

Bachelor thesis 2018

User-oriented intuitive web interface for SanTour



Student: Mikko Lerto

Professor: Alexandre Cotting

Submitted: 30.7.2018

I. Abstract

The purpose of this research is to create an intuitive user-interface for a hiking application while considering the needs of people with physical and mental limitations. SanTour is a hiking application designed for people with physical or mental limitations. These limitations can for example be the fear of heights or reduced mobility in the knees. The latest version of SanTour at the time of writing was developed in 2017 as the first prototype of the application. The visual aspects of the prototype were not the focus in the development and as a result, the application was not very visually pleasing. To improve the user experience of SanTour, I used the UX lifecycle described in the book “The UX Book” by Rex Hartson & Pardha S. Pyla (2012) as my guideline. I began by analysing the existing information and the needs of hikers, after which I designed and developed a web interface which I then in the end evaluated. The evaluation revealed that the interface was an improvement on the previous prototype, but some points of improvement were also found in the new prototype.

Keywords : user experience, user interface, hiking, physical limitations, mental limitations.

II. Foreword

This thesis was written as the final work for a bachelor's degree in business information technology at HES-SO Valais-Wallis. The subject of my research was creating a user-oriented intuitive web interface for a hiking service named SanTour. The subject was created by Alexandre Cotting, a professor at HES-SO to improve the interface previously developed prototype application.

I conducted my research between February and July of 2018. It was very exciting for me to get to re-design the whole interface of a web service from the beginning to the end. It was a pleasure to work on a service that could potentially help people with their limitations or disabilities. I was very interested in studying hiking and hikers. My aim was to understand hikers and hiking web services while considering the dangers and limitations that hiking itineraries may have.

The goal of my research was to use the information gathered to create an improved user interface and user experience from a previously created prototype application. The challenges I encountered while conducting my research were with language barriers and time management but overall, I was able to carry out my research without any significant problems.

The research was carried out by gaining firsthand experience in hiking and with people in the target audience of SanTour. To gain a deeper understanding, I interviewed professionals in the field of hiking. Once the information was gathered, a design was created, and a high-fidelity prototype was developed and finally evaluated.

Many people helped me along the way with my research and I want to thank them all for their time and efforts. I want to give a special thank you to Alexandre Cotting for choosing me to research this topic, Jenni Kiviniemi for visualizing beautiful layouts for SanTour, Jean-Paul Calbimonte Pérez for helping me with the scoring process and evaluation of the final product, Roger Schaer for helping me with the optimization of SanTour and I also want to thank all the people who were involved in the interview and evaluation parts of my research.

TABLE OF CONTENTS

- I. ABSTRACTII
- II. FOREWORDIII
- TABLE OF CONTENTSIV
- LIST OF TABLES.....VI
- LIST OF FIGURESVI
- LIST OF ABBREVIATIONS VIII
- INTRODUCTION 1
- 1. ANALYSIS 3
 - 1.1. STUDYING EXISTING INFORMATION 3
 - 1.1.1. Market benchmark (Modélisation des parcours touristiques) 3
 - 1.1.2. Tourism Professional Meeting workshop of December 2017 3
 - 1.2. UNDERSTANDING HIKING & HIKING WITH SENIOR CITIZEN 4
 - 1.3. STATE OF THE ART 5
 - 1.3.1. Expression of difficulty level 5
 - 1.3.2. Itinerary visualisation 6
 - 1.3.3. Points of interest expression 6
 - 1.3.4. Points of difficulty expression..... 7
 - 1.3.5. Additional services & information 7
 - 1.3.6. Ease of use 8
 - 1.3.7. Mobile support 8
 - 1.3.8. Results 9
 - 1.3.9. Outdooractive 9
 - 1.3.10. Wegaw 11
 - 1.3.11. Snukr 12
 - 1.3.12. SwitzerlandMobility 15
 - 1.3.13. Conclusion..... 18
 - 1.4. INTERVIEWS..... 18
 - 1.4.1. Findings..... 19
 - 1.4.2. Conclusion 22
 - 1.5. WIREFRAMING AND MOCK-UPS 23
 - 1.6. PROJECT TECHNOLOGIES 24
 - 1.6.1. PHP 26
 - 1.6.2. Java 26
 - 1.6.3. C# 27

