum. Besides storing student and museum material, an important job of the ZHDK Archive is to store mandatory legal documents, which usually must be stored for 10 years.

The internal recording system that the ZHdK uses can be seen in Figure 10.

We were particularly interested in the archiving criteria to find out how exactly important and unimportant digital objects are differentiated. There are archiving standards such as the ISAD(G) (“General International Standard Archival Description”) and the recently redefined “Records in Context” guidelines, but the ZHdK does not apply these and has defined its own criteria.

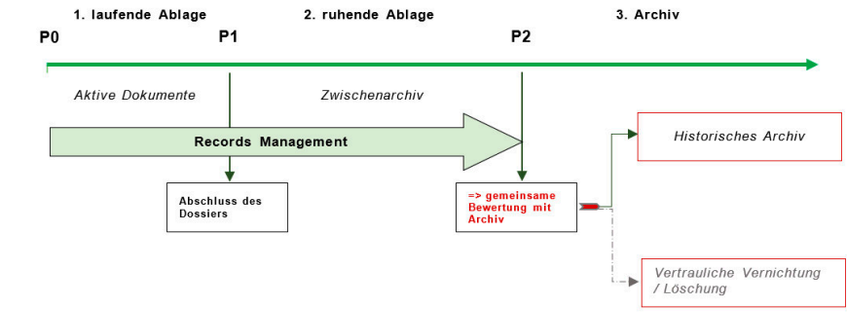
The criteria of the ZHdK, as per Christine Baur:

- Is the content of the material relevant to the university?
- Does the material belong to the university at all?
- Can the archive handle the material?
- Can the archive provide the correct storage facility?
- Is it necessary to preserve the object at all or is a photo sufficient for documentation?
- Is it necessary to include the original in the archive or is an image sufficient?

Additionally, she shared that there are still some challenges to documenting artistic works today. The storage of paper is very simple. Documents are stored in pH-neutral cardboard boxes. This is considerably more difficult with fragile material – audio-visual material requires a special temperature, and the archive is mainly concerned with delaying the ageing process.

The archive’s task is often misunderstood – archiving does not mean that all files delivered are completely transferred to the archive. On the contrary, the archivists separate and inspect the material, and remove the parts that they do not consider important for storage.

Figure 9: The ZHdK life cycle filing system, consisting of three different filing areas (Sent to us by Christine Baur)



Legende:

P = Phase

P0 entspricht der Phase, in der das Dossier/das Geschäft eröffnet und bearbeitet wird; P1 entspricht der Phase der Schliessung des Dossiers/Geschäfts; P2 entspricht dem endgültigen Abschluss des Dossiers nach Ablauf der Aufbewahrungsfrist.

Figure 10: The recording system of archival material of the ZHdK archive (Sent to us by Christine Baur)

Figure 11: Archive of the ZHdK

Figure 12: Documents stored in pH-neutral boxes

Figure 13: Old records of students at ZHdK (≈1920)

2.6.3. Exchange with Nicole Graf

As the focus of our work is centered on images, we wanted to talk to a representative of the E-Pics image archive at ETH Zurich. Nicole Graf is the head of the archive and provided us with information about the archive's approach and activities.

In a slide deck provided to us by Nicole Graf, we learned that the image archive was founded in 2001 as an image agency and has been offering photos as open data since 2015. The archive owns 3.6 million physical images, 1.3 million of which are digitised. Between 60,000 and 80,000 images are digitised every year.

The guidelines for maintaining the collection consist of the following criteria:

- Does the stock fit into the collection (relevant for ETH, technology & science, infrastructure & buildings, landscape & local views of Switzerland) or is it directly related to ETH Zurich?
- Is metadata available?
- Can usage rights be transferred?
- Is the physical condition of the image adequate?

In Figure 14 below, the workflow of the ETH photo archive regarding incoming photographic archival material is explained.

Figure 14: Workflow of ETH photo archive (German) (Sent to us by Nicole Graf)

Figure 15: Image as a source of information vs. image as an object (Sent to us by Nicole Graf)

Within their digitisation process, the ETH Library defined three different types of images (Figure 15).

- The image as an information carrier (left): Any metadata associated with the image is added to the catalogue by the person cataloguing it.
- The image as an object (centre): Labels around the image are also digitised.
- The album as object (right): In addition to the individual images, the entire album page is digitised, allowing users to see the arrangement of the images.

Until 2021, metadata indexing was based entirely on human knowledge. This is now being supplemented by AI, which automatically generates keywords and enables so-called auto-tagging. However, the results of this tagging are generic and sometimes contradictory. A degree of manual verification is still necessary.

2.6.4. Findings Interviews

Through our interviews, we learned a lot about the different archiving methodologies used at ZHdK and ETH. The archivists' decision process of whether objects are kept and/or retained in the archives, or discarded, was particularly interesting to us, as we were aiming to apply this methodology to our own project.

Dealing with masses of digital data is not only a problem that is relevant on a personal scale, but for any professional environment that similarly deals with large amounts of data. The process of selection and curation is very important. ontinously

reevaluating content kept in the archives is crucial. This is evident in all three interviews we conducted.

The three-cycle archiving system that the ZHdK Archive uses was particularly interesting to us; it makes sense to separate different archival materials into different areas of priority. We explored this concept in our first quick prototypes. The idea of treating the image in different ways according to the ETH Image Archive was also new and interesting to us. It makes sense to view an image differently depending on the context.

2.7. Navigating Through Literature

2.7.1. Personal Digital Photography

History Overview

In the past, only nobility and the rich could commission pictures. Today, anyone can take a picture with a mobile phone, giving the masses the power to communicate through pictures – and this all started with the Eastman Kodak Company (Schuster, 2020, p. 18).

In the late 19th and early 20th centuries, the idea of personal and social self-determination emerged in America. Because of the leisure time and travel that Americans had, the camera became increasingly important. The portable camera became a medium of self-definition and group identity (Gordon, 2020, p. 2).

In 1888, the first practical, affordable, and portable film camera was introduced by the Eastman Kodak Company. The camera dominated the amateur photography market 24 years later (Gordon, 2020). Kodak's famous slogan was "You press the button, we do the rest" (Turnbow, 2023).

Kodak's marketing strategy led to the spread of photography as a mass medium. By the end of 1905, one third of the US's population had been convinced to take up photography as a leisure activity (Turnbow, 2023). However, Kodak's advertising

Note. An advertisement with the headline "The World is mine – I own a Kodak," published in Ladies' Home Journal in 1912. Retrieved from www.repository.duke.edu/dc/eaa/K0469

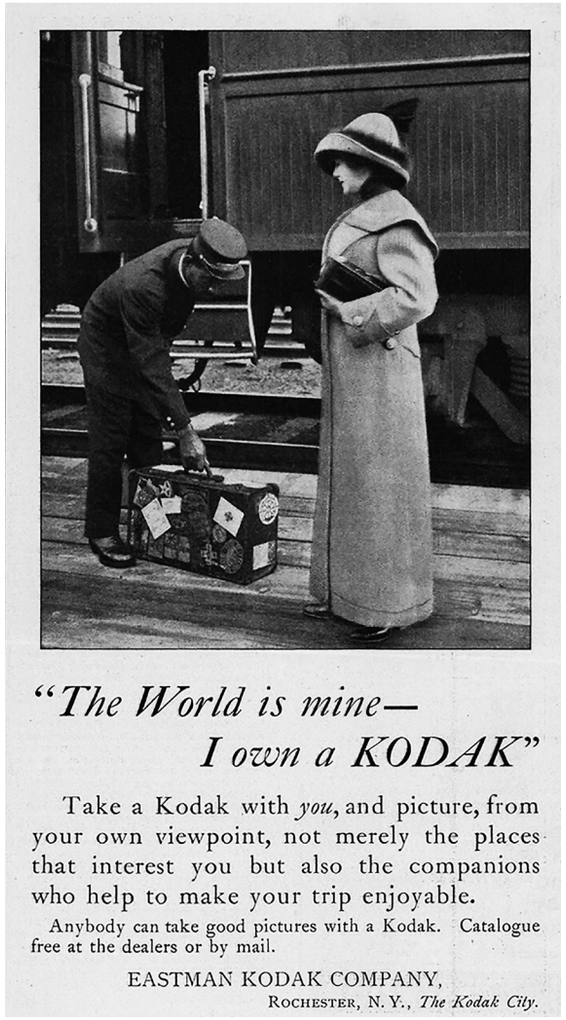


Figure 16: Kodak advertisement

measures excluded people who did not belong to the privileged white class.

The “Kodak Girl” traditionally came to represent the Kodak Company and the lifestyle they were selling – a white woman who represented travel and adventure (Turnbow, 2023).

A 1912 advertisement (Figure 16) in the Ladies’ Home shows a woman in travelling clothes carrying such a Kodak camera (Gordon, 2020). She is standing on the platform looking down at an African American porter. He is carrying her luggage with many stickers from her travels. The image is a powerful representation of racial and class dynamics. The woman in the photograph appears determined and commanding, while the porter is submissive and bowing respectfully. However, the text accompanying the ad says that the consumer has the power to see the world as she wishes – but clearly, this did not apply to everyone (Gordon, 2020, pp. 25–26). This was also reflected in other campaigns. In 1913, for example, an advertisement in the Saturday Evening Post showed the white American man outdoors, symbolising him as the master of nature and ‘primitive’ people (Gordon, 2020, p. 37).

The Kodak Girl campaign ran up until the 1970s. But of course, women of colour could not become Kodak Girls. In reality, however, photography was important in African American families, as it was a tool for self-representation (Turnbow, 2023).

Theories and concepts for a future digital camera were created as far back as in the 1960s, and it was actually invented in 1975 by Steven Sasson (Cabral, 2023). This first digital camera weighed nearly 4 kg. Sasson was an employee of the Eastman Kodak Company, but they were not interested in his invention at the time. The first digital camera to actually go to market was 1990’s Dycam Model 1 (2023).

While the first camera phone was released as far back as 1999, Apple inarguably revolutionised the concept with the first iPhone in 2007. It was attractive, easy to use and paved the way for the notion that everyone should carry one (Stapley, 2022).

As we now carry smartphones wherever we go and not only use them to communicate with other people, phones with a camera function are expanding our photography practice (Gye, 2007). Okabe and Ito argue that “the camera phone is a more ubiquitous and lightweight presence, and is used for a more personal, less objectified viewpoint and sharing among intimates. Traditionally, the camera would get trotted out for special excursions and events – noteworthy moments bracketed off from the mundane. By contrast, camera phones capture the more fleeting and unexpected moments of surprise, beauty and adoration in the everyday” (2006, p. 99).

According to Okabe and Ito, photography in particular has moved away from the targeted towards a more spontaneous shot. More spontaneous motifs are now being captured and more unplanned photos are being taken (2006).

The proliferation of the internet and mobile devices has made photo sharing easier and more popular. Henne et al.’s 2014 study describes that in 2013 more than 350 million photos were uploaded to Facebook every day. In comparison, Instagram had only 55 million per day (Henne et al., 2014). The numbers have increased tremendously. Broz states that there are approximately 5.3 billion photos taken per day. Since social media apps rarely provide information, the exact numbers have been estimated by Broz. Most images per day are shared on WhatsApp with 6.9 billion images, 3.8 billion on Snapchat, 2.1 billion on Facebook and 1.2 billion on Instagram (Broz, 2024).

Motivations Behind Collecting Photos

The general motivations behind collecting and archiving objects will be explained in the following section. The human tendency to collect can also be applied to the motivation behind photo collections.

According to a survey of 200 students in 1994, about 50% of them carried physical photos with them (Schuster, 2020, pp. 176, 177). It turned out that they were mostly memories or keepsakes. It was found that 90% of all photos carried were of loved ones. Schuster repeated this survey around 10 years lat-

er with an additional 95 students and it turned out that over 79 people still carried analogue photos around with them (2020).

Carrying the photo around with you, close to your body, fulfils a kind of representative role and allows the bond with loved ones to become present (Schuster, 2020). Based on various statements by the different students, it can also be argued that the photo takes on a symbolic meaning as an “amulet and lucky charm”. Several students stated that they hoped that nothing would happen to the loved one as they always carried the photo with them. Carrying pictures of loved ones also became significant during the wartimes. Photos were taken before leaving and served as an amulet at the front (“The woman’s love protects me”) as well as representing their sporadic social contact at the time (2020, p. 178).

In this sense, it can be argued that photos are part of ritual elements. A ritual is a sequence of actions that is not functional but has a symbolic meaning. The photo is a memory and relic of the event (Schuster, 2020, p. 6-8).

A photo functions as a memory; it can document personal as well as other people’s memories (House et al., 2004). The memory function of a photo is strongly emotional, but also has informative components. In the survey, participants stated that their favourite photos were not chosen per se for their quality, but for the memories and emotions they evoked (2004).

People tell each other their stories from memories. Having a photograph of it is a way to keep the stories alive (Garry & Gerrie, 2005).

Photo Metadata

With the widespread use of digital cameras, a near infinite number of images have been created (Boutell & Luo, 2005). To keep track of all these photos, we try to organise them by classifying them.

These classifiers can be created from the content of the image, such by grouping them by colour or motif. But digital cameras

offer another way of collecting and classifying information (2005).

EXIF (Exchangeable Image File Format) is one of the most widely used standards for image metadata. Manually tagging and organising photos is time-consuming – so by leveraging the existing information contained in EXIF metadata, we can save considerable amounts of time.

EXIF files record metadata tags which contain information about the image and its context, for example information about the camera the image was taken with, date/time information, and geolocation metadata (Troncy et al., 2011, p. 136). EXIF is the standard file format for smartphone image metadata nowadays.

When it comes to the creation of location metadata – which will be relevant in Section 2.7.3, *Spatial Navigation* –, the positioning accuracy of a smartphone has improved in recent years; pre-2016, the GNSS (Global Navigation Satellite System) module in a smartphone had an accuracy range of around 3 to 5 m in good, even over 10 m in bad conditions (Zangenehnejad & Gao, 2021, p. 3). Since then, the sub-meter level was achieved for smartphone receivers, though in regular conditions, the accuracy is generally still in the single-digit meter area.

Many people do not realise that when they upload a photo, they share more than just the visual content, namely the metadata. The metadata contains a lot of private information, such as geolocation and the name of the camera used, which the user shares unknowingly (Henne et al., 2014).

Dr Sutardja (2021) states that metadata remains associated with the photo even when the image is sent or uploaded somewhere, unless it is deliberately removed.

Some social media platforms strip photos of their metadata when they are uploaded, but still use the data collected to learn more about their users. They are interested in things like which smartphone or camera was used and when and where the pho-

to was taken, and all of this information can be misused (Sutardja, 2021).

Henne et al. (2014) conclude that there are two main ways in which the privacy and usability of metadata can be protected.

- Users must be made aware of the existence of metadata through appropriate visualisation. Useful solutions should be developed that demonstrate the awareness and transparency of metadata.
- Users should be able to decide for themselves whether metadata should remain, whether they want to share it with certain people, or whether they want to remove it (Henne et al., 2014).

2.7.2. Collecting / Archiving (Digital) Objects

Disambiguation

Gaining an exact understanding of the difference between the terms “archiving” and “collecting” has proven to be difficult – the two words overlap in meaning and are used interchangeably in certain contexts.

The Dictionary of Archives Terminology mentions the “many, sometimes contradictory, meanings” of the term “collecting” (Society of American Archivists, 2005). The Cambridge Dictionary states the most general meaning of the word – “to bring something together from different places or over a period of time” – as well as how it specifically refers to a recreational activity (“to get and keep things of one type such as stamps or coins as a hobby”) (Cambridge University Press & Assessment, n.d.-b).

Endres and Zeller define the Western idea of collecting as “an intentional and selective accumulation of like elements” (2022, p. 1). The elements of *intention* and *selectiveness* are missing from the standard dictionary definition but prominent in the literature and design discourse we encountered, thus we consider them important aspects of these terms.

The DAT defines archiving as “all actions relating to the selection and care of records of enduring value” (Society of American Archivists, 2005). In the Cambridge Dictionary, archiving is both “a collection of historical records relating to a place, organization, or family” and “a place where historical records are kept” (Cambridge University Press & Assessment, n.d.-a). Archiving therefore means to gather things specifically for the sake of endurance and preservation, which is a condition a collection does not need to meet.

Now transitioning into the digital realm, the DAT defines a digital object as “information in binary form and its associated metadata” – any digital file could be considered a digital object. A born-digital object is an object “originating in a computer environment” (Society of American Archivists, 2005). For simplicity’s sake, we use the term “digital objects”; this includes audio, video, text or image files, passwords, applications, retrieved websites, etc.

Following the previous definitions, we have come to understand personal digital archiving as preservation of personal digital objects for the future; digital collecting involves the deliberate management of digital objects, regardless of purpose of objective.

There does not seem to be an academic consensus on whether what we are doing with our digital objects can be categorised as either archiving or collecting, since the element of intentionality is arguably missing; Endres et al. call this “amassing” (2022, p. 3); more on this later. Of course, this depends on the person and the file type.

Collecting as Human Behaviour

Collecting has been a core aspect of human behaviour since ancient times. According to Harari, “Writing is a method for storing information through material signs” (2014, p. 122). The first recorded name in history belongs to an accountant – an ancient Sumerian individual named Kushim, who wrote administrative information on a clay tablet, which has survived until now (Harari, 2014). This early example shows how collecting

and recording have been important to the development of civilisation.

In the European capitalist economy, collecting as the amassing of goods is inherent to our social fabric. People value objects, as we are socialised to prioritise them – "implicit in European culture has always been a tendency which we now recognise as typical, that is, a peculiarly intimate relationship to the world of goods"(Pearce, 1995, p. 150).

The ability and acceptability of collecting as a pastime depends on a number of socio-economic factors; namely, we are only able to collect if our means are sufficient. In today's culture of mass consumption, collecting is more acceptable and accessible than ever. Goods are cheap and widely available (Dillon, 2019).

Collecting serves as an extension of our identity; it gives us a sense of control. This is no different when it comes to our digital possessions. Dillon notes that "digital collecting is not, as might seem at first blush, a departure from human activity in the material realm, but a natural occurrence of established human behavior now enabled in an emerging information infrastructure" (2019, p. 270). Our intrinsic motivations to collect are still the same; the framework for us to do so is just different.

Like Assmann (2008) puts it, to collect is to defy temporal change; making the choice to collect something means leaving something else behind. We all have our individual categories and varying degrees of importance that are personal to us.

Creating collections of objects does not only mean preserving and acquiring knowledge about the world. They also serve as mementos of important events that are passed on to the next generation in this way (Rein, 2022).

Throughout the literature mentioned so far, the element of intention is heavily emphasised when it comes to collecting (Endres & Zeller, 2022). Assmann (2008) mentions the additional element of time; collecting objects makes them almost exempt

Note. Engraving by Ferrante Imperato (1550-1625) from his book "Dell'historia naturale", who created one of Europe's first natural history collections. The image depicts him and his son showing it off to visitors. Retrieved from www.sil.si.edu/Exhibitions/wonderbound/crocodiles.htm

Figure 17: Wunderkammer – cabinet of curiosities

from the passage of time and removes them from their typical context. This is especially poignant regarding our digital collections since the digital landscape changes at a rapid speed.

Historical Methods of Organising Collections

In the past, people had a different understanding of knowledge collection and education, but tried to narrow it down, sort it and make it comprehensible.

Early on in the Middle Ages, a type of educational system known as the 'seven liberal arts' was constructed (West, 2010). Its origins can be found in classical ancient Greek education.

According to West, Aristotle defined the liberal sciences as ideal subject matter for those who did not only want to learn what was "practical or useful", but were after "intellectual and moral excellence in general" (2010, pp. 1–2).

The liberal arts were differentiated between the *trividium* (study of language – grammar, logic, and rhetoric) and the *quadrividium* (study of science – geometry, arithmetic, astronomy and music) (West, 2010, p. 6).

The term ‘Wunderkammer’ (Figure 17) originates from the Renaissance. With the principle of the ‘cabinet of curiosities’, man endeavoured to permeate his world in an ordering and shaping way and to equip it with designs for the future (te Heesen, 2012, p. 31).

Objects that could not be explained or understood at first glance were collected and presented there. The the cabinets of arts and curiosities were created to elicit curiosity and amazement (2012, p. 35).

Zytaruk (2011) describes how how the flourishing of travel and trade particularly influenced the establishment of chambers of art and curiosities. In those unspecified collections, a wide variety of objects such as chameleons, alligators’ skins, insects set in amber, South American feather work, and more were displayed (Zytaruk, 2011, p. 2).

Rein (2022) describes how the European view of the world was shaken by information about the other worlds to the south as a result of the worldwide voyages of discovery in the 15th century. Previous knowledge was called into question by the many unknowns, such as new objects and areas, and people looked for new ways to reassure themselves of their knowledge of the world (Rein, 2022, p. 2).

Like the knowledge system of the seven liberal arts, the cabinets of curiosities were an attempt to represent the natural world and the breadth of human knowledge. Both systems attempted to combine and connect different areas of knowledge – the seven liberal arts linguistics and numerology, and the cabinets of curiosities art and natural science. We argue that people at that time came up with different constellations because they had a different level of knowledge than we do today.

Are digital photo collections a kind of modern cabinet of curiosities?

Today’s digital photo collections show a similar accumulation and curation – or lack thereof – of images from different areas

and cultures that also capture curious objects and memories. Certain images were taken in faraway countries, during various activities, for their entertainment factor as well as for the appeal of the object and added to the collection both unconsciously and consciously.

Another common feature is the question and concern about the ownership of the object. Then as now, the rights of who exactly owns the object are blurred.

Navigating Digital Collections

Almost all of the literature mentions how under-researched the area of personal digital information management is (Watkins et al., 2015). The types of data we collect have diversified immensely, and yet there is no intervention step of organising it. Often, there is an appeal for design intervention to facilitate “a more meaningful relationship with digital possessions”; “individuals can both enjoy and attach importance to their digital collections, yet the tools at hand often fail to provide adequate support for the full range of value and meaning” (Watkins et al., 2015, p. 10).

Surprisingly little is known about our habits of retrieving personal files. The operating system plays a factor, as Mac users retrieve their files more quickly than Windows users due to differences in organisation habits and interface (Bergman et al., 2012).

The main ways to navigate digital files are via hierarchical navigation and query-based search (Bergman et al., 2008). No matter how capable a desktop search engine is and regardless of advances in technology, users generally prefer to use hierarchical navigation – browsing chronologically – to find the data they are looking for. Bergman et al. suggest to investigate exactly what search functions are needed to be more attractive to users, and how to save time in chronological navigation (2008, p. 19). Benn et al. (2015) hypothesised that people prefer virtual navigation over search due to its similarity to real-world navigation, and indeed, this seems to be the case – their study found that the same areas of the brain are activated in digital search as during real-world navigation. Digital

navigation just seems to be more intuitive than query-based searching, and design strategies should support this (Benn et al., 2015).

When it comes to the organisation of personal digital file collections, most people seem to have trouble to an extent, even those who are technically literate. In Marčetić's (2015) analysis of 220 students across three different universities in Croatia, she investigated their personal digital archiving habits as they pertained to personal and study-related digital belongings. She found that all the participants made at least some sort of an effort to organise their digital collections; also, everyone agreed on the importance of keeping their digital things organised. However, when it came to the actual time and effort put into organising, results were different. For example, 44,5% of all participants stated they regularly deleted unneeded documents, and a total of 50% stated they either only created backups at random or never at all. Information fatigue seemed to be a big contributor in this; due to the high influx of digital documents, regularly organising everything requires too much time (Marčetić, 2015).

Spurgin (2011) talks about how Personal Information Management (PIM) relates to collecting personal digital photographs. PIM itself is seen as a boring, low-priority task (which is congruent with our later field research), which is also reflected in the way we deal with our photographs – many people share the intention of eventually organising them, but never get around to it. However, she points out that the activity of organisation is viewed differently in other leisure contexts; for some hobbyists, the organisation of the information is an important part of the hobby itself (Spurgin, 2011, pp. 153–154).

2.7.3. Spatial Navigation

While looking for new and interesting ways to re-experience static photo archives, we began to investigate the topic of spatial navigation skills. Rather than learning about existing spatial

navigation tools included in modern smartphones, we felt the need to learn about their effects on our cognitive abilities to inform our design process.

Many studies have been conducted in the field of cognitive mapping to determine whether GPS navigation systems impact our spatial awareness. For example, Burnett's and Lee's study (2005) investigates the ability of participants to navigate a series of virtual routes in a driving simulator. Their results show that those who used a vehicle navigation system retained the memory of the routes they had taken much less accurately than those who used traditional methods – e.g. a physical map or handwritten notes. Due to the fact that they could not rely on active guidance, those participants using traditional navigation methods paid attention to their surroundings much more closely than those relying on a GPS navigation system. However, it is important to mention that the participants using GPS navigation were given much less time to study the map in advance (Burnett & Lee, 2005, pp. 7–8).

The study also mentions that those participants who used traditional methods experienced higher stress levels during the navigation task – however, the increased stress resulted in a higher ability to subsequently remember the routes they had taken. The obstacles they faced increased their resilience in reacting to unforeseen circumstances, whereas the non-traditionalists were more reliant on their navigation tools and less flexible to change (2005, p. 8). Burnett and Lee argue that, in order to mitigate the decrease of cognitive ability due to relying on digital navigation guides, "adaptive learning-oriented user-interfaces" should be prioritised, rather than "uncertainty minimising styles" (p. 9).

Similarly, Boari et al. argue that "applications on mobile devices could be designed to enhance rather than erode spatial skills, by supporting the use of imagination to align real and virtual content" (2012, p. 1611). In their study, they investigated the ability of participants to correctly match differently rotated objects using the Mental Rotation Test (MRT) as developed by Shepard and Metzler in 1971. Participants relied either on men-

tal or physical rotation in 3D virtual space. Their motivation behind this was to investigate navigation ability, as mental rotation – rotating an object in your mind – is a skill that is very important in adaptive spatial navigation. Their test results show that while physical rotation is less cognitively difficult, it is also less efficient, as those participants using mental rotation were able to correctly guess solutions much more quickly (Boari et al., 2012, pp. 1612–1614).

Boari et al. (2012) argue that relying on physical interaction – in this case, physically rotating an object in 3D virtual space – rather than engaging with mental rotation erodes cognitive ability; while the task is cognitively easier, and the mental workload is lowered, there is also no opportunity for learning by building spatial skills. While they were not able to definitively prove some of their hypotheses, as a more long-term study would be required to do so, their suggested solution for this problem is not to implement rotational interactivity in mobile applications for navigation, to support cognitive development of spatial skills (Boari et al., 2012, pp. 1618–1619).

Wilmer et al. (2017) describe this concern as the "'ooading' of our semantic memory into a modern technological device". Adding on to the suggested solution of Boari et al, they encourage users to set their map so that North is always facing upwards, rather than being able to rotate the map at will to ease the cognitive workload. They also discuss the effect of smartphone usage on long-term memory; early research strongly indicates that the effect is rather negative, meaning that heavy reliance on smartphone tools decreases the capability for long-term memory (Wilmer et al., 2017, pp. 8–9).

Research suggests that a developed spatial ability might be linked to structural brain changes and could even play a part in preventing Alzheimer's disease, though this is still being researched and not conclusively settled.

One group which is an interesting case study for this is taxi drivers, who of course have extensive and well-trained spatial memory. An example of why is in MRI scans, the posterior hippocampi of London taxi drivers are significantly larger compared to those who do not drive taxis, and their size directly correlates with the amount of time spent as a taxi driver. This is due to the fact that the posterior hippocampus expands along with the environmental memory we store. The hippocampus is the part of the brain that is responsible for spatial memory (Maguire et al., 2000, p. 4398).

Spatial disorientation is a significant symptom of Alzheimer's disease. In their 2015 study, Tu et al. (2015) examined patients with Alzheimer's disease and frontotemporal dementia, and both showed hippocampal atrophy, which suggests that this correlates with patients' decreased ability to orient themselves and find their way home (Tu et al., 2015).

The Taxi Brains Project by Spiers Lab aims to investigate this relationship further. In 2021 and 2022, they set out to recruit London taxi drivers for MRI scans and testing on their route planning ability. Results of the study are as of yet not published (Spiers Lab, n.d.).

2.7.4. Recapitulation of Literature Review

So far, our assumptions about the difficulties of personal digital file management seem to be correct; the unlimited storage space we have available, the high amount of digital files received, and the lack of a proper organisational framework all lead to fatigue and our inability to manage our digital lives to a satisfactory degree. We aim to further investigate this in our field research.

It was especially interesting to learn that people prefer hierarchical navigation because it is most similar to real-world navigation. It makes sense that we would prefer in the digital realm what is most natural to us in real life. We plan to lean into this aspect of authentic exploration in our project work.

We were not surprised to see our expectations about readily available GPS technology and highly interactive smartphone navigation apps having a negative effect on our spatial abilities confirmed. Our challenge is now to incorporate this knowledge into our project. We aim to create a final product that strikes a balance between being user-friendly and cognitively beneficial.

2.8. Art & Design Review

For the Art & Design Review, we conducted in-depth research on the topics of Collecting, Archiving, Photography and Spatial Navigation. Here, we present a selection of art and design works that cover each of these areas. This gave us an overview of existing projects, which helped us with the framing of our project and thesis.

It was important to us to investigate thoroughly and portray the field as diversely as possible. While these works inspired us in our ideation process in subtle ways, more concrete projects and how they specifically relate to our project goals can be found in Section 3.2, *Related Projects*.

Time Capsules (1950–1970)
Andy Warhol

www.warhol.org/timecapsule/time-capsules/

In the mid-1960s, Andy Warhol started collecting all the things he encountered in his everyday life that he found desirable, which he kept in 610 cardboard boxes until the end of his life. He included valuable drawings and source material for his art as well as trivial objects such as bills, receipts, letters, and telephone call notes.

The MMK Museum argues that Warhol's "Time Capsules" are regarded as the last cabinets of curiosities and offer a cultural-historical journey into the past into the capitalist American society.

Note. Retrieved from www.flickr.com/photos/36378366@N00/3696479148

Waste Not (2012)
Song Dong

www.art-almanac.com.au/song-dong-waste-not/

The project “Waste not” consists of over 10,000 objects collected in Dong’s mother’s house over five decades. His mother began to accumulate household objects such as crockery, basins, empty drink containers, bottle caps, lighters, fast food containers, and biscuit tins when his father passed. These objects all represent memories and enabled her to live in the present. With his project, Dong created space for his mother to organise her memories and history. “Waste not” reflects and mirrors grief and austerity and leads to a celebration of life.

Archives in Motion (2019)
EPFL+ECAL Lab

www.epfl-ecal-lab.ch/research-projects/roger-tallon-archives-in-motion/

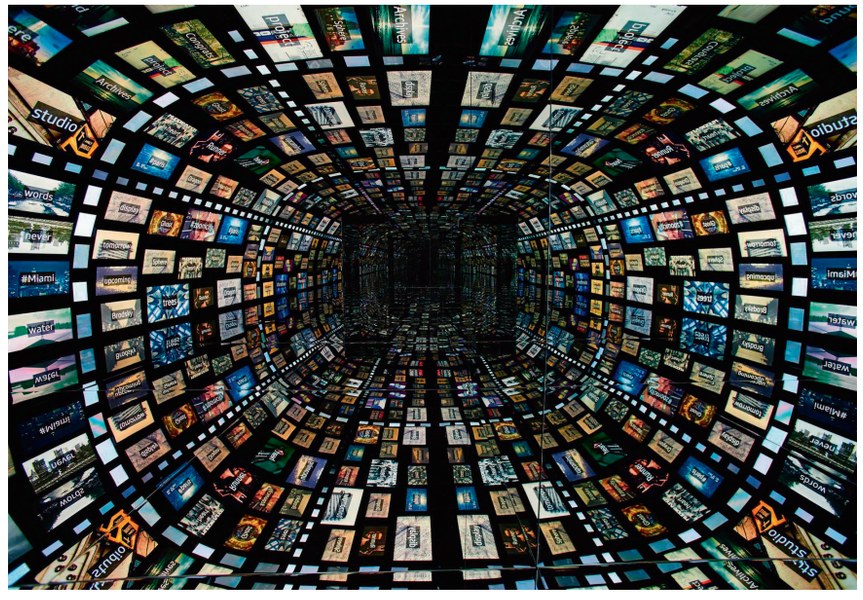
‘Archives in Motion’ highlights the work of designer Roger Tallon and invites users to interactively view his enormous collection of drawings, images, and texts. With this project, the EPFL+ECAL Lab has created a virtual world in which the user can be fully immersed in the heart of the library, allowing them to lose themselves in the vast collection.

The Supermarket of Images (Since You Were Born) (2021)
Evan Roth

www.evan-roth.com/~/shows/since-you-were-born-2021/

The project “Since You Were Born” represents all the images that the artist Evan Roth stored in his web cache since the birth of his daughter. He printed out all the images without defining any selection or hierarchy. As a result, logos, screenshots, family photos and advertising banners surround the viewer in visual space, creating a personal and individual portrait of the 21st century.

By transforming his online data into a narrative made of technology, Roth allows the huge collection of images to be physically seen and experienced.



Social Soul (2014)
Lauren McCarthy, Kyle McDonald

www.lauren-mccarthy.com/Social-Soul

The “Social Soul” project was created for a TED Conference. It is a digital immersive experience that displays a user’s Twitter stream in a 360-degree view using monitors, mirrors and sound. The experience starts with the stream of the visiting person. Using a customised algorithm, the participant is then brought together with another TED participant – their “soulmate” – and both people’s social streams are combined. After participating, they will both receive a message, encouraging them to link up offline.

Satellite Collections (2009–2015)
Jenny Odell

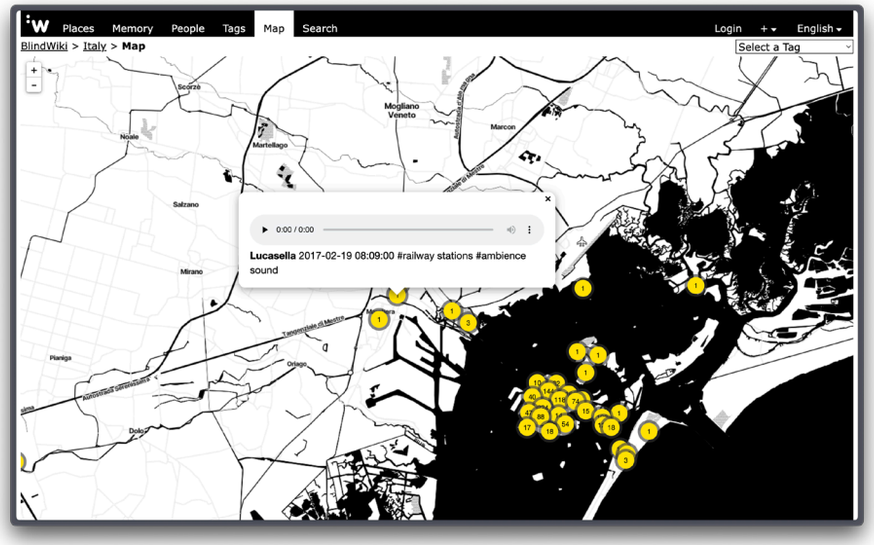
www.jennyodell.com/satellite.html

The “Satellite Collections” are an art project by Jenny Odell. She collected screenshots of similar things on Google Satellite View (basketball courts, container ships, airplanes), isolated them from their original context, and created collage prints with them. These are views we don’t get to see in our everyday lives. “[…] It is precisely from this inhuman point of view that we might be able to read our own humanity, in all of its tiny, repetitive marks upon the face of the earth.”

Humans of New York (Ongoing, started in 2010)
Brandon Stanton

www.humansofnewyork.com/

In the photo blog “Humans of New York”, which Brandon Stanton began in 2010, he publishes various interviews and photos. Stanton’s original goal was to just photograph 10,000 residents of New York and create a catalogue. Along the way, he began to interview his subjects, which he also published on the blog. He created a unique online archive, where photos are not just photos, but where real insights and emotions are linked to them through life stories.



BlindWiki (2014–2024)
Antoni Abad

www.blind.wiki/

The collaborative project BlindWiki, created by Antoni Abad, is an audio network on where blind and visually impaired smartphone users record their audio memories using the geographical location of the recording site. By sharing their geotagged memories, experiences and thoughts on BlindWiki, a new verbal way of navigation through audio presentation and guidance is made possible.

Dublin Portal (2024)
Benediktas Gylys

www.portals.org/

The art installation “The Portal” visually connects cities with each other. The ‘Dublin Portal’ connects Dublin with New York and enables a 24/7 real life livestream. The installation invites the public to look beyond borders, their social circles and cultures and find more similarities than differences. The project began in 2016 and has since expanded into a worldwide movement in both the physical and virtual world.

Insights from Art & Design Review
As mentioned in the beginning, we gathered these projects to gain a broad understanding of what has previously been done in the field. While they each contain different emotional nuances, from grief to joy, connectedness and new discoveries, they all have one thing in commone: they reframe a subject matter – a collection, an archive, a spatial experience – in a new way, they remove it from its usual context and give it a new one. While we did not know this at the time, we ended up incorporating this approach in our project as well.

3. Concept

3.1. Concept and Angle

After our extensive research, we saw our assumptions confirmed. Due to lack of motivation, time, technological fatigue, and the task itself not being interesting, people are unwilling to organise their digital photos – even though many of them state that they are unhappy with their organisation at present.

Additionally, our access to unlimited storage space devalues the experience of taking and keeping photos, which became evident in our workshop. Due to the wide and quick accessibility of digital photography, people are less selective in what they take pictures of than previously.

Our purposes currently for taking digital pictures are different and more varied compared to pre-smartphone times; we use digital photos not only to capture memories, but also as a short-term memory aid (e. g. to remember important documents) and to instantly share them with others. Being sent pictures by others, such as memes, and amassing screenshots that are only temporarily relevant, are active hindrances in curating a personal photo archive – there is too much unwanted clutter.

Therefore, the foundational questions we aimed to build our project on were: What do we have these photo archives for? How can we re-access them in a way that makes sense to us individually?

This is where we want to intervene with our project. How could we make the digital photos we have collected relevant to us again – bring new life into these static archives?

The two main approaches we identified to achieve this goal:
1. Propose a new way of organising.
Suggest a system that is more thorough than what we are familiar with now (chronological gallery in our phone, files sorted by file name in the finder of our computer) and that considers the different purposes we have for taking photos.

- We borrow from traditional archiving methodology and apply these systems for managing large-scale collections to the smaller, personal collection. (Compare interview with Christine Baur: the ZHdK archive differentiates between ongoing, actively-used storage, intermediate archive and long-term archive.)
- Photos already have metadata attached to them: date, time, and geolocation data (in the case of iPhones). We could leverage this metadata to showcase our photo archives in a different way compared to the simple chronological gallery.

2. Propose a totally new, unique way of accessing photo archives. Propose an experiment that does not necessarily prioritise productive organisation but experiencing.

- A collaborative aspect could have considerable potential – photo archives are personal, but we also take many pictures to share with others. It might be interesting to try and find commonalities between users and invite additional ways of experiencing this way.

After further research into the topic of geolocation metadata and spatial navigation skills, we decided to introduce the geographical aspect as an additional component into our project. We initially planned to develop a separate device that reflects the familiar properties of the compass.

Our thought process behind conceptualising a device was that it would encourage a slow computing approach, since it would be removed from the familiar smartphone environment (which comes with many built-in distractions). We also wanted to lean into haptic support for memory retrieval, as the benefits are documented (Chen et al., 2019, p. 802).

We pivoted to a smartphone application in the end, which has many advantages:
- It is widely accessible for everyone with a smartphone.
- It directly accesses the phone's gallery.
- The smartphone is a device most people carry at all times already.
- It is also the device most people use to capture new photos.

Ultimately, this resulted in Ody-C – a concept for a smartphone application that allows users to rediscover their personal pho-

to archives in a spatial way. We empathised the aspects of exploration and embodiment; the user physically has to move around to navigate the interface. This way, the original intent of an interaction that is not only digital but is grounded in the real world was maintained.

The name “Ody-C” represents this sense of exploration. It evokes the name of the ancient Greek hero Odysseus, who faced many obstacles on his homeward journey, but was ultimately successful in finding his destination. The capitalised “C” represents the compass, the core element of our interface.

3.2. Related Projects + Positioning

During our search for related projects, we specified certain parameters. The projects we found contain at least one of them, if not several. These parameters were defined in our research questions, and they are aspects we prioritise.

- Exploring the relevance of personal digital objects
- Providing a new way of exploring photo archives
- Leveraging the existing metadata of digital objects
- Reevaluating image archives disconnected from their metadata (through AI or manual organisation)
- Incorporating an innovative, interactive approach to spatial navigation

Ody-C is positioned in this same area and contains all of the aforementioned parameters: it re-explores the relevance of personal photos, leverages their existing metadata, and uses a spatial, embodied approach.

Note. Project Chronoscope, following on the next page.

Note. Project Chronoscope, viewer explores photo archive.