1.6.4. Node.js.....	27
1.6.5. Back-end technology	28
1.6.6. Database.....	28
1.6.7. Conclusion	28
1.7. TOOLS.....	29
1.7.1. Git, GitHub & Source Tree	29
1.7.2. MAMP	29
1.7.3. Atom.....	30
1.7.4. WebStorm	30
1.7.5. Studio 3T & MongoDB community compass.....	30
1.8. DEFINING PROJECT MANAGEMENT	31
2. DEVELOPMENT.....	32
2.1. GENERAL INFORMATION REGARDING DEVELOPMENT.....	32
2.2. SPRINT 0	33
2.3. SPRINT 1	34
2.4. SPRINT 2	34
2.5. SPRINT 3	35
2.6. SPRINT 4	39
3. EVALUATION	46
3.1. PLANNING	46
3.2. EVALUATING.....	46
3.3. ANALYSING	47
3.4. FINDINGS	48
CONCLUSION	51
4. REFERENCES	52
APPENDIX I: SANTOUR SPECIFICATION REPORT	54
APPENDIX II: SANTOUR INTERVIEWS SUMMARY.....	60
APPENDIX III: SANTOUR LAYOUT VISUALIZATION INSTRUCTIONS.....	66
APPENDIX IV: SANTOUR WIREFRAMES	73
APPENDIX V: SANTOUR MOCK-UPS	75
APPENDIX VI: PRODUCT BACKLOG.....	79
APPENDIX VII: SANTOUR USER GUIDE.....	80
APPENDIX VIII: SANTOUR TECHNICAL GUIDE	89

AUTHOR'S DECLARATION..... 105

LIST OF TABLES

Table 1: Grading requirements for difficulty expression5

Table 2: Grading requirements for itinerary visualisation6

Table 3: Grading requirements for points of interest expression6

Table 4: Grading requirements for point of difficulty expression7

Table 5: Grading requirements for additional services & information7

Table 6: Grading requirements for ease of use8

Table 7: Grading requirements for mobile support.....8

Table 8: Classification results9

Table 9: List of participants in the interviews 19

Table 10: Table of scores for front-end technologies 25

Table 11: List of all user stories for the development of SanTour 32

Table 12: Tasks for Sprint 0..... 33

Table 13: Tasks for sprint 1 34

Table 14: Tasks for sprint 2 34

Table 15: Tasks for sprint 3 35

Table 16: Tasks for sprint 4..... 39

Table 17: Participants of the final evaluation 47

Table 18: Table of the issues that participants had during the evaluations 49

Table 19: Table of highlighted feelings the participants had about each task 49

LIST OF FIGURES

Figure 1: The UX lifecycle wheel2

Figure 2: Rocky terrain on the hike in Italy4

Figure 3: Outdooractive point of interest9

Figure 4: Outdooractive map types..... 10

Figure 5: Outdooractive expression of difficulty 10

Figure 6: Outdooractive overall view of itinerary 10

Figure 7: Outdooractive mobile view of itinerary 11

Figure 8: Wegaw POI and POD information along with expression of difficulty. 12

Figure 9: Wegaw itinerary map 12

Figure 10: Snukr tag selection..... 13

Figure 11: Snukr itinerary view..... 14

Figure 12: Snukr POI view	14
Figure 13: Snukr alerting user to use the mobile app	15
Figure 14: SwitzerlandMobility itinerary map view	16
Figure 15: SwitzerlandMobility itinerary overview.....	16
Figure 16: SwitzerlandMobility point of interest	17
Figure 17: SwitzerlandMobility mobile browser view of itinerary.....	17
Figure 18: Interviewing Julien Petit	18
Figure 19: Classic topographic map	20
Figure 20: 3D topographic map.....	21
Figure 21: Google maps topographic map screen shot	21
Figure 22: Planimetric map	21
Figure 23: Screen capture from the obstacles section of the first prototype of SanTour	22
Figure 24: Early wireframe of the vision of SanTour	22
Figure 25: Wireframe and mock-up of the front page of SanTour	24
Figure 26: Schema of the architecture of SanTour	25
Figure 27: Percentage of websites using various server-side programming languages	26
Figure 28: MAMP user interface	30
Figure 29: Yes or no question before(right) and after(left) picture	37
Figure 30: Multiple choice question before(right) and after(left) picture	37
Figure 31: A 15 option question turned into a slider	38
Figure 32: Slider question before(right) and after(left)	38
Figure 33: Radar chart view of itinerary’s attributes and user’s attributes	39
Figure 34: Public transport information button with link location	40
Figure 35: Main view of itinerary recording.....	41
Figure 36: View of adding a point of interest.....	41
Figure 37: View of adding a point of difficulty	42
Figure 38: View of setting the POD value	42
Figure 39: Screen where user can select saved profile	43
Figure 40: Cookie prompt	43
Figure 41: Google PageSpeed Insights score and grade	45
Figure 42: Pingdom full-page test results	45