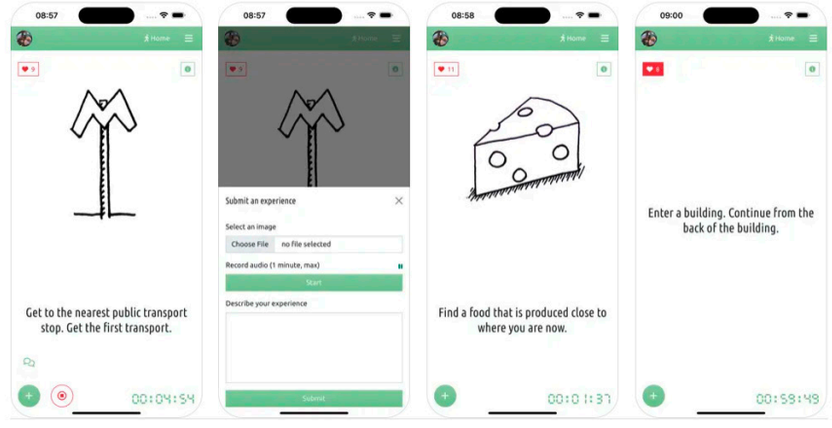
Chronoscope (2018)
Everyday Design Studio

www.iat-eds.dcr.sfu.ca/?eds_project=chronoscope

Chronoscope is a design artefact that was a result of the designers' research into personal digital photo archives and their metadata. They investigated how they could leverage existing metadata and use it in a new and interesting way. They came up with a physical artefact resembling a kaleidoscope. Each user can access their photo archives on it via Dropbox. On a small, circular screen, they are able to view one photo at a time. By rotating different controls, the user can change the temporal parameters and scroll through the images depending on which one is selected. There are three different modes: basic (oldest to newest photo), date (show all the images taken on a specific date regardless of year, e.g. December 24th), and time (show only photos taken during a specific hour of the day, regardless of date, e.g. 10 AM).

We found that this project uses existing metadata in a very interesting way that we are not familiar with. The authors argue that randomness is an element that is frequently used, but ineffective in creating new experiences with static archives (Chen et al., 2019, p. 807). Instead, we should take advantage of the existing metadata. A random approach (e.g. serving you a random photo from your archive) does not go deep enough, which is an insight we appreciate and want to utilise in our own project. What we also really liked was the haptic aspect of the product. The researchers mention the concept of ecphoria (Chen et al., 2019, p. 802) and how sensory input can help with memory retrieval. This is something we want to research more and perhaps incorporate into our project.

Note. Retrieved from www.apps.apple.com/us/app/d%C3%A9rive-app/id1159726913

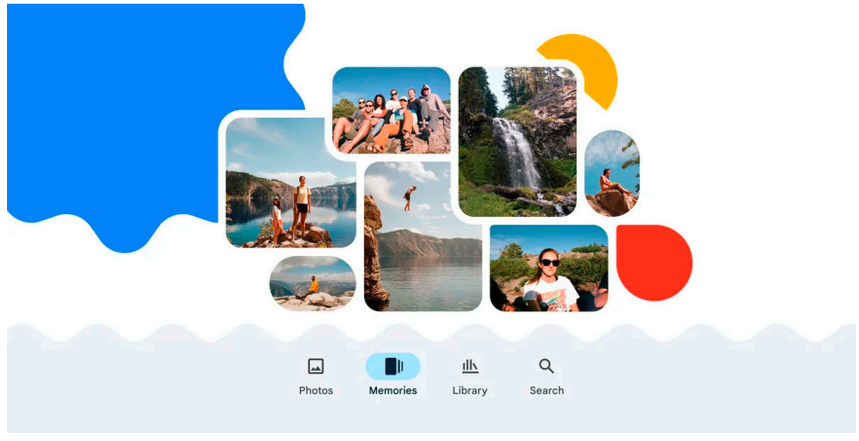


Dérive app (2012)
Babak Fakhamzadeh, Eduardo Cachucho

www.wsa-global.org/winner/derive-app/

Dérive is a platform that provides users with a tool to explore their surroundings by providing them with unconventional prompts. This essentially turns urban exploration into a game. It aims to break up routines and encourage spontaneity.

We quite like this approach of generating new experiences and rediscovering your surroundings under a different lens. Our smartphone as a tool has a lot of potential to not only be a tool for navigation and support us in our well-trodden routines, but to discover new, exciting aspects about our environment.



Google Memories (2023)
Google

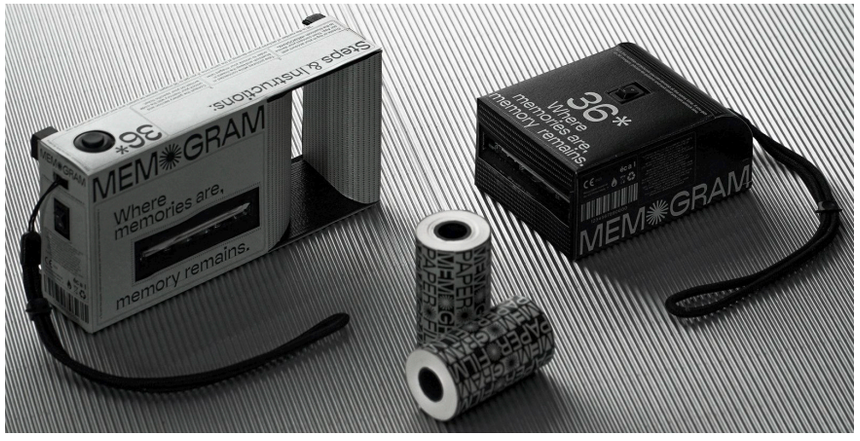
www.blog.google/products/photos/google-photos-memories-view/

These days, many smartphone operating systems offer built-in ways to rediscover your personal images. With the help of AI image recognition, Google suggests “memories” for the user to keep. Photos taken on the same or consecutive days are grouped together, which will then be suggested as collections. With generative AI, a title for the collection can also be created.

Additionally, Google Photos will serve up random photos on a daily basis, e.g. a photo that was taken a year ago on that day.

It is also common in smartphones to feature AI-powered search tools. By entering keywords such as “hiking”, “cats”, images featuring these subjects will come up.

In our experience, these tools are steps in the right direction; we believe they could be utilised more purposefully. They still operate with the “randomness” factor (See also: Chronoscope); the memories that are suggested to save are still largely random and not specific to the user’s needs. It is also unclear what can be done with the memories once they have been saved, as they are still then only accessible in a chronological gallery.

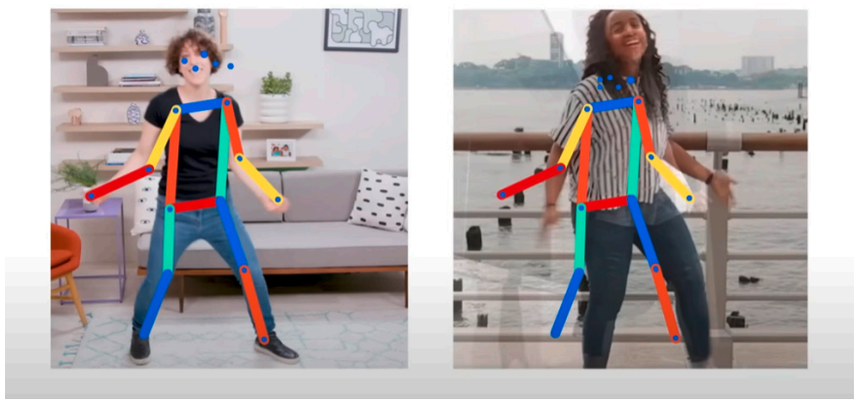


Memogram (2022)
Jamy Herrmann

www.ecal.ch/en/feed/projects/7009/memogram/

Memogram consists of a physical device as well as a web app. The device can be attached to a smartphone and communicates with it via Bluetooth. When taking a photo, the device creates a receipt with some contextual information of what can be seen on the image and temporal metadata. There is also an “appointment” printed on the receipt – a certain date at which you are allowed to access the photo.

This project aims to recontextualise the relationships we have with the pictures we take – to be more selective with what we capture, and to activate our memory by only conveying textual information. To us, it is extremely memorable with the visual language it uses.



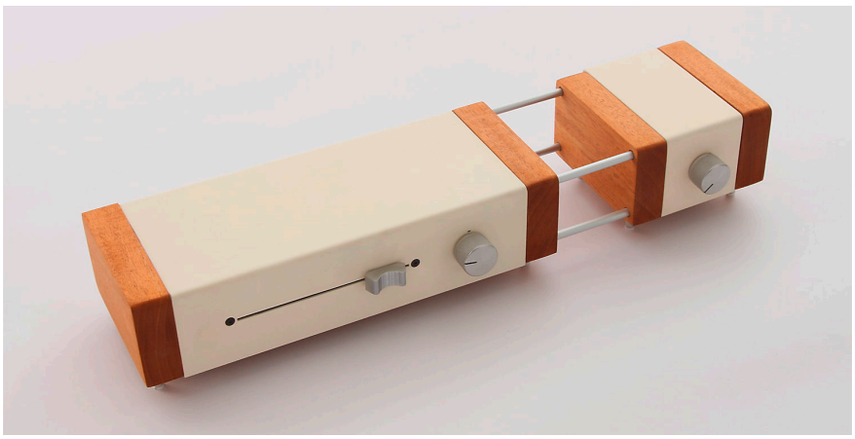
Move Mirror (2018)
Google Creative Lab

www.experiments.withgoogle.com/move-mirror

Move Mirror is an AI experiment that allows users to discover pictures in a fun way. The user turns on their webcam, then the computer analyses their pose and matches it with one of the 80,000 images from the pre-existing database which cover all kinds of activities: doing karate, dancing, etc. It was created using Tensorflow.js.

This is a technically quite simple, but still very exciting experiment, as it conveys exactly what we are looking to achieve in our project: It creates a new context for existing images, and offers an embodied way to explore this.

Note. Retrieved from www.talamram.nl/oloradio



Olo Radio (2018)
Everyday Design Studio

www.iat-eds.dcr.sfu.ca/?eds_project=olo-radio

Olo Radio, a similar project by the same design studio as Chronoscope, lets you trace back your past music-listening habits. The project consists of a radio device – unlike Chronoscope, it features no screen interface, but only rotating knob and slider controls. Analogously to Chronoscope, the device operates in three different time modes – date, time, and life.

As we have moved into the streaming era and collect less physical media, our music listening habits have become more fleeting and temporary. This project offers a unique way to rediscover your personal musical history.

The principles on which the device operates are the same as Chronoscope: the designers have leveraged existing metadata that can be retrieved without doing any additional work. Interestingly, the designers have purposefully not included any screen-based interface, as they wanted the experience with the device to focus on emotionality, inviting the user to think back on the moment in time when they were listening to the music, rather than focusing on any precise metadata-based information.

Pokémon GO (2016)
Niantic / The Pokémon Company

www.pokemongolive.com/

Pokémon GO is an Augmented Reality app that encourages players to go outside and explore their surroundings while walking around and catching Pokémon at the same time. It uses GPS technology to identify the user's precise location and interactive landmarks. Wild Pokémon spawn all around the player, who is then able to catch them. There are seasonal events, and different Pokémon are available depending on the player's location.

What we like about this game is the fact that it encourages exercise by going outside and walking around. It also has social components and allows you to meet like-minded people just by interacting with the game. It combines interactive digital elements with spatial navigation, and physical movement to create a unique experience.

t-SNE Map (2018)
Cyril Diagne, Nicolas Barradeau & Simon Doury

www.experiments.withgoogle.com/t-sne-map

t-SNE Map is one of Google's Arts & Culture experiments. It is named after the t-SNE (t-distributed Stochastic Neighbour Embedding) algorithm which visualises data by giving each datapoint a location in a two-or three-dimensional map (Van Der Maaten & Hinton, 2008). t-SnE Map is a project that maps thousands of artworks in a three-dimensional space. It does not work with metadata at all; instead, the exact location of each artwork is determined by its visual similarity to its nearest neighbours. The map can be explored freely by navigating through it on the web; by clicking on an art piece, you zoom in on it, get to see it up close and can learn more about it by clicking on the attached link.

This project appeals to us because it offers a new way to explore images, by navigating through them in a 3D space, randomly finding fascinating works in the vast archive. The landscape is visually diverse due to the differently-coloured image clusters.

3.3. Involvement of Our Stakeholders

From the beginning, we planned to involve our stakeholders as much as possible, namely our end users. Although we did not yet know what our final outcome would look like at that point, we included our possible users throughout the research and ideation phase. This is why we conducted a workshop with 4th semester design students, as well as our online survey. Later on, we would go on to test our prototype in user testings.

As for the question of who our actual end users would be, we intentionally did not limit ourselves to a specific user group. After we narrowed down our topic to personal digital photo archives, it became clear that this is a near-universal problem, as most people own a smartphone nowadays and use it to take pictures. In fact, according to DataReportal, there were a total of 10.77 million active cellular mobile connections in early 2024 in Switzerland, which amounts to 122.1 percent of the population. (The difference can be explained by some people holding multiple SIM cards, or non-Swiss residents holding Swiss SIM cards.) Additionally, 78.4 percent of the population are active social media users (Kemp, 2024). It is safe to say that smartphones are ubiquitous in today's society.

In our Google survey, we were also able to cover age groups ranging from under 18 to 65 and above, indicating that people of all ages have touchpoints with smartphone photography today.

Due to convenience, our early workshops and user tests were limited to students at ZHdK. Since we believe that ZHdK students are naturally more technologically inclined, and since we also wanted to appeal to people not already familiar with common design principles, we made an effort to include other people as well, which is again reflected in our survey and later user tests.

Of course, we also incorporated the feedback and suggestions of our mentors and fellow classmates as far as possible. Staying true to our goals was a bit challenging sometimes. We had many different stakeholders who had varying levels of knowledge of our research and varying preferences, so we had to balance this with our actual findings that proved or negated our assumptions.

4. Project Development

4.1. Ideation Methods

In order to help us progress, we used a number of design methods (as already described in Chapter 2, *Research*).

During the BA Concept seminar, we did several exercises together, namely: 20 ways of description; defining the qualities, parameters, and values of our project; and 50 sketches of design (Figures 18, 19, 20).

The idea of 20 ways of description was to describe our project in 20 different ways. Interestingly, some of the descriptions still match our final concept, e.g. “encouraging slow/mindful computing”, “creating a dynamic but reliable personal digital archive”, “finding physical metaphor to make digital possessions more tangible” – which is a good indicator that we succeeded in implementing our original intentions for this project.

We defined the qualities, parameters and values that were crucial to us. Some qualities we aimed to implement were tangibility, playfulness, and to re-introduce agency (for the user). These values were relevant throughout our process and final outcome.

Additionally, we created 50 sketches of design, we came up with 50 different ideas for what the final project outcome could look like at the diploma exhibition. Our topic was quite multifaceted and abstract and there were many aspects to it that we wanted to dive into, so it was challenging for us to imagine concrete project outcomes. We organised our sketches on two axes: analogue vs digital, informative vs emotional.

These three tasks were very useful to us because they forced us to think inside of these more concrete parameters after we had previously only discussed the topic in a very abstract way. Seeing as we had only formed our group a week prior to the seminar taking place, we were still in the very early stages of approaching the topic. Not only did these tasks help us refine

Figure 18/19: 20 ways of description; 50 sketches of design

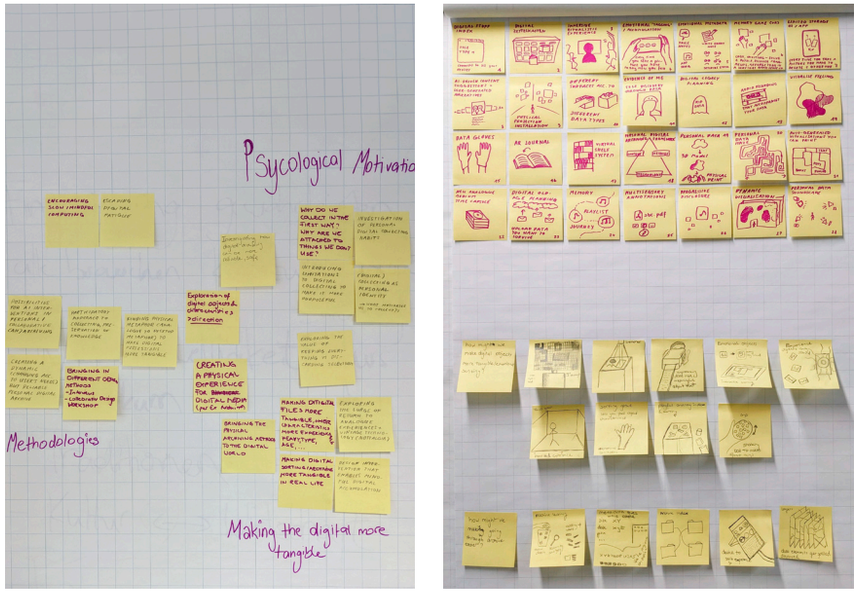
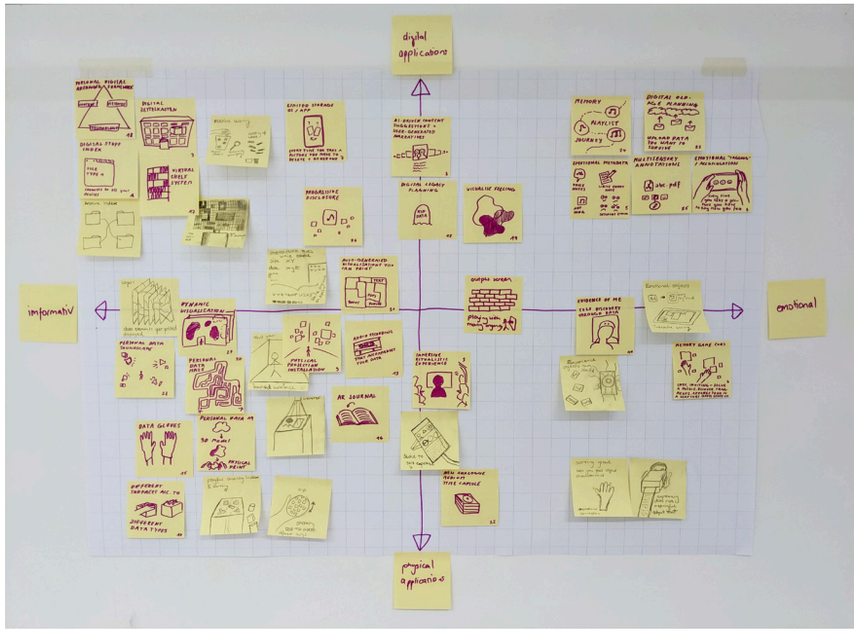


Figure 20: 50 sketches axes



our understanding of it, and what the potential destination of our journey could be, but they also made clear in which areas we were on the same page already, and what some misunderstandings were that we were then able to clear up.

Further along during the process, we used the creative speed dating method we had learnt earlier in our studies (Figure 22).

To come up with the topics for the creative speed dating, we organised the information and key problems we had gathered during the research process, which you can see in Figure 21. At this point, the topic was still a bit difficult to grasp, so this helped us immensely.

We identified two key problems that had emerged and proposed a total of three solutions for them.

The first problem is the fact that people own too many digital photos – so many that it is impossible to comprehend their scope. Possible solutions would be to take an *undesigning* approach, to deconstruct smartphone photography and introduce new limitations.

The other key problem emerged during the survey we conducted. Many people brought up the why; why should we organise our photos? Our proposal to address this would be to suggest a new way of exploration for one's static photo archives.

The creative speed dating was a useful method at this stage as we had defined three areas of design we could potentially go into: the *undesigning* aspect; suggesting a new organisation method; and creating new connections. In combination with these terms, we came up with eight adjectives: playful, collaborative, haptic, radical, futuristic, slow, nostalgic, and limited.

For each intersection of this grid, we rapidly came up with one idea for a final project outcome (within 2 minutes). Among these, we chose our three favourite ideas that had emerged and developed two of them into early prototypes for the second progress session.

Figure 21: Understanding the Bigger Picture

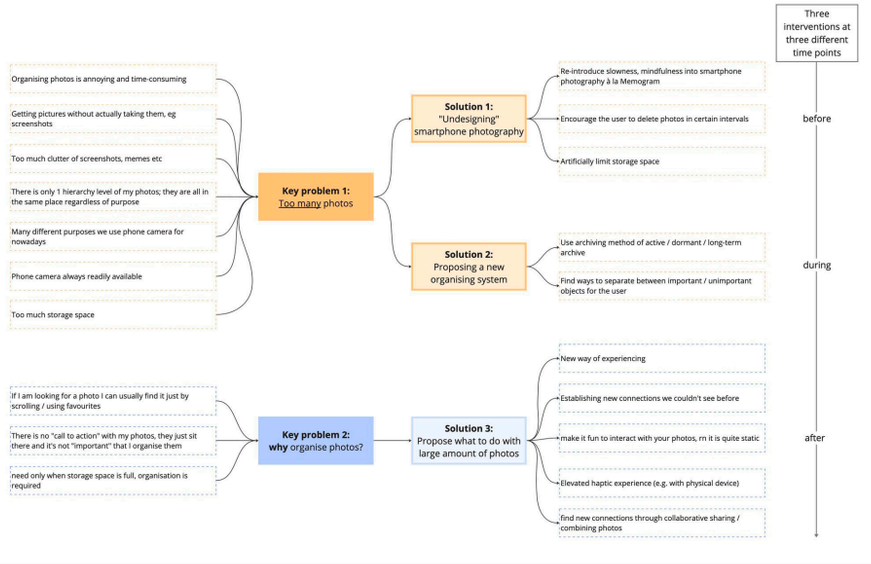


Figure 22: Creative Speed Dating

4.2. First Design Investigations

At this stage, to help us narrow this big area down to a concrete direction to pursue, we decided to conduct a number of design investigations that would help us advance our project.

First quick prototype: quick sorting (pre Archivo) (Figures 23/24)
Our first iteration was to explore how the user could more easily reorder and delete objects. To do this, we came up with a concept that would allow the user to move the photo to new locations in the gallery with simple swipe gestures, minimise the file size, move it to their memories and set a time limit for automatic deletion. We then implemented this concept with a low-fidelity prototype in combination with physical images.

While this prototype addressed new photos as they are being created or received, it failed to address the already existing mass of photos in our phones. How could we better interact with them, and how could we make the whole interaction more playful? We took these questions into consideration for our future iteration and development of the prototype.

Archivo – Photo Archiving Assistant (Figma prototype) (Figures 25/26)
During the BA Concept course, we explored various directions and ultimately focussed on the aspect of how users could have more fun when clearing out their personal galleries. To this end, we noted the following questions:

- How can we get people to take better care of their digital data?
- What is the best method, what is the best technology to address this issue?
- How can we better visualise this data to make it more tangible for people?

During our rapid field research where we asked people about their personal interaction with their digital files, we realised that many people are not motivated to interact with their data.

Figure 23/24: First cardboard prototypes

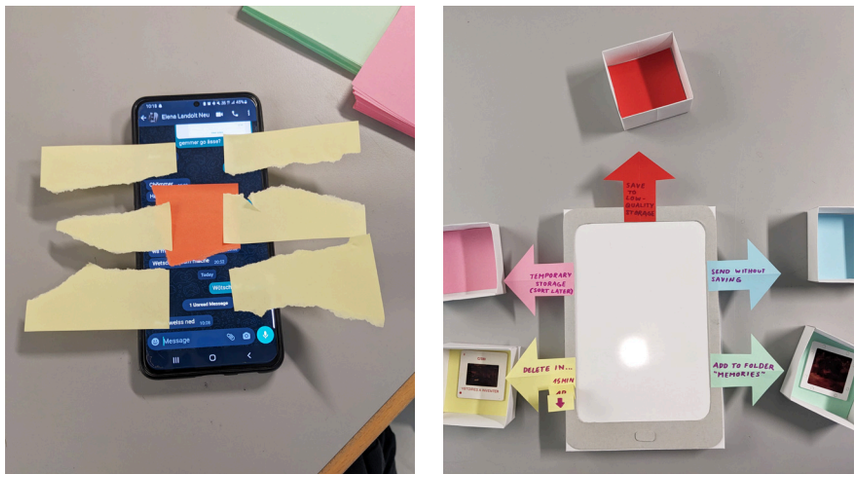


Figure 25/26: Archivo – make organising fun

archivo

Based on this, we designed an app, Archivo, that would show how the amount of files a user has and make it easier to navigate their personal gallery. We were inspired by the swiping mechanism used by dating apps such as Tinder and Bumble to design an app where you could either swipe images into the archive or into the trash can. This creates a playful approach to interacting with the images.

Due to the limited time frame, we limited ourselves to photos as the data type to organise in Archivo; while we opened up our research area again afterwards, looking back, it is interesting how our final outcome Ody-C is not so far away from this initial quick prototype.

Photos by Hour (Code Experiment)

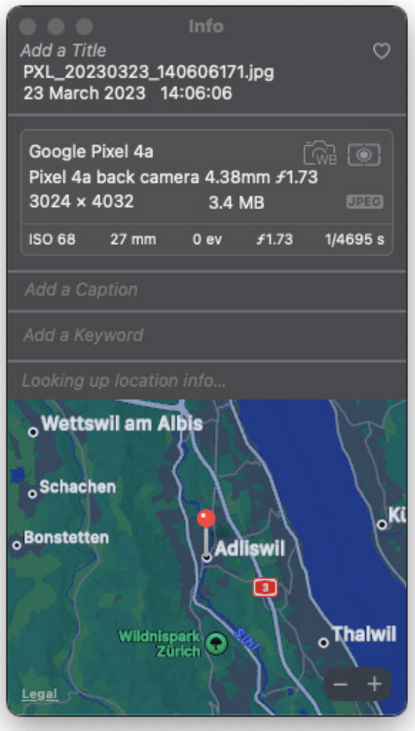
We spent a considerable amount of time thinking about how we could explore our image archives in new and interesting ways while still utilising the existing metadata that is attached to the images (see Figure 27). As we were very inspired by the Chronoscope project, which used time-related metadata and placed it on different axes the user could manipulate, we aimed to recontextualise image metadata in a similar way.

With the help of ChatGPT, we created a Python script that extracted the EXIF data of a series of images and put this data into an HTML file. This HTML site then displayed the images with the date and time they were taken. It also featured 24 buttons, one for each hour of the day, with which you could filter the images. Therefore, you could for example display all images taken between 4 and 5 PM, regardless of date. The order of the filtered images was however still chronological (Figure 28).

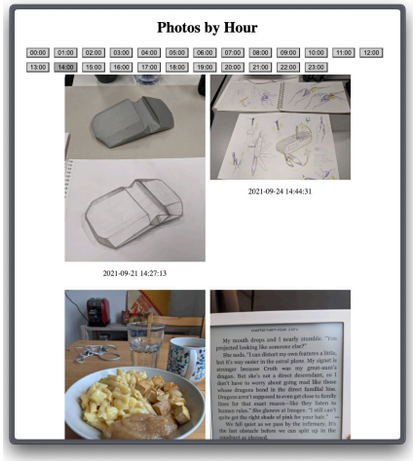
In a second iteration of this experiment, we decided to compare our individual photo galleries by taking the same code and altering it slightly. To differentiate the pictures, there is a blue frame around Tanja's and an orange one around Mo's (Figure 29).

It was quite interesting to see our pictures in this new temporal context, removed from the chronological order we are used to.

Figure 27: Image metadata, viewed in Photos application on MacOS



Figures 28/29: Code: Photos by Hour / Mo vs Tanja Photos



There were patterns that emerged, for example, we could see all night-life photos taken in the early morning hours, or pictures documenting our morning commute. Through manipulating the order of the images, we created a new temporality, removing them from their usual context and showcasing these new parallels we would not have noticed otherwise.

Arduino Cold/Heat Pad + Season Association

Another design idea we explored was to make photos more tactile and bring the user closer to their memories through heat simulation. In combination with an Arduino microcontroller, we used a Peltier element (Figure 30), which is a thermoelectric energy converter, meaning it can release heat on one side and cool (absorb heat) on the other side when electrical energy is applied to it.

For our exploration, we used the code already written for the “Photos by Hour” experiment. We extended this with the filter components “Spring”, “Summer”, “Autumn” and “Winter”. For this, we defined different heat values for the different seasons, which we could control using the keyboard (Figure 31).

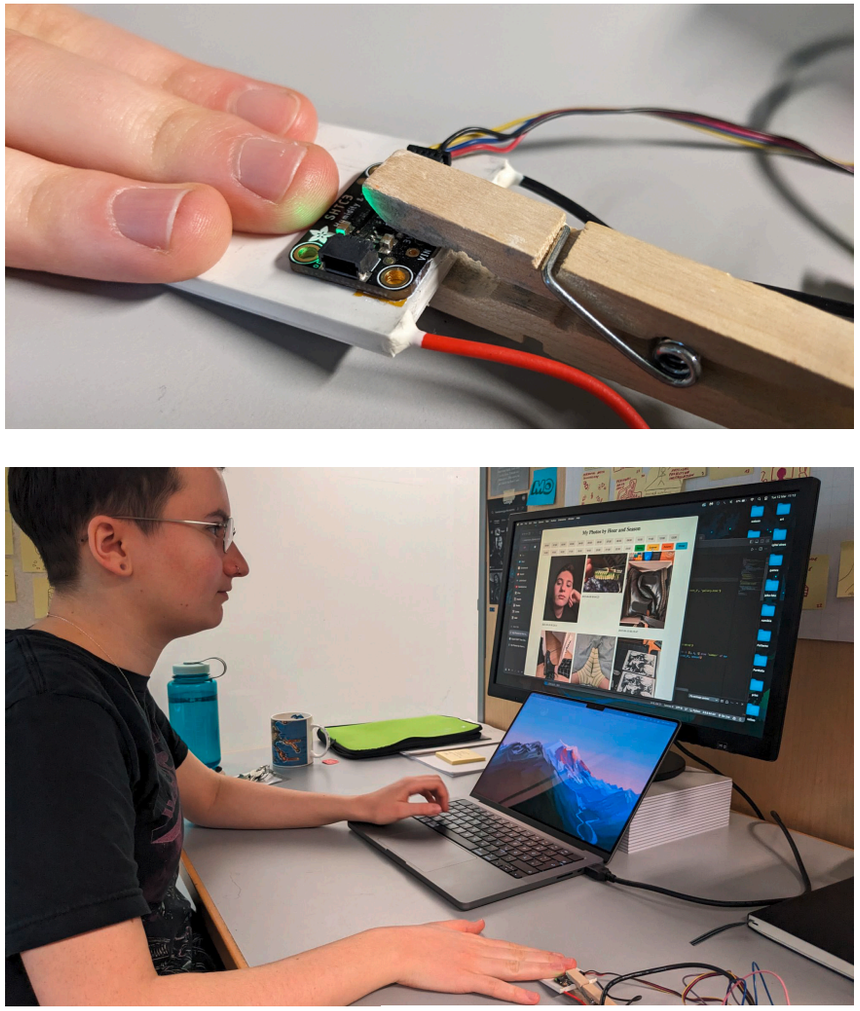
We learned that the heat simulation really offered an exciting experience and reminded the user of what it was like when they took the picture.

On a technical level, there were also some difficulties. The Peltier element warmed up very quickly and reached the desired temperature, but it took quite a long time to cool down to a low temperature. If the user switched from hot to cold, it took one to two minutes for the element to simulate the correct temperature. For this reason, it was unfortunately not suitable for further prototypes.

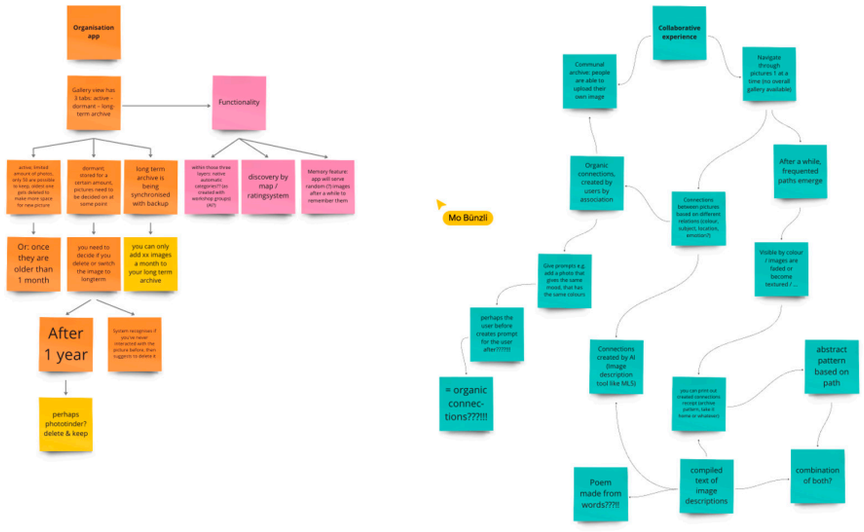
Dual Prototypes for Progress Session 2: Photo Organizing / Exploration

For Progress Session 2, we pursued two different approaches as described in Figures 32 and 33 above. The iteration points that seemed most exciting to us were photo organisation and exploration.

Figures 30/31: Arduino cold & heat association



Figures 32/33: Concept of two main directions



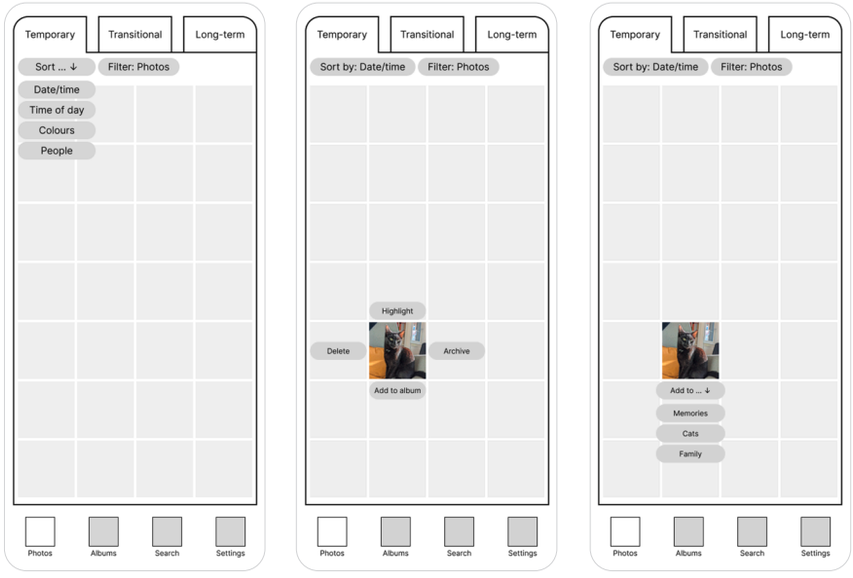
For the photo organisation, we came up with a concept that rethinks the usual smartphone gallery app. We were inspired by the interview we conducted with Christine Baur, the head of the ZHDK archive. In our redesign, we also thought of assigning three different areas to the gallery, as is the case with the ZHdK archive.

In this app concept (Figure 34), a distinction is made between the current, temporary, and permanent archive. The current archive only has space for a certain number of images, so the user must deal with the collected images. The user can then move images to the temporary archive where the images are stored for one year. After one year, they must decide whether to delete the images or keep them in the long-term archive.

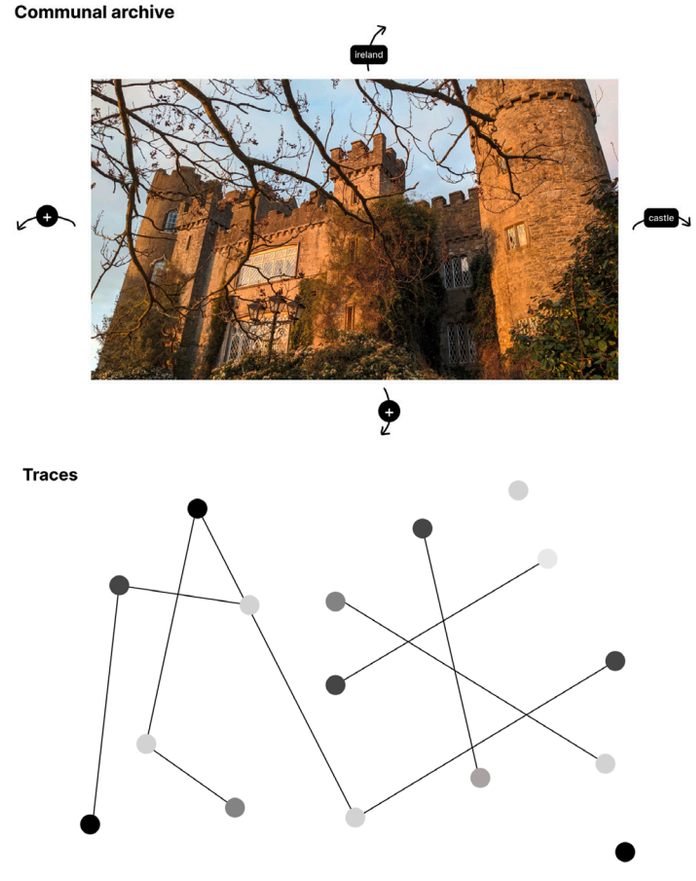
With the concept for an explorative application (Figure 35), our concept was to build a communal photo archive in which users can actively participate. At the moment, users only have access to their own personal photo archive. We wanted to change this by using a slow design approach to give users more meaning to deal with their personal archive and the archive of others.

Images can be added onto other ones by using keywords. This could work in a playful way and encourage users to browse through their gallery and respond to a given keyword with an image to promote the shared archive. Another function we featured in this concept was to incorporate the “ageing” factor: digital photos and images show no signs of wear. Just by looking at a digital photo, one cannot tell how many times it has been looked at already. As found through our literature review, analogue images offered users more emotional value through the wear and tear of the images. Therefore, in this product concept, our intent was to show the wear and tear of the images in the communal archive. The images are interconnected in a large network (Figure 36); users are able to explore these paths by clicking on the keyword connections. The more often certain connections are followed, and photos are viewed, the more visible the wear would be. In this case, we showed it by simulating cracks and fading in the images (Figure 37).

Figure 34: Prototype of the organisation app



Figures 35/36: Prototype of the collaborative experience / network of images



These prototypes were presented in a progress session presentation. The feedback we received after the presentation and the testing phase was very diverse. The “wear and tear” factor in particular generated significant debate, and the metaphor of providing the digital image with cracks was not the best solution as it was too simplistic. Instead, it was suggested we explore how else digital consumption might be visually represented. For instance, rather than transferring analogue ageing to the digital space directly, we could explore digital image compression as a metaphor for ageing.

Follow-up Experiments: Image Pixelation, Dominant Colour Filtering

The feedback we received in this progress session resulted in our next design explorations.

We investigated digital deterioration and considered how exactly we could visually represent it. As mentioned before, translating the analogue deterioration process into the digital – by showing cracks on the image and creating a fading effect – was not quite sufficient. How could we translate this process into the digital space and play off of the existing attributes of digital images?

Digital images become increasingly compressed the more they are screenshot and shared amongst people or posted on the internet. They already go through a process of deterioration, and leaning into this as a visual metaphor could be more meaningful.

We created a Javascript code that displayed an image on a web page, and the more you clicked on it, the more pixelated and the less recognisable it became (Figure 38). We quite liked this effect but ultimately were not sure how to explore this aspect further, so we set it aside for the time being.

In the second experiment (Figure 39), we further investigated colour sorting, which came up frequently when discussing possible inputs for a creative sorting option.

Figure 37: Wear and tear

We used a p5.js library called Colour Thief. It selects and displays dominant (most frequently occurring) colours of an image. This allowed us to display one dominant colour per image, according to which we could arrange the archives in the future.

This experiment generated an fascinating output for us on how exactly we handle photos and how we see them. The idea of organising by colour has a lot of potential as it can show new connections between images, regardless of their content, and create an additional layer of meaning (as showcased in the t-SNE Map project). Ultimately, we also did not pursue this idea further as it would have likely led to us having to do a significant amount of coding and even getting into machine learning, which, at that point in time, was not as in alignment with our skills and interests as other areas would be.

We were still missing an indefinable quality we felt lacking – to what extent could we continue to research and develop our project from this design exploration?

Final Concept: Compass Cardboard Prototype + Figma / ProtoPie Mockup

At this stage, we had not found anything that really caught our attention in a permanent way and made us want to go in deeper. After discussing what our core interests were again, what was important to us and what we wanted to focus on, we narrowed it down to the following aspects:

- We wanted to focus on designing and not let ourselves be limited by our worries about not being able to implement our concept in time (due to lack of coding knowledge). Also, perhaps our ambition to have a fully realised and functional final product was not so realistic at this stage, and also not necessary – conducting a thorough design process was more important.
- While the archiving and organisation of digital images has a lot of potential and is definitely underexplored in the design field, the other core problem of “What do I actually do with my digital images? What is my core motivation of engaging with them?” that came up during the research process seemed more promising to us.

Figure 38: Applied pixelation filter

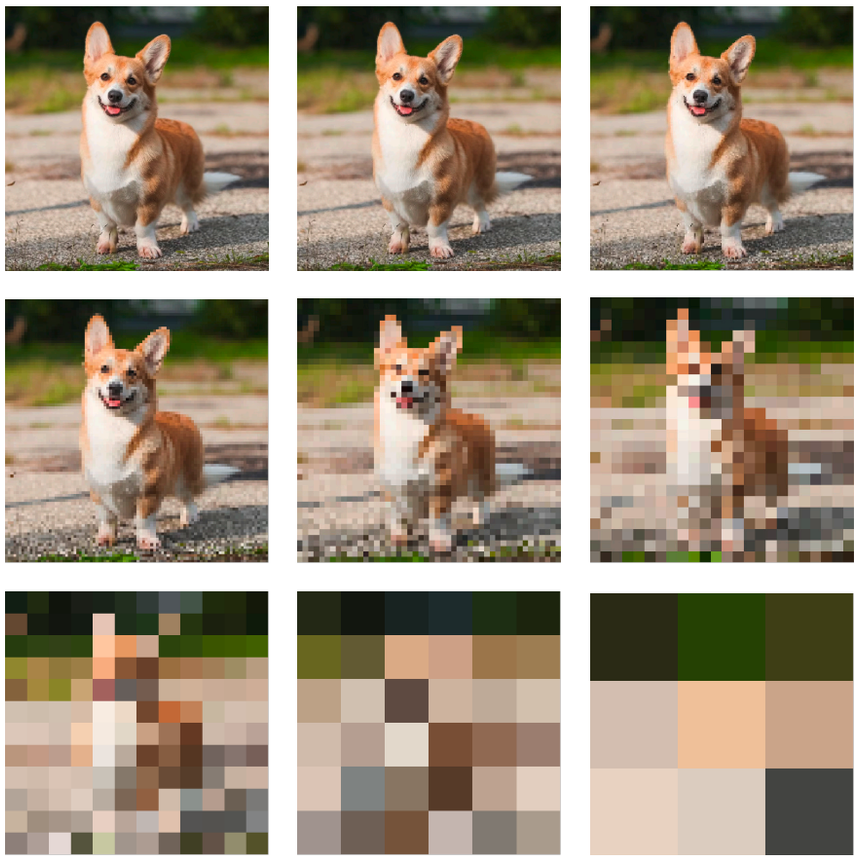
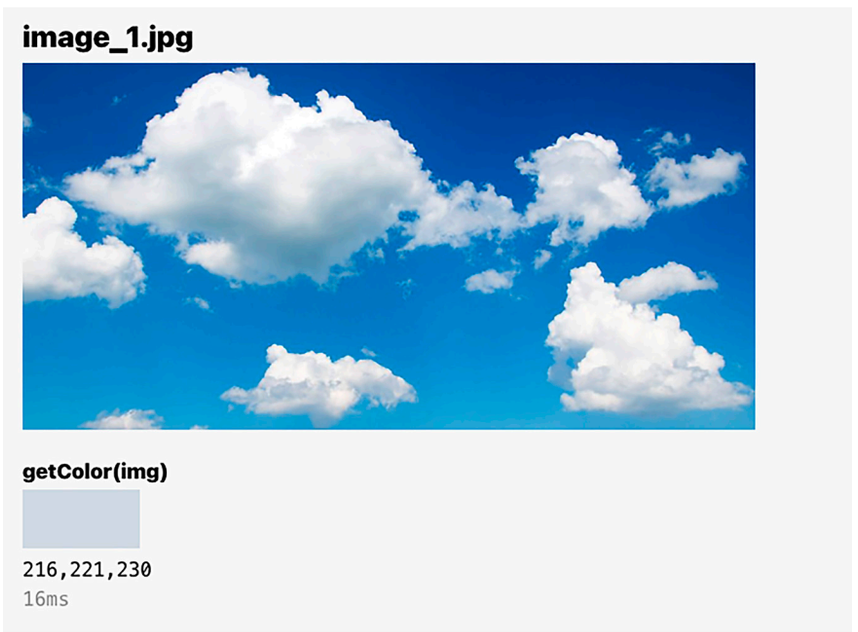


Figure 39: Dominant colour experiment



- One project we kept coming back to during our entire process up until that point was Chronoscope by Everyday Design Studio. We liked the designers' framing of it as the culmination of their design exploration, as they had utilised a Research through Design (RtD) approach (as described in Chapter 2, *Research*). Their arguments as to why their efforts culminated in a physical design artefact made perfect sense to us – they argued that physical stimuli can aid in memory retrieval; and of course the telescope as an object has many affordances that lend themselves to the exploration of images through time (Chen et al., 2019). Similarly, we gained the motivation to create a physical object as our final output. Having a haptic component, we felt, would ground our project outcome.
- Chronoscope utilised existing image metadata, which was an aspect we had looked into earlier but then put to rest. Now, as we investigated again, we realised we were still very interested in the aspect of geographical metadata, and wanted to explore it more thoroughly.

As we considered potential objects that give an affordance reminiscent of location metadata, we quickly landed on a compass. Our design object would have rotary knobs to fine-tune the different available parameters for searching – this reminded us of a camera lens. Our object would combine the affordances and associations of both objects. Our first sketches of this object can be seen in Figure 40.

Instead of a compass "face", our concept incorporated a circular digital interface. It would show a person's personal image collection, and they would be able to explore the collection based on geographical factors. For one, leaning further on the compass association, the displayed image would change based on which cardinal direction the person was facing; north, east, south, or west. With the rotary knob, further parameters could be manipulated, such as defining the distance to the image in kilometres, or – coming back to our earlier explorations of temporal metadata – the time of day.

A first quick cardboard prototype is shown in Figure 41. With this, we felt we were going in the right direction; the com-

Figure 40: First sketches for object prototype

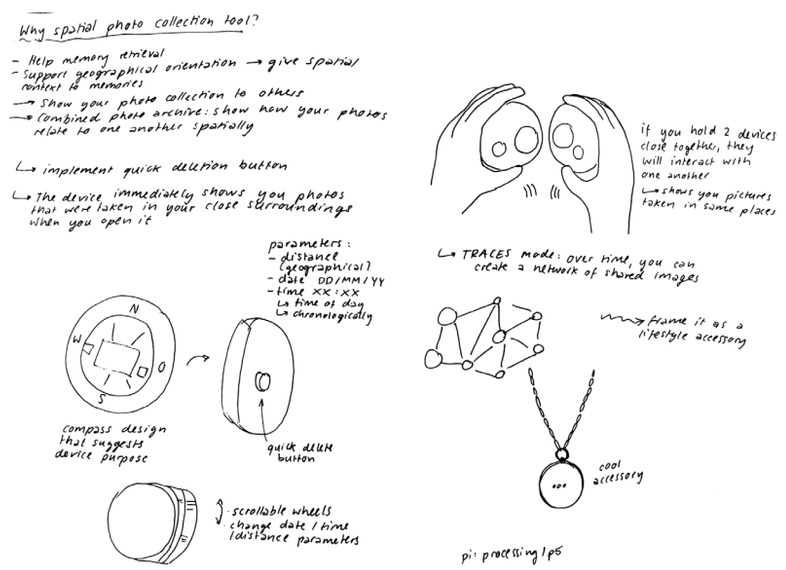
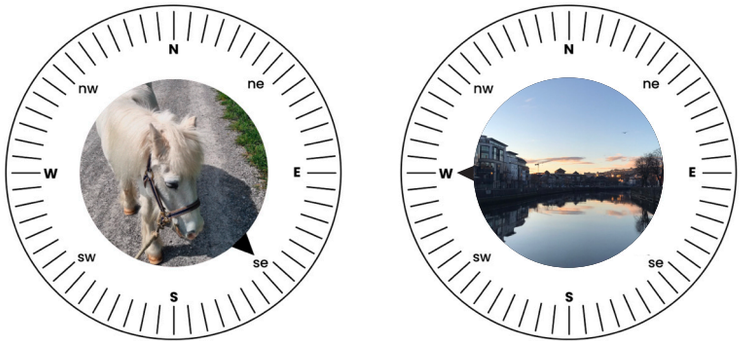


Figure 41: Cardboard prototype

Figure 42: First Figma mockups



pass-like object made sense, and manipulating the rotation knobs to change the displayed image was playful and interesting. We also created a rudimentary interface in Figma, as seen in Figure 42.

Upon considering the technical feasibility of this idea, we saw that not only would we have to design, test, and iterate on an interface, we would also have to gather technological components and create a device to go with them. Truthfully, neither of us had much experience with the design of such a physical product, which would require much technical precision. On top of that, sourcing a handheld round screen that still had a good resolution and touchscreen capabilities turned out to be difficult. Additionally, using components that required coding such as an Arduino microcontroller would limit us to only being able to prototype while relying on code. Although we had set out not to limit ourselves from the get-go, we also wanted to achieve a high-fidelity result that supported our strengths.

The compromise solution we came up with in the end was to create a smartphone-based application. This would solve a problem that occurred to us in the ideation process of our physical object: Seeing as the device would be a separate entity from the smartphone, we would only be able to mirror one's digital photo gallery onto the device. Having the application directly on the smartphone, it could theoretically directly access the photos on the device, thus creating an experience that would ultimately be more useful. Also, we could frame the project differently this way: By developing a smartphone application, anyone could download it and use it in a real-life scenario – previously, we had taken more of an approach of creating a speculative object. First iterations can be seen in Figures 43/44/45.

We created first prototypes using Figma and ProtoPie; this turned out to be a good call – while Figma is very good for creating screen-based visual designs, ProtoPie has more extensive prototyping capabilities. Also, by displaying a ProtoPie prototype on a smartphone, we could access the smartphone's compass sensor.

Figures 43/44/45: First iterations

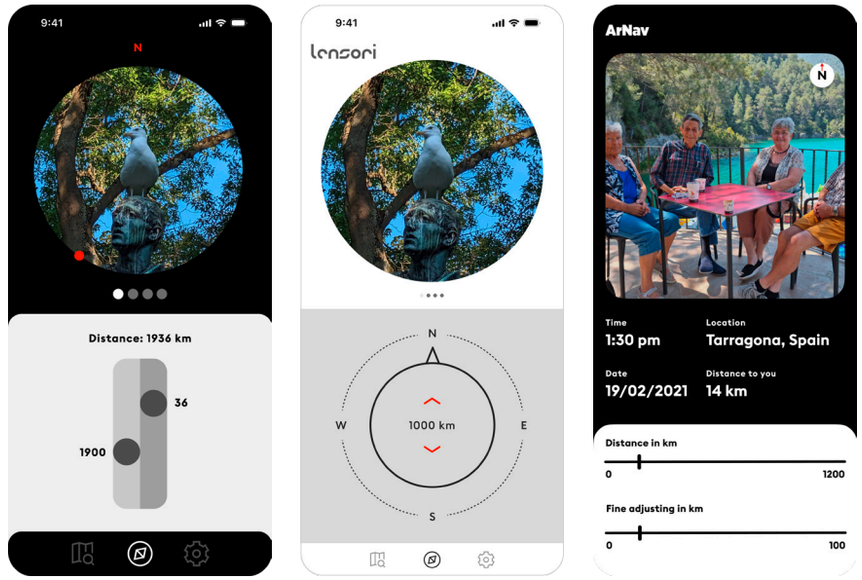


Figure 46: Application functions

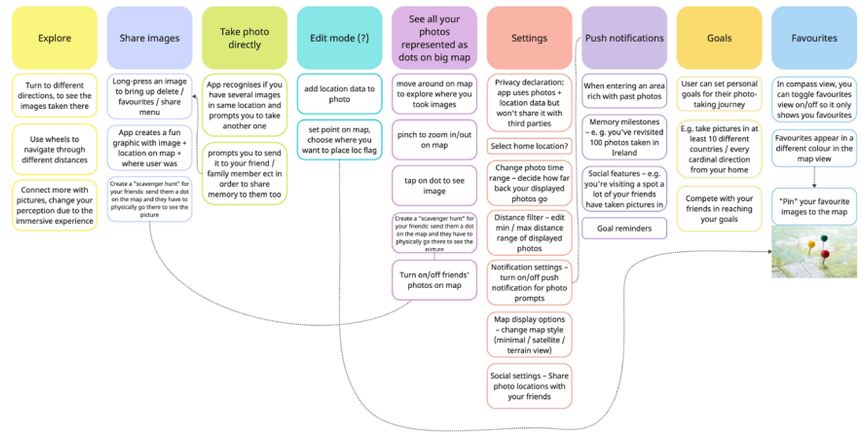


Figure 47: Functions divided up per screen

At this stage, we noted down all the functions that would make sense to include and divided them up into four areas of the prototype, as you can see in Figures 46 and 47. The core navigation would consist of Explore (later renamed to Navigate), Map and Settings.

The Navigate screen would be our core exploration screen which featured the compass interface and the actual experience of discovering one's photos. Next, there would be a Map screen that would supplement the Navigate function by providing an abstract data visualisation of one's photos on a map.

The prototype that we showcased during the third progress presentation consisted of the following features and core mechanisms:

- Core exploration screen that allows the user to explore their personal photo archive. Depending on the direction they face, a different image is displayed. The compass navigation is split into eight sectors, each of which displays the range of images taken in that area (see Figure 48). By changing the cardinal direction the user is facing and the distance to their current location, they can explore their images. Users can explore their images by facing a different direction and changing the distance to their current location on a dial.
- For the navigation, we created a combination of the rotating compass mechanism, as well as a distance scroll wheel (Figure 49). Using the up and down arrows, the user could scroll farther away or closer to their current location. By using the right arrow, they could change the kilometre intervals, so decide if they moved e.g. in increments of 10 km or 100 km. This way, they could control their experience more precisely.
- A map view which gives a more holistic overview of the images. However, on this screen the images are represented in an abstract way (e.g. as dots on the map), so the main exploration still takes place in the compass screen.

Figure 48: Compass navigation principle

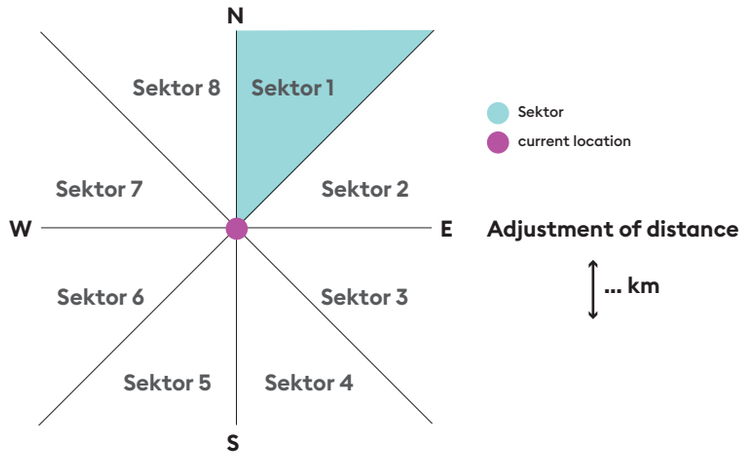
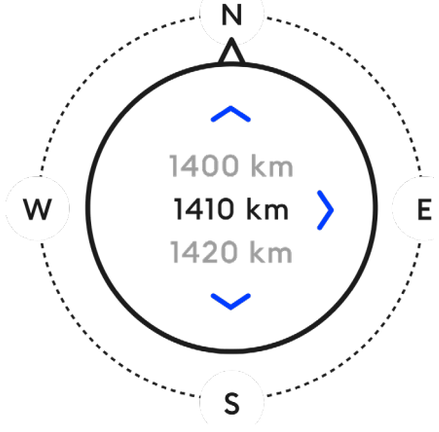


Figure 49: Navigation tool at time of Progress Session 3



4.3. Evaluation, Next Steps

While our process so far had not been the most straightforward, we were glad to explore many different topics and gain varied insights.

The topic of digital personal file management is vast, and a project in this area can go in many different ways, which we have definitely learned. A big lesson we took away was that we had to limit ourselves in one way or another. As we started out with the broad topic of personal digital archiving, we narrowed it down to personal digital photo archives, and then to a new way of exploring these archives.

All of the design explorations we had conducted helped us in reaching our goal, whether we implemented the gained insights in the final product or not. Each experiment helped us figure out what aspects were interesting to us, and where we saw a potential space for our project to exist in.

What always helped us tremendously was exchanging thoughts and discussing with our mentors, fellow Interaction Design students, and people outside of the ZHdK institution. All of these people offered valuable and unique insights from their own perspectives. Of course, it also helped to be a team of two people; the ability to discuss ideas, introduce and re-introduce elements was essential and brought us much further in our process. While our design process was quite broad overall, it helped us come up with a stronger concept in the end.

Another lesson we learned was not to get intimidated by the potential methods and technical skills required to implement an idea. Since neither of us is an expert in coding and/or electronics and we see our strengths elsewhere, our perceived lack of skill in these areas hindered us when we could have been thinking much further.

After all, the expectation of having a fully realised final product is not necessarily the main goal, as the design itself and the overall process are much more important. We were also able

to make good use of design methods we had previously worked with during our studies, for example the Creative Speed-Dating method was a well established and tested way for us to quickly generate ideas when were stuck, and something we went back on many times throughout this process.

These were our next steps for part 2 of the project development phase:

- Work out the core problems of our application (detailed in Section 4.4, *Developed Prototypes*).
- Define exactly which parameters we want to be able to change within the navigation.
- Do extensive user testing of our prototype(s).
- Create iterations for the visual design of the screens.
- Create an in-depth interactive prototype that gives an accurate experience of what we want to convey with the app, e.g. display images that are correct to the indicated rotation and distance.

4.4. Developed Prototypes

After the last progress session, we were still facing a lot of problems concerning the core mechanisms of our prototype. We started to identify all the factors which need work.

First, there were a lot of problems with the core mechanism of the compass exploration screen. If we continued with the eight-sector system as described in the previous chapter (Figure 48), the problem was that the sector became larger and larger as the user increased the distance to their current location. This means that, at a larger distance, the navigation becomes much less precise.

For example, if you look at Figure 50 below, in which the user is in Switzerland, the images taken in Switzerland are precisely navigable and the user is able to gain meaningful context from them, as they are distributed all around them. However,

all the images in Libya / Egypt / Sudan (assuming the user has taken photos there) would be in the same area of navigation, so there would be no meaningful differentiation.

Thus, our most pressing concern was to solve this far-distance exploration problem. We aimed to solve this problem in our next iteration by replacing the fixed-sector system with a *customisable sector system*. This meant that we would add a second interactive control next to the distance control, with which the user could adjust the width of the respective image sector (see Figure 51). This way, they could choose to display a narrower and more precise angle at farther distances, to narrow down the images displayed, and open it up more widely at closer distances, if they so chose.

Another concern we had at this stage was the wildly differing use cases we could imagine. What if the user is originally from Italy but now living in Switzerland, and the majority of their image archive is located in Italy? What if the user has travelled extensively, and what if they have not travelled at all? What if the user is in a moving vehicle, for example a bus or a train, how would the experience then change?

We decided to create personas to demonstrate these different use cases, and then to define the individual user flows for each of these personas (Figure 52/53).

For the different personas, we used the comments we gathered from previous user interviews, feedback from mentors and classmates as well as personal experience.

We created three different personas with different backgrounds, interests, values, actions, motivations, pains, and contexts, each with different problems and needs for our application.

This was particularly helpful for us to revise and customise the user flow. The user flow we created formed the framework for our Ody-C project.

Figure 50: Size of compass sector increases along with distance

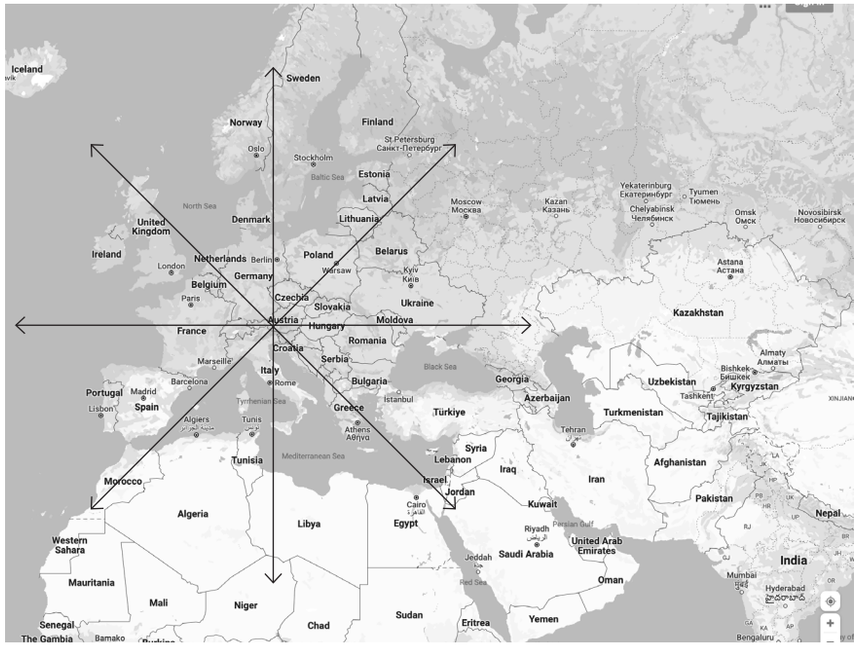
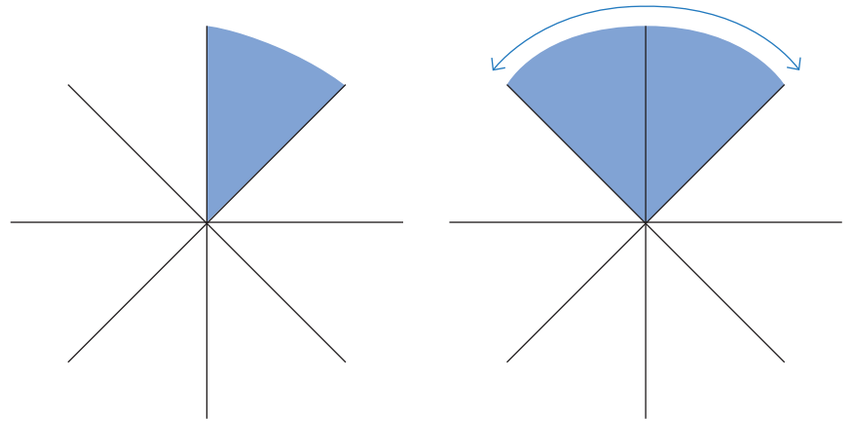


Figure 51: Sector system before vs after



By developing the customisable sector system, we were able to address the following problems:

- How can we tackle the problem of the area getting bigger and bigger by increasing the distance?
  · By dynamically customising the sector of displayed images, the user can narrow them down to a very precise degree.
- How does the app work when there are no pictures taken in some directions? What if someone hasn't travelled at all? is it just empty? Does it stay at the last shown picture?
  · The last shown picture is displayed. The user is able to view more images by extending the sector.
- If a picture is taken exactly on the intersection of two sectors, which one does it belong in?
  · This problem is no longer applicable as there are no longer any intersections.
- What if you are from Italy and took most of your pictures there but just moved to Switzerland (Figure 50 from previous chapter)?
  · Again, by narrowing down the sector, the user is able to customise their experience as precisely as desired.
- How does the app differentiate between the more than 1000 pictures I took in my home town when I am there?
  · The user can navigate through these images when they are at home– but of course, a selling point of the application is its *embodiment* – the experience is more varied when the user is within a photo "hot spot", at the location where they took a lot of photos.

Figure 54 below shows the updated navigation view. Figure 55 shows the map view.

Another question we kept running into was: Should the user be able to dynamically change their location on the map? This would solve some additional problems for us – e.g. the last question, only being able to navigate one's image archives immersively when they are in close proximity to one's location –, but in a way, it would be less embodied. We decided to review this issue, along with some other ones, during user testings.

Figure 52/53: Sample persona / user flow

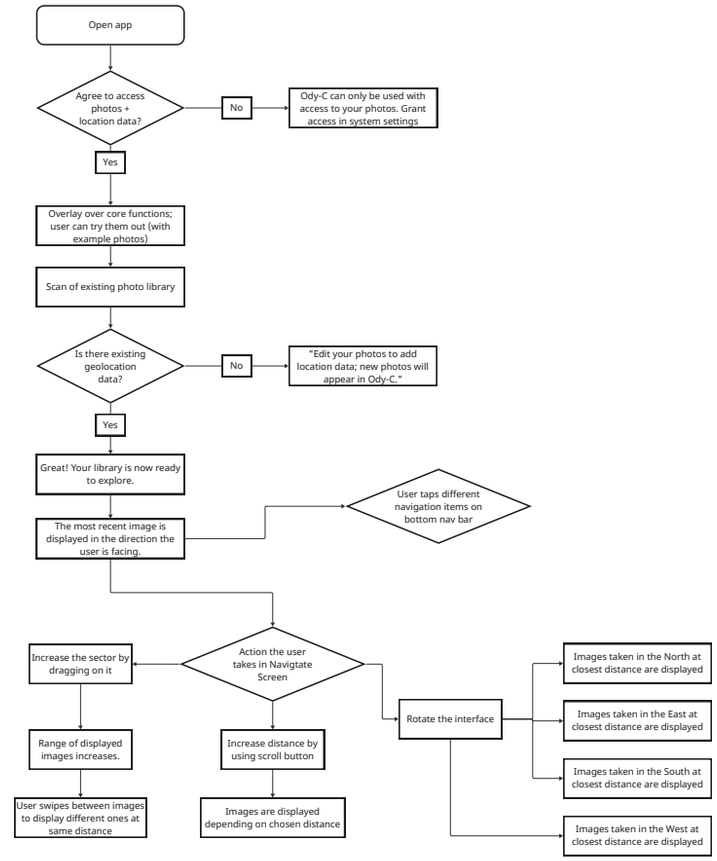
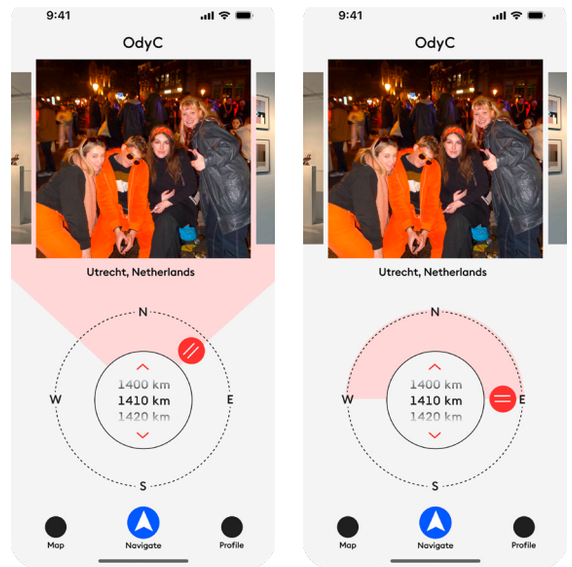


Figure 54/55: Updated prototypes



4.5. First User Testings

In our user tests of Ody-C, we were particularly interested in whether users could utilise our main navigation. To this end, we built a ProtoPie prototype that demonstrated the functionality of the interactive rotation navigation and allowed users to experience it. In addition, we created a Figma flow, which we executed using a simplified form of A/B testing. Instead of conducting separate variant testings with different user groups, we tested both on the same users and generated feedback that way.

We asked ten different users from our network inside and outside the ZHDK to test our prototype. This seemed to us to be an important step, as we also want to address people outside the ZHDK in our target group and include their opinions in our project. (See Section 3.3, *Involvement of our Stakeholders*, in Chapter 3, *Concept*.)

The response to our creative proposal of Ody-C was nothing but positive. All of our respondents stated that they found interacting with the core navigation interface very intuitive. The scroll wheel in the centre to adjust the distance was quickly used and interacted with due to the 3D navigation.

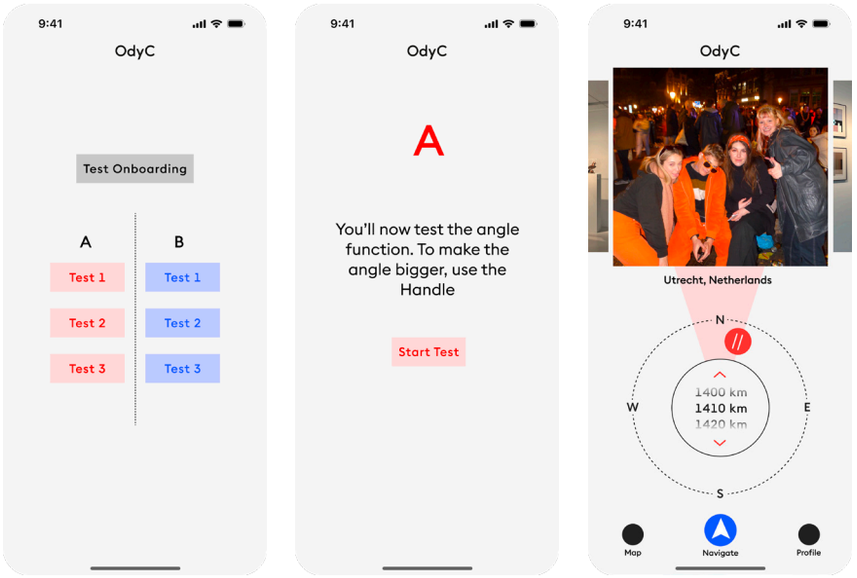
As the compass interface is linked to the smartphone's compass sensor, our testers quickly got used to it and rotated the smartphone and themselves to discover images.

For the A/B testing, we designed three different flows to find out which UI elements the users find more appealing and more necessary (Figure 56).

Test 1 focused on the function and integration of the map. The idea that the user can change their location and interact with their images from a location other than the one they are in already raised some discussion points.

When we tested this function, we received mixed feedback. Some respondents liked the idea, and they argued that the

Figure 56: Section of user testing flow



ability to change the location to a past holiday hotel for example and move around there would be a great way to relive memories and immerse themselves there again. Another user, on the other hand, said that they did not need this function as they would find it difficult to re-experience images in certain directions because they were not in the same place physically.

In test 2, we were interested in whether our users would want and use a context menu (Share, Like, Delete) while long-pressing photos in Ody-C. To do this, we tested the way the context menu was displayed. In the first option, the context menu appeared while the image is greyed out; in the second option, the photo appeared in full view with the context menu at the bottom.

Our test users clearly indicated that a context menu within our app would make sense.

The response here suggested that version B seemed more intuitive for users, as they are already familiar with this interaction from the flow within the smartphone gallery.

In test 3, we wanted to find out whether our users liked the visuals of the sector element and whether they found it more intuitive if it extended into the images or remained within the compass navigation element.

The feedback from our test users was clear in this area. All preferred the version in which the sector extends into the image – as it shines into the photo archive and reveals the images, so to speak.

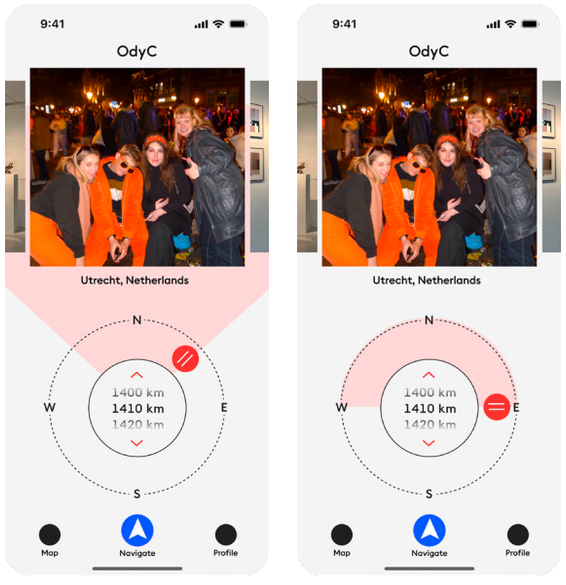
We learnt a lot of valuable lessons from our first user testing. Our concept was well received and was seen as interesting and fun. This confirmed our approach and showed us that we were on the right track.

However, we also realised that we needed to organise testing differently and formulate our instructions more clearly. We continued to show the sector element as a ‘torch’ in the image – by having it extend past the compass interface, the difference is

demonstrated in Figures 57 and 58 – as well as having this element controlled by a slider but effectively attached to the sector, as this provides more context when interacting with the navigation.

We also learnt that the issue of being able to change one’s location on the map generated quite diverse feedback. Really, it could be argued both ways whether one or the other was more embodied and reflected our goal more clearly, so we simply had to decide which one to implement, and then further test its viability.

Figure 57/58: Big sector / small sector



4.6. Final Prototype Fabrication

Through further discussions and mentoring, we iterated on our UI & UX elements. As found in the first user testing, the interaction with the compass and the scroll option worked well and was intuitive for the user. Our navigation elements ‘Map’, ‘Navigate’ and ‘Settings’, however, were all on the same hierarchy level. This was problematic as the ‘Navigate’ screen was the most important feature of the app and therefore needed to be more prominent.

We requested a mentoring with Florian Wille, a Senior Design Strategist at the agency Dreipol and a lecturer at ZHdK. With his professional guidance, we were able to take a slightly different approach to our interface, which reframed the concept and solved some of our remaining practical problems. Figure 59 below shows an updated wireframe.

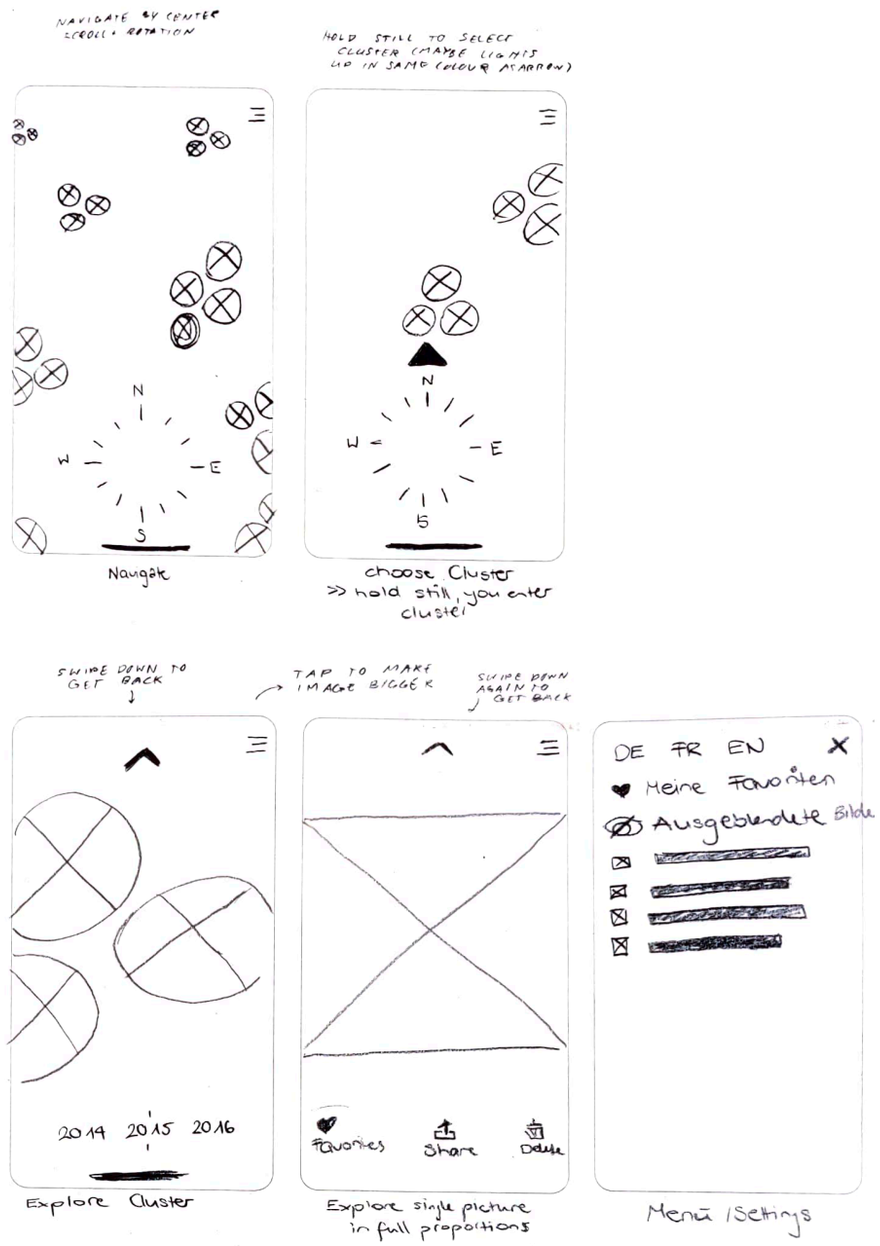
In our new – and final – design, the different images are arranged in clusters, in a minimalist form like a sort of cloud, and distributed around the user, just like on a ship’s radar (Figure 60). By rotating the phone, the user is able to discover the different clusters surrounding them.

In this new interface, the core exploration screen combines properties of the ‘Navigate’ and ‘Map’ screens, so there is no longer a need to separate them.

The user is given the opportunity to discover these in a more playful way – they have to capture the clusters by rotating the smartphone and selecting the desired cluster of images to take a closer look at them. Selecting the cluster takes them to the next layer (Figure 61), where they can consciously explore the images in the selected cluster. In this iteration, we reintroduced the factor of time, to account for the arrangement of equally localised images in different time periods. A horizontal slider displays the years in which the photos were taken.

Finally, on the third zoom layer, the image can be viewed fully, and a context menu (delete/share/favourite) appears (Figure 62).

Figure 59: New wireframes created after the UI & UX mentoring



We are aware that this UI & UX has a slightly different functionality than the previous prototype. However, this combines the navigation function and map in a better, more intuitive way and creates an overall better user experience.

Another point that came up in our discussion was the onboarding. Do we need to introduce the user to our app? Ideally, we would be able to guide the user without explicitly including an onboarding. We implemented micro-interactions, such as a nudge animation that triggers when the user fails to identify the correct interaction element after a while.

Another challenge we faced was the question we had already dealt with earlier. How do we deal with the area under the angle becoming larger and larger the further away we get? The solution we had previously defined was an angle that could be adjusted. With this new UI, however, this element was no longer relevant and a new solution had to be found.

4.7. Final Prototype Viability User Testing

For the final round of user testings, we used the Rapid Iterative Testing and Evaluation (RITE) method. This method describes an approach of quickly iterating on a prototype, then evaluating it again in a user testing, followed by immediately implementing the learnings in a new iteration, testing this one again, and so forth. Users we approached were fellow students, friends, and family members, all between the ages of 20 and 50.

The first feedback we received was that the core interaction of the prototype was fun to use; this approach felt sort of like a game. However, the user struggled with understanding the navigation and tried to tap on the screen to zoom in on the clusters, rather than using the navigation wheel to approach them, which we had implemented.

In order to make this more understandable, we added a nudge animation which prompts the user to use the central scroll

Figures 60/61/62: Three zoom layers of the new concept

wheel. We also added a start screen which contains a summary of the app concept in one sentence, hoping that everything would be more clear to users this way.

In the second round, we tested with several people. They all said they found the concept and mechanism very promising; one even stated that they actually only use the map feature of their iPhone gallery, as the masses of photos are unnavigable. This confirmed to us further that our approach is a meaningful way of navigating these vast image archives. They also stated that it opens up a new way to interact with images in the physical space.

We received vocal support for our context menu (Delete / Share / Favourite). Users stated that sharing is the most important aspect of interacting with their photos, and this absolutely needs to be a part of the app. This group again did not find the navigation elements of the interface intuitive to use; users intuitively touched the clusters on the screen, rather than using the navigation elements. We understood at this point that this core principle needed an overhaul.

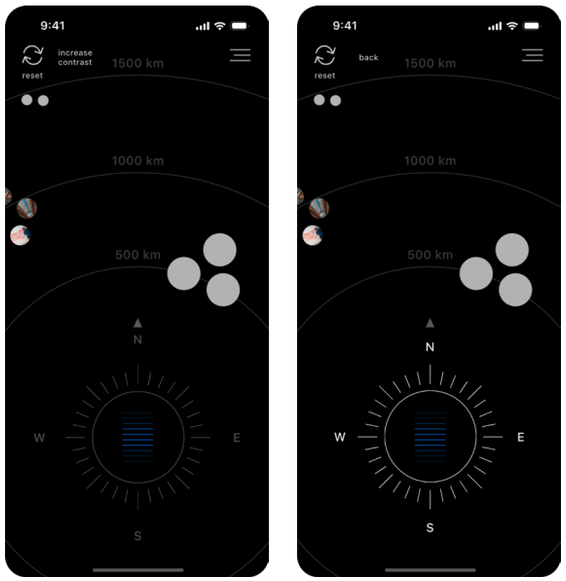
We updated the prototype to allow for zooming in on the photo clusters by tapping on them, in addition to the scroll mechanism. We also added some minor adjustments that improved the overall user experience. For example, we implemented a “pinching” gesture that allows the user to exit a screen by swiping downwards, rather than just being able to do so by tapping on the “back” arrow.

We also received the feedback that the white-on-black interface offers too little contrast (Figure 63); especially the opacity of the white elements is too low, which might be unhelpful for people with lower vision (Figure 64). We created an alternate high-contrast version of the interface and tested both with an older age group of people in their 50s.

When testing with two people in their 50s, it became clear that the interface does not have enough contrast. Our test person stated that they would not have noticed it at all without the

increased colour and had registered it as a compass. At the time of writing this, this was our last iteration element.

Figure 63/64: Low vs high contrast interface



4.8. Exhibition Concept & Storytelling

In terms of our exhibition concept, we aimed to answer the following question: What exactly do we want to say with the exhibition, what story do we want to tell visitors with our project?

We will work with four elements (Figures 65/66/67). We will use a plinth on which a tablet is placed that contains our prototype and invites the visitor to explore images of near and far data by rotating it. The plinth is mounted on a wide base, 150 cm in diameter, that provides stability, using a metal rod and ball bearing system. The tablet itself is mounted on the plinth, while the whole plinth rotates. This way, the visitor will be able to engage physically with the prototype, while the tablet is still secured.

To visually represent our concept and incorporate it into our exhibition setup, we will use a decal on the plinth to make it look like a compass. This way, we aim to make visitors aware of the way they exist in relation to the cardinal directions, something that we do not often have to consider in our day-to-day lives.

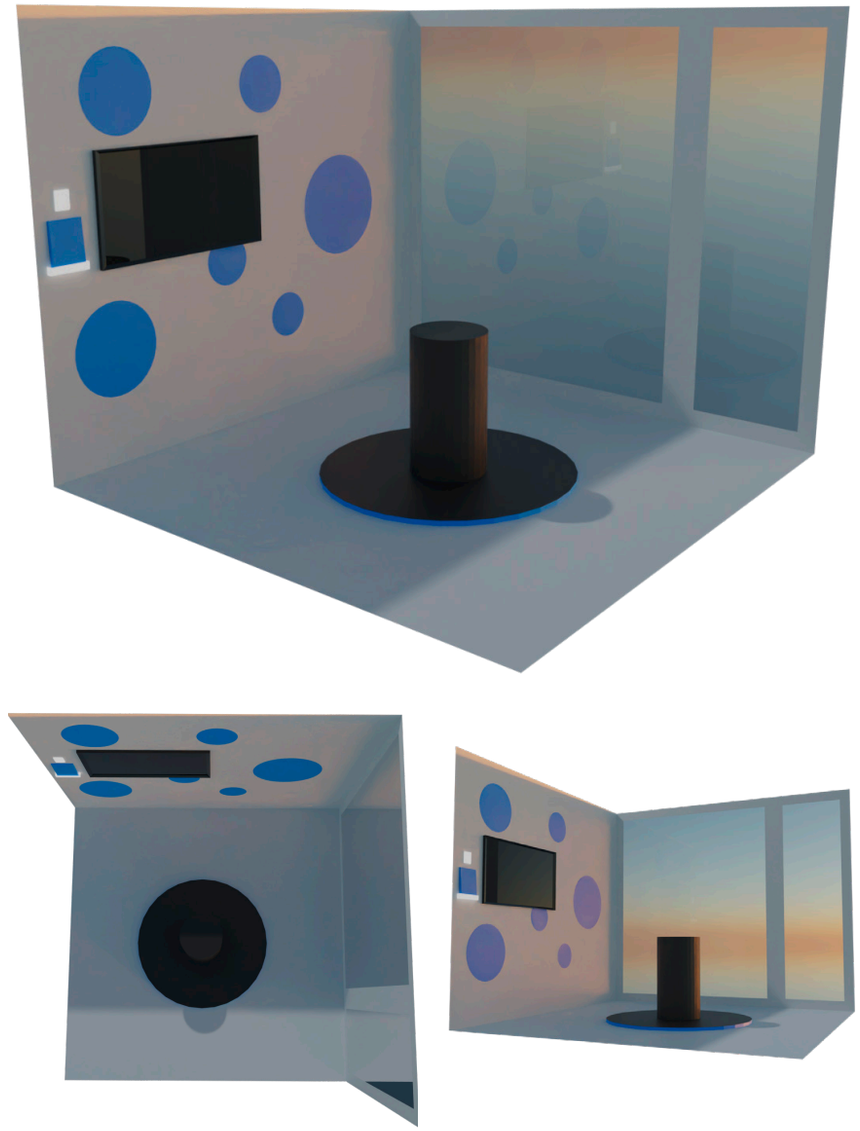
For more context, we will include a screen in the background, which gives the visitor a better understanding of the project concept and how the app functions through our video. In addition, the thesis placed next to the screen invites the visitor to learn more about the whole subject and our process.

With Ody-C, we want to find a new way to access memories that would otherwise be left to gather dust in archives. The unique aspect of our project is its geographical localisation of past images to create a dynamic experience.

Ody-C ...
... creates a new access point to memories.
... offers a dynamic experience depending on location.
... encourages (embodied) exploration.
... uncovers the hidden information attached to your photos.
... supports the development of spatial navigational skills.

We hope to convey all of these goals in our prototype, and through the name of the application, as well. With the name, we aimed to capture a feeling of exploration, navigation, while still feeling modern. We found that “Ody-C” is a playful twist on The Odyssey, the story of Odysseus’s adventurous homebound journey after the Trojan war. The capital “C” also highlights the compass, a core feature of our application.

Figure 65/65/67: 3D renderings for our exhibition concept



5. Conclusion

5.1. Evaluating Hypothesis + Research Questions

We will now address our initial research questions and check whether our two hypotheses are correct. Also, we will investigate how our product addresses our hypotheses.

1. What are motivations for collecting things?
Some reasons for collecting things are a deep personal interest or passion, to engage in a community, or for emotional connection, such as to share things with people important to you. Other reasons can be simple aesthetic appreciation, or to remember things. Reasons to keep a collection, and criteria for curating them, are as diverse as people are. Overall, these reasons overlap a lot with why people take and keep photos. We learned this mainly through our desk research, by participating in the Anarchiving Practices workshop and hearing people's personal anecdotes.

2. What are motivations for taking photos in the smartphone age?
We verified this in our research: our literature review, survey, and workshop. Again, reasons for taking photos are as diverse as we are, but it can be said that many people will take smartphone photos to capture memories, to document information, and to share with others.

This impacted our design decisions in the sense that we developed an application that will hopefully be useful for as many people as possible and be interesting to people regardless of their specific personal needs. Our application is adaptable and provides a neutral ground for exploration, something everyone can benefit from.

3. What are the reasons for our limitless amassing of digital photos?
We have come to realise that our current digital organisational infrastructure does not sufficiently address users' actual needs.

Across all of our sources, our secondary research as well as our own primary research, people unanimously stated that they were not as organised as they hoped they would be. The big symptom of this is that people are intimidated by their vast personal photo collections, and they lack both the time and motivation to deal with them. We believe that addressing this problem at its core rather than just addressing the symptoms is required. While our project did not go in the direction of proposing a new user strategy for organisation, we hope to see new, more radical proposals that could even prompt a shift in how we think about our personal digital files.

4. Is our access to infinite storage space detrimental to our user experience of digital tools?
This can definitely be answered with yes. There is a gap here between existing user strategies for dealing with digital files and our ability to carelessly gather digital materials because storage space is so cheap and abundant. Again, while our project does not address this specific question, we hope to see new proposals in the future.

Hypothesis 1:
By designing a tool or framework for personal digital curation, we could generate a positive impact on users' ability to curate and revisit digital content.
Seeing as we iterated on our hypothesis after generating more user input and early prototypes, our project outcome does not address the entirety of this hypothesis. However, we believe we succeeded in addressing the latter half of it: We proposed a new way for users to revisit their digital content with a positive impact.

Many of our users shared that they found our approach playful, and they had not previously considered the possibility of re-experiencing their photos in an embodied spatial way.

Throughout our user testings, people were quite engaged. Many users were very interested in the concept as soon as they understood it, and they all started to engage with it very quickly by contributing their own personal exploration ideas. We

were not fully able to verify the hypothesis due to the lack of a fully realised prototype. But we verified it as far as it was possible, and we consider it a success.

Hypothesis 2:
By using geographical metadata, we can develop a smartphone application that lets the user explore their personal digital photo archives in a new and interesting way.
Again, we believe we succeeded with this. We created an application that takes parameters we are already used to and positions them in a new context.

By putting the geographical parameters at the forefront of the application, we hope to bring spatial awareness to our users, and hope we are able to let them see their images in a new light.

Coming back to our methods detailed in Chapter 2, *Research*, we find that our prototype can successfully be interpreted using the Research Through Design approach. It brings attention to a problem we face that has been underexplored in the general design field so far – in this case, the amassing of digital objects, our lack of organisational structure to deal with them, and the lack of proposed design solutions for re-exploring these static archives –, and it presents a creative proposal for dealing with these circumstances. During exchanges with our user groups, we found that many people were somewhat aware of these issues. During our conversations, as they progressively became more aware and started to engage with the problem, they were quick to suggest solutions of their own.

When it comes to our prototype, many people were excited about it, stating that they had not previously thought of the possibility of exploring their personal photos in a spatially embodied way.

Therefore, we hope to have succeeded in our goal to inspire a playful examination of our static personal digital archives. We hope to be able to contribute to the wider conversation surrounding design proposals for addressing these issues, and we hope to see many more in the future.

5.2. Contribution / Usability of our Product

We believe that we succeeded in our intended contribution. With this project, we proposed a new framework that showcases the potential of metadata, specifically geolocation metadata, and how it relates to images. By using it for personal photo navigation, we also addressed the problem of navigating and organising large personal digital archives.

Through our testing, we realised that we could only check the validity of certain functions in a fully implemented, coded, and customisable prototype. There were certain limitations when it came to user-testing a superficially interactive prototype. But we believe we succeeded in testing it as much as feasible and were able to validate the app's core functions.

Experiencing a personal photo archive through the Ody-C framework is a subjective journey. In order to test the application as far as possible, we created a sample flow with images of our own. This allowed users to engage with the prototype.

Ultimately, our prototype is a creative proposal; we want to encourage people to think about how they engage with their personal digital photo archives. This was definitely the case throughout our user tests.

With this project, we relied on our skill and interest in UX/UI design. While we considered stretching our capabilities, we ultimately were not ambitious to an unrealistic extent. We did not try to conceptualise around skills we did not have, which was wise in hindsight.

Another point we want to mention here is that we purposefully did not include any Artificial Intelligence or machine learning in our project. As demonstrated in our reference projects, there is a lot of potential for an intervention of AI as a means to bring new life to static photo archives. However, this area of research is evolving rapidly; its landscape will likely look completely different in just a few years. We consciously did not include AI in our considerations, instead relying on static data consisting of

pre-existing metadata attached to images. For this reason, we believe we have created a proposal that holds up well and will stand the test of time.

5.3. Process Review

Our research area was quite wide in the beginning. It took us a while to fully understand the topic, to figure out our potential users' needs, to identify our exact interests, and then to combine all of these aspects in one concept.

Our process was highly iterative, which had its good and bad sides. On the one hand, we were able to learn a lot by covering such a wide field. We did not limit ourselves and considered many possibilities, even those outside of our existing skill set. Due to our process being highly iterative, it was constructive to check back on our initial assumptions regularly and update them as we gained more information.

On the other hand, we could have been more decisive and trusted our intuition more. Looking back on the process, we were quite close to our final product with our very first assumptions and quick prototypes. Rather than opening up the field again, we could have been more assertive at times and pursued our initial interests right away. Of course, some of these challenges were due to being in a group and having conflicting opinions at times. We also let ourselves be deterred by outsiders' opinions, though, when it was us who had done the research and knew the relevant data.

However, while we could have believed in ourselves and the process more, we also could have done with asking for help more frequently. The most pivotal moments in our design journey occurred due to feedback from people who were not involved in the process. For example, our mentoring with Florian Wille helped us advance our final prototype to the next level. Even just asking classmates was extremely helpful; as we were deep in the process, it sometimes only took another person

looking at the project very briefly to generate fresh new ideas. While the process was by no means perfect, we put in a lot of work, utilised many design methods we knew, and relied on our network and mentors often.

5.4. Evaluating Teamwork

We used a highly collaborative approach throughout the process. Working on the thesis as well as on the project, we were constantly in exchange, discussing our approach and evaluating our progress. It was very helpful to have the constant opportunity to exchange ideas and discuss problems, as well as to drive the concept forward.

One method that we used several times and that became one of our favourite methods was the creative speed dating. This method was great for generating new ideas and directions to find out which direction the project could go. When we disagreed on certain points and areas, we always talked to each other and tried to find a solution to the respective problem through constructive criticism and feedback. We believe that it was precisely this good communication with each other that made our team work so well.

From the beginning of the semester, starting with the concept seminar, we kept a blog on which we wrote down all our progress steps, problems, feedback and findings. This turned out to be a helpful support when writing our thesis. It allowed us to keep track of our thought processes and recapitulate them. We kept the blog on a weekly basis and created a new chapter every week. We believe this will be a valuable resource in the future.

5.5. Further steps

Firstly, would developing a physical device the way we envisioned it in our first prototypes still make sense at this stage? Ultimately, from a usability standpoint, it likely would not. Like we detailed many times, having too many smartphone pictures and having no reason to revisit them is an almost universal problem. Adding a separate device would add another barrier of entry.

Regardless of these considerations, it would still be quite fun to develop this physical prototype idea further, and definitely worth exploring. Its feasibility would have to be evaluated once a viable prototype exists.

If we were to develop the application further, there are a number of possibilities we could take it in – features we had thought of originally but did not have time to implement, and features suggested to us by peers and users.

For example, when we first ideated on the functions of our app during the Project Development stage, we wanted to implement social features, and gamify the application to an extent (See Figures 46/47 in Chapter 4, *Project Development*). By encouraging the user to set goals and share their archives with their friends, family members and acquaintances, new connections and revitalising the archives might be accomplished.

Another promising next step would be to think beyond the photos format and to integrate other file formats into the application. At the very beginning of our process, we were planning to address various types of digital objects including documents, sound files and video content. We would like to explore how these types of files might become more graspable through an embodied interaction approach.

Nowadays, documents are not visible. They are neatly packaged using application icons and the info text, but are not accessible from the outside except through their metadata. But what does the metadata tell? How can a new relationship to their metadata be established for these other files?

For these other file types, metadata other than location metadata might be more interesting to investigate. Which metadata could we leverage best to create a more fun experience, to make them more interesting for the user to interact with?

Our current concept is expandable in many directions. Ultimately, we are very happy with the point to which we were able to develop it and look forward to the exhibition.

6. Bibliography

Books

Endres, J., & Zeller, C. (Eds.). (2022). *Collecting in the twenty-first century: From museums to the web*. Camden House.

Gordon, T. S. (2020). *The mass production of memory : travel and personal archiving in the age of the Kodak*. Amherst, Massachusetts : University of Massachusetts Press.

Harari, Y. N. (2014). *Sapiens: a brief history of humankind*. McClelland & Stewart.

Pearce, S. M. (1995). *On Collecting – An investigation into collecting in the European tradition*. Routledge.

Schuster, M. (2020). *Foto-Psychologie: Fotos sehen, verstehen, gestalten* (3. Edition). SpringerLink.

te Heesen, A. (2012). Theorien des Museums zur Einführung. Junius.

Troncy, R., Huet, B., & Schenk, S. (2011). *Multimedia Semantics : Metadata, Analysis and Interaction*. (R. Troncy, B. Huet, & S. Schenk, Eds.). Wiley-Blackwell.

Book chapters

Assmann, A. (2008). Sammeln, Sammlungen, Sammler. In K. Junge, D. Šuber, & G. Gerber (Eds.), *Erleben, Erleiden, Erfahren – Die Konstitution sozialen Sinns jenseits instrumenteller Vernunft* (pp. 345–354). transcript Verlag.

Burnett, G. E., & Lee, K. (2005). The Effect of Vehicle Navigation Systems on the Formation of Cognitive Maps. In *Traffic and Transport Psychology* (pp. 407–418). Elsevier. https://doi.org/10.1016/b978-008044379-9/50188-6

Jaillant, L. (2022). Design Thinking, UX and Born-digital Archives: Solving the Problem of Dark Archives Closed to Users. In *Archives, Access and Artificial Intelligence* (Vol. 2, pp. 83–107). Bielefeld University Press.

Okabe, D., & Ito, M. (2006). Everyday Contexts of Camera Phone Use: Steps Toward Techno-Social Ethnographic Frameworks. In *Mobile Communication in Everyday Life: Ethnographic Views, Observations and Reflections* (pp. 79–102).

Spurgin, K. M. (2011). 'Three Backups Is a Minimum': A First Look at Norms and Practices in the Digital Photo Collections of Serious Photographers. In C. A. Lee (Ed.), *I, Digital – Personal Collections in the Digital Era* (pp. 151–201).

Conference proceedings

Boari, D., Fraser, M., Stanton Fraser, D., & Cater, K. (2012). Augmenting Spatial Skills with Mobile Devices. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1611–1620.

Bergman, O., Whittaker, S., Sanderson, M., Nachmias, R., & Ramamoorthy, A. (2012). How do we find personal files?: The effect of OS, presentation & depth on file navigation. *Conference on Human Factors in Computing Systems - Proceedings*, 2977–2980. https://doi.org/10.1145/2207676.2208707

Chen, A. Y. S., Odom, W., Zhong, C., Lin, H., & Amram, T. (2019). Chronoscope: Designing temporally diverse interactions with personal digital photo collections. *DIS 2019 - Proceedings of the 2019 ACM Designing Interactive Systems Conference*, 799–812. https://doi.org/10.1145/3322276.3322301

Henne, B., Koch, M., & Smith, M. (2014). On the Awareness, Control and Privacy of Shared Photo Metadata. *Financial Cryptography and Data Security*, *8437*, 77–88. https://doi.org/10.1007/978-3-662-45472-5

House, N. Van, Davis, M., Takhteyev, Y., Good, N., Wilhelm, A., & Finn, M. (2004). From 'What?' to 'Why?': The Social Uses of Personal Photos. *CSCW '04: Proceedings of the 2004 ACM conference on Computer supported cooperative work*.

Maguire, E. A., Gadian, D. G., Johnsrude, I. S., Good, C. D., Ashburner, J., Frackowiak, R. S. J., & Frith, C. D. (2000). Navigation-related structural change in the hippocampi of taxi drivers. *Proceedings of the National Academy of Sciences of the United States of America*, *97*(8), 4398–4403. https://doi.org/10.1073/PNAS.070039597

Watkins, R. D., Sellen, A., & Lindley, S. E. (2015). Digital Collections and Digital Collecting Practices. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 3423–3432. https://doi.org/10.1145/2702123.2702380

Essays

West, A. F. (2010). *The Seven Liberal Arts*. Classical Academic Press.

Journal articles

Benn, Y., Bergman, O., Glazer, L., Arent, P., Wilkinson, I. D., Varley, R., & Whittaker, S. (2015). Navigating through digital folders uses the same brain structures as real world navigation. *Scientific Reports*, *5*. https://doi.org/10.1038/srep14719

Bergman, O., Beyth-Marom, R., Nachmias, R., Gradovitch, N., & Whittaker, S. (2008). Improved search engines and navigation preference in personal information management. *ACM*

Transactions on Information Systems, *26*(4). https://doi.org/10.1145/1402256.1402259

Boutell, M., & Luo, J. (2005). Beyond pixels: Exploiting camera metadata for photo classification. *Pattern Recognition*, *38*(6), 935–946. https://doi.org/10.1016/j.patcog.2004.11.013

Dillon, A. (2019). Collecting as routine human behavior: Personal identity and control in the material and digital world. *Information and Culture, 54*(3), 255–280. University of Texas Press. https://doi.org/10.7560/IC54301

Garry, M., & Gerrie, M. P. (2005). When Photographs Create False Memories. *Current Directions in Psychological Science, 14*(6), 321-325. https://doi.org/10.1111/j.0963-7214.2005.00390.x

Gye, L. (2007). Picture This: the Impact of Mobile Camera Phones on Personal Photographic Practices. *Continuum*, *21*(2), 279–288. https://doi.org/10.1080/10304310701269107

Marčetić, H. (2015). Exploring the methods and practises of personal digital information archiving among the student population. *ProInflow*, *7*(1), 29–40. https://doi.org/10.5817/ProIn2015-1-4

Tu, S., Wong, S., Hodges, J. R., Irish, M., Piguet, O., & Hornberger, M. (2015). Lost in spatial translation - A novel tool to objectively assess spatial disorientation in Alzheimer's disease and frontotemporal dementia. *Cortex*, *67*, 83–94. https://doi.org/10.1016/j.cortex.2015.03.016

Van Der Maaten, L., & Hinton, G. (2008). Visualizing Data using t-SNE. *Journal of Machine Learning Research*, *9*, 2579–2605.

Wilmer, H. H., Sherman, L. E., & Chein, J. M. (2017). Smartphones and cognition: A review of research exploring the links between mobile technology habits and cognitive functioning. *Applied Sciences*, *13*(17). https://doi.org/10.3389/fpsyg.2017.00605

Zangenehnejad, F., & Gao, Y. (2021). GNSS smartphones positioning: advances, challenges, opportunities, and future perspectives. *Satellite Navigation*, *2*(1), 1–23. https://doi.org/10.1186/S43020-021-00054-Y/TABLES/5

Zytaruk, M. (2011). Cabinets of curiosities and the organization of knowledge. In *University of Toronto Quarterly* (Vol. 80, Issue 1, pp. 1–23). https://doi.org/10.3138/utq.80.1.001

Web articles

Cabral, L. (2023). *The History of Digital Cameras*. https://www.backthenhistory.com/articles/the-history-of-digital-cameras

Rein, A. (2022). *Dinge und Kontexte: Kultur-Perspektiven im Alltag*. https://www.kubi-online.de/artikel/dinge-kontexte-kultur-perspektiven-alltag

Stapley, J. (2022). *The History and Evolution of Digital Camera Photography*. Wex Photo Video. https://www.wexphotovideo.com/blog/news-articles/social-commentary/the-history-and-evolution-of-digital-camera-photography/

Stappers, P. J., & Giaccardi, E. (n.d.). *Research through Design | The Encyclopedia of Human-Computer Interaction, 2nd Ed*. Retrieved 12 May 2024, from https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/research-through-design

Sutardja, P. (2021, December 22). *The Risks of Metadata in Your Online Photos*. https://www.myamberlife.com/the-risks-of-metadata-in-your-online-photos/

Turnbow, D. (2023). *Before Instagram, There Was Kodak*. Smithsonian American Women's History Museum. https://womenshistory.si.edu/blog/instagram-there-was-kodak

Web pages

Broz, M. (2024, April 6). *How many pictures are there (2024): Statistics, trends, and forecasts*. https://photutorial.com/photos-statistics/

Cambridge University Press & Assessment. (n.d.-a). *ARCHIVE | English meaning - Cambridge Dictionary*. Retrieved 1 May 2024, from https://dictionary.cambridge.org/dictionary/english/archive

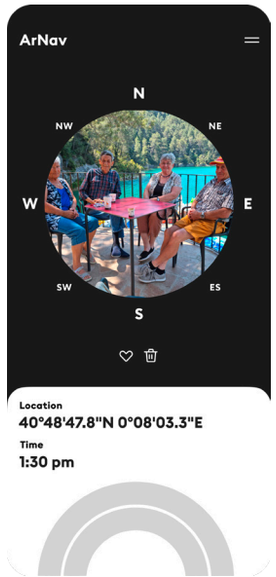
Cambridge University Press & Assessment. (n.d.-b). *COLLECTING | English meaning - Cambridge Dictionary*. Cambridge Dictionary. Retrieved 22 January 2024, from https://dictionary.cambridge.org/dictionary/english/collecting

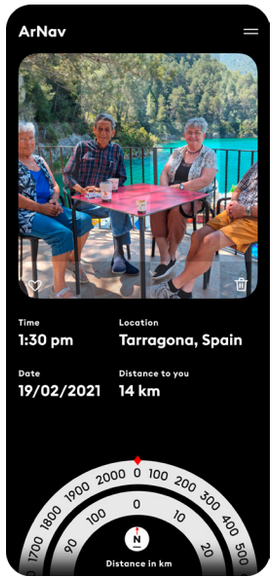
Kemp, S. (2024). *Digital 2024: Switzerland*. DataReportal – Global Digital Insights. https://datareportal.com/reports/digital-2024-switzerland

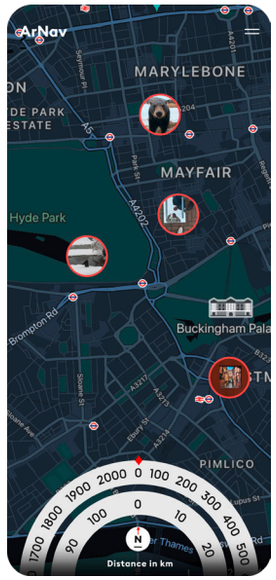
Society of American Archivists. (2005). *Dictionary of Archives Terminology*. SAA Dictionary. https://dictionary.archivists.org/index.html

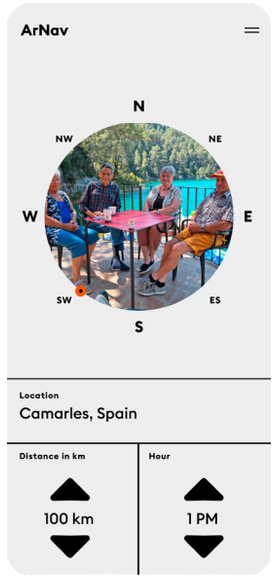
Spiers Lab. (n.d.). *Taxi Brains Project | Spiers Lab*. Retrieved 30 April 2024, from https://spierslab.com/taxi-brains-project/

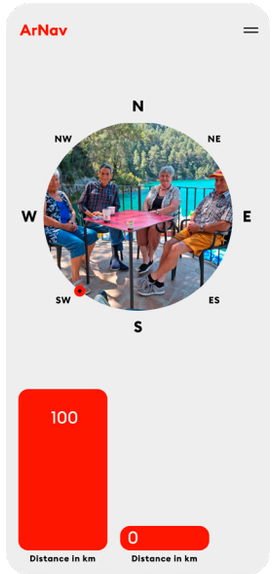
7. Appendix

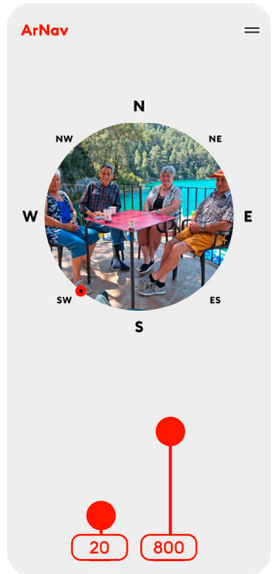

ArNav
N
NW
NE
W
E
SW
ES
S
Location
40°48'47.8"N 0°08'03.3"E
Time
1:30 pm

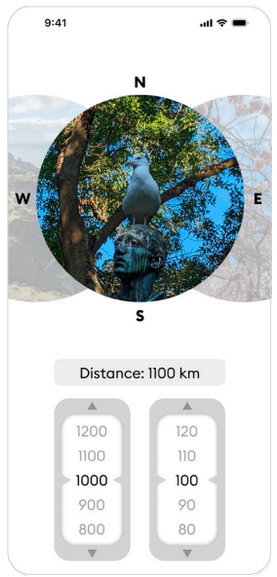

ArNav
Time
1:30 pm
Location
Tarragona, Spain
Date
19/02/2021
Distance to you
14 km
Distance in km

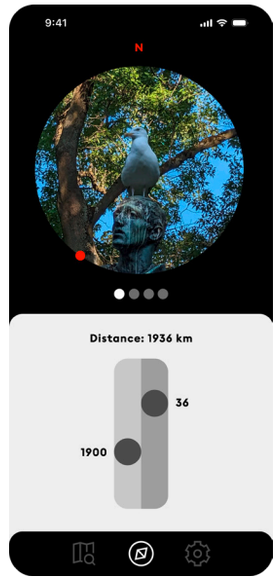

ArNav
MARYLEBONE
MAYFAIR
Hyde Park
Buckingham Pala
PIMLICO
Distance in km

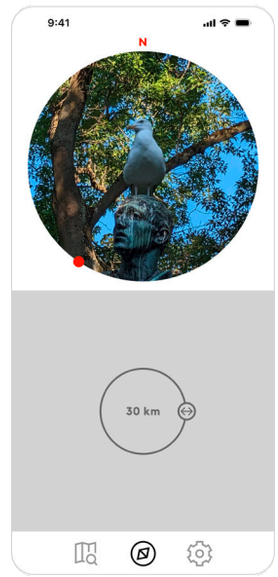

ArNav
N
NW
NE
W
E
SW
ES
S
Location
Camarles, Spain
Distance in km
100 km
Hour
1 PM

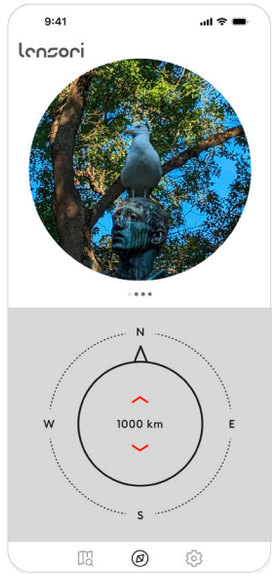

ArNav
N
NW
NE
W
E
SW
ES
S
100
0
Distance in km
Distance in km

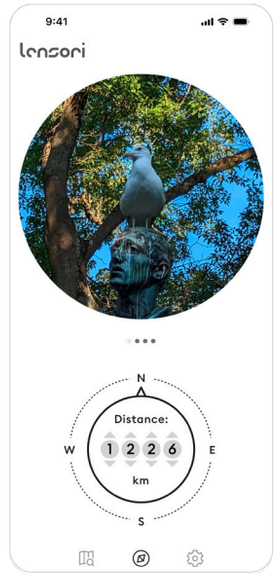

ArNav
N
NW
NE
W
E
SW
ES
S
20
800


9:41
N
W
E
S
Distance: 1100 km
1200
1100
1000
900
800
120
110
100
90
80


9:41
N
Distance: 1936 km
36
1900


9:41
N
30 km


9:41
lensori
N
W
1000 km
E
S


9:41
lensori
N
Distance:
W
1 2 2 6
E
km
S

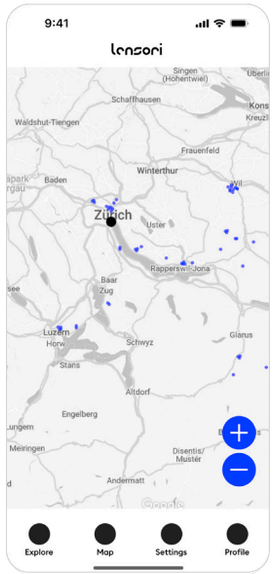

9:41
lensori
Paris, France
N
NW
NE
W
1300 km
E
SW
SE
S
explore

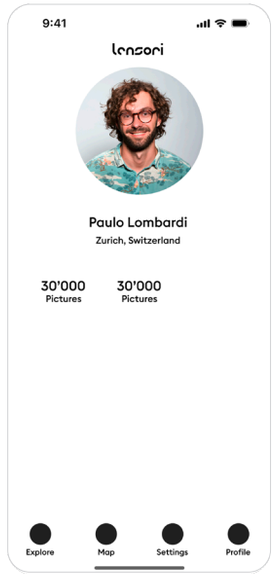

9:41
lensori
Utrecht, Netherlands
N
W
1410 km
20°
E
S
Explore
Map
Settings
Profile

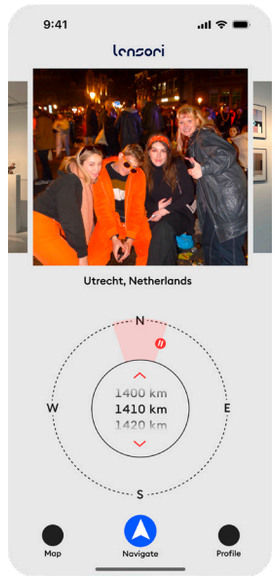

9:41
lensori
Utrecht, Netherlands
N
W
1410 km
90°
E
S
Explore
Map
Settings
Profile


9:41
lensori
Utrecht, Netherlands
N
W
1410 km
180°
E
S
Explore
Map
Settings
Profile


9:41
lensori
Utrecht, Netherlands
N
W
1410 km
180°
E
S
Explore
Map
Settings
Profile


9:41
lensori
Singen (Hohentwiel)
Schaffhausen
Waldshut-Tiengen
Frauenfeld
Winterthur
Baden
Zürich
Uster
Rapperswil-Jona
Baar
Zug
Luzern
Schwyz
Glarus
Stans
Altdorf
Engelberg
Meiringen
Disentis/Mustér
Andermatt
Explore
Map
Settings
Profile

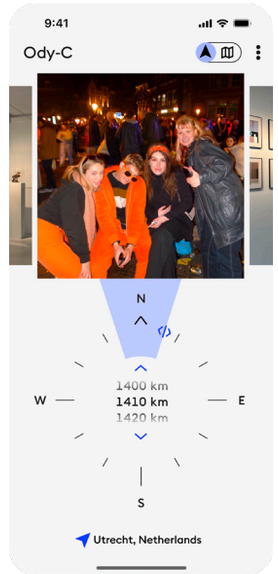

9:41
lensori
Paulo Lombardi
Zurich, Switzerland
30'000
Pictures
30'000
Pictures
Explore
Map
Settings
Profile

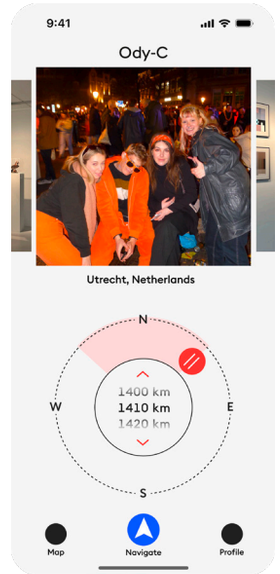

9:41
lensori
Utrecht, Netherlands
N
W
1400 km
1410 km
1420 km
E
S
Map
Navigate
Profile


9:41
lensori
Utrecht, Netherlands
N
W
1400 km
1410 km
1420 km
E
S
Map
Navigate
Profile

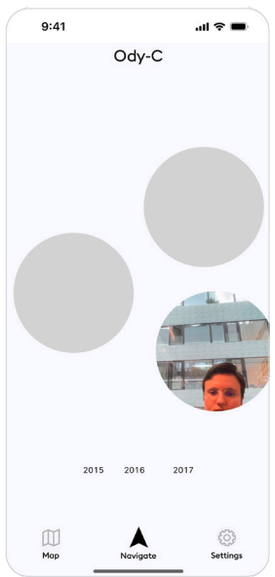

9:41
Ody-C
Utrecht, Netherlands
N
W
1400 km
1410 km
1420 km
E
S
Map
Navigate
Profile

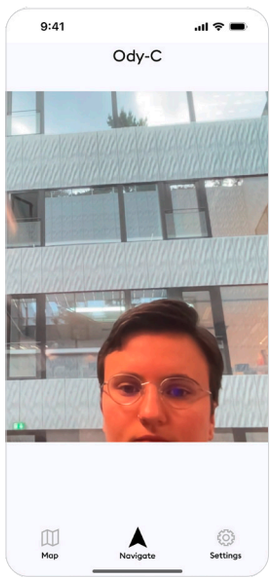

9:41
Ody-C
Utrecht, Netherlands
N
W
1400 km
1410 km
1420 km
E
S
Map
Navigate
Profile

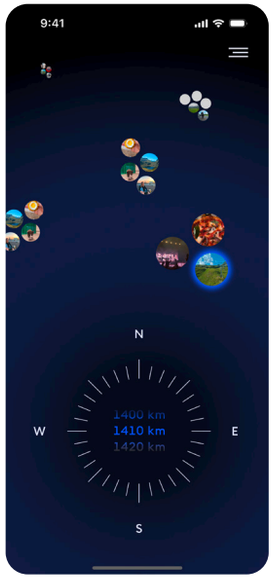

9:41
Ody-C
N
W
1400 km
1410 km
1420 km
E
S
Utrecht, Netherlands

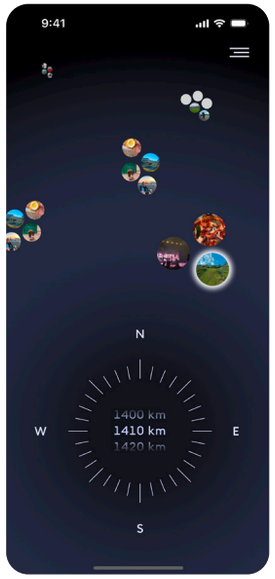

9:41
Ody-C
Utrecht, Netherlands
N
W
1400 km
1410 km
1420 km
E
S
Map
Navigate
Profile

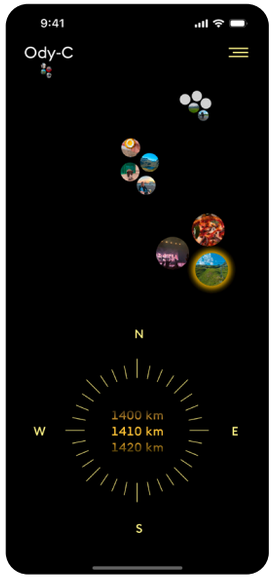

9:41
Ody-C
N
1400 km
1410 km
1420 km
W
E
S
Map
Navigate
Settings

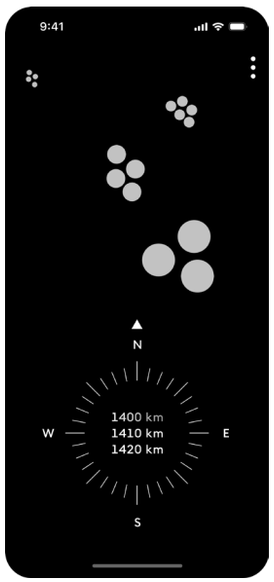

9:41
Ody-C
2015
2016
2017
Map
Navigate
Settings

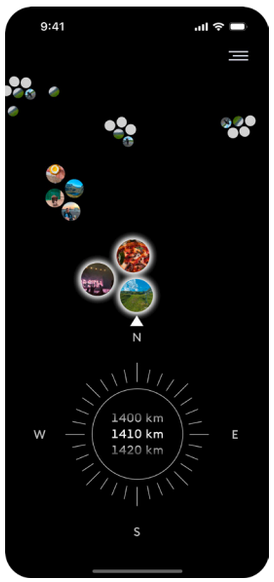

9:41
Ody-C
Map
Navigate
Settings

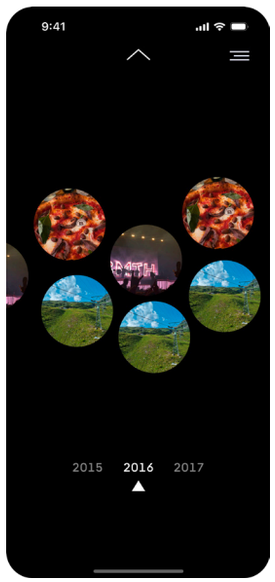

9:41
N
1400 km
1410 km
1420 km
W
E
S

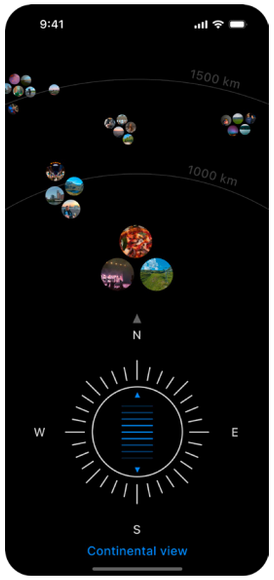

9:41
N
1400 km
1410 km
1420 km
W
E
S

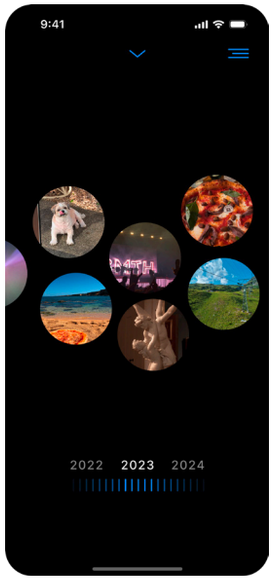

9:41
Ody-C
N
1400 km
1410 km
1420 km
W
E
S


9:41
N
1400 km
1410 km
1420 km
W
E
S


9:41
N
1400 km
1410 km
1420 km
W
E
S

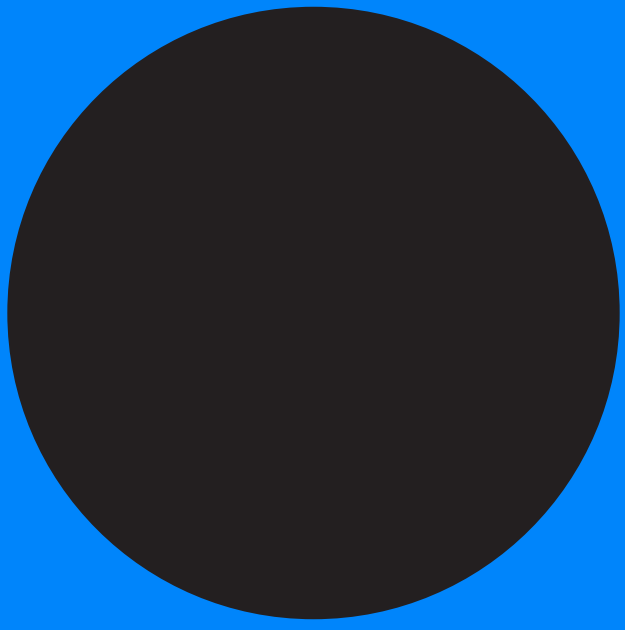

9:41
2015
2016
2017


9:41
1500 km
1000 km
N
W
E
S
Continental view


9:41
2022
2023
2024


9:41
3. April 2024
Piemmirio, Italy
Share
Favourites
Hide
Delete

Bachelor Thesis



Mo Bünzli / Tanja Landolt