LIST OF ABBREVIATIONS

IDE	Integrated development environment
POI	Point of interest
POD	Point of difficulty
JSON	JavaScript Object Notation
API	Application programming interface
HTML	Hypertext Markup Language
XML	Extensible Markup Language
kB	Kilobyte
UX	User experience
GUI	Graphical user interface
SCSS	Sassy CSS
SASS	Syntactically awesome style sheets
CSS	Cascading Style Sheets
SQL	Structured Query Language
NoSQL	Not only SQL

INTRODUCTION

SanTour is a hiking application that was first introduced in 2015. SanTour is divided into a mobile app and a web application. The mobile app is designed to be used to collect data for hiking itineraries and the web application is used by clients to find a suitable itinerary for their needs. In this thesis project we will be focusing on the SanTour web application.

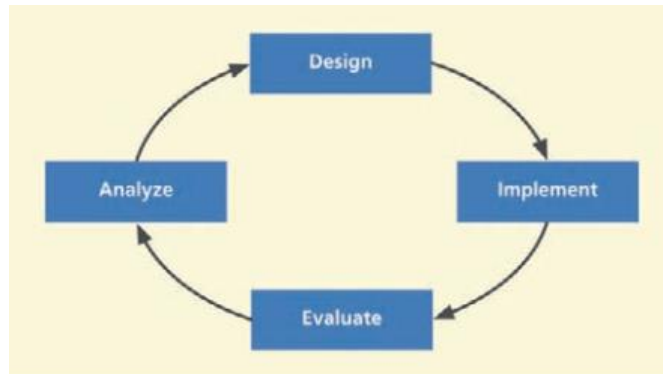
The current version of Santour is prototype which contains a form that when filled tells the client the compatibility of itineraries that are read from a file inside the web application. The user interface of the application is not very refined and should be improved so that the users can have a better experience.

SanTours aim is to propose hikers with itineraries that serve their limitations and needs. SanTour aims to help people with physical and mental limitations. These limitations can for example be the fear of heights or reduced mobility in the joints. SanTour recommends these users with itineraries that have different scores depending on their compatibility to the user's preferences. The user is provided with a map where the user can see different points of interests (POI) and points of difficulty (POD). With this information, the user can choose an itinerary that is most suitable for their needs.

The current state of SanTour is that the user interface of the application is not very intuitive. On the first prototype, the interface was not the focus, but more the proof of concept. The goal for me is to improve the user interface of the web application and turn it into a high-fidelity prototype. High-fidelity prototypes are the vehicle for refining the design details to get them just right as they go into the final implementation (Hartson & Pyla, 2012, p. 397).

To accomplish my goal, I will be using the UX lifecycle described in the book "The UX Book" by Rex Hartson & Pardha S. Pyla (2012) as a guideline in my work. The lifecycle is a wheel that repeats its self in order to create a quality product by improving the product in each iteration. The wheel consists of Analysing, Designing, Implementing and Evaluating. Analysis in the wheel means to understanding the problem and the needs of the users. Designing means creating designs such as wireframes and mock-ups to help conceptualize the interface you're designing. Implementation means bringing your designs to life by creating the software and hardware required. After you've implemented your design, you will then validate it by evaluating the product so that it can be refined in the next iteration of the lifecycle. After Evaluation is completed, the lifecycle can start a new round. For SanTour one round of the UX lifecycle has already been done in 2017. The current prototype version of SanTour is the result of that lifecycle.

Figure 1: The UX lifecycle wheel



Source: (Hartson & Pyla, 2012, p. 54).

In the beginning, I will start by analysing already existing information that has been written about SanTour. After which I will try to understand the problems that SanTour tries to solve by getting myself introduced in hiking. Once I've understood the basics of hiking, I will then interview professionals in the field of hiking so that I can gather more in-depth information about hiking and what could be improved in SanTour.

After gathering and analysing information, I will design the new layout for SanTour. This layout will try to solve the problems that the users had with the current prototype of SanTour. The layouts will also try to include new functionalities that users may like to have for SanTour.

Once the designing is finished, I will start the implementation by developing a working prototype that will follow the layouts created previously. Once this development process is done, I will move on to the evaluation part.

In the evaluation part of the lifecycle, I will interview the same people that I interviewed at the analysis part of the lifecycle. With the help of these people I will evaluate the prototype I've created and I will record the data so that it can be analysed to improve SanTour in the future.

1. Analysis

1.1. Studying existing information

SanTour had been in development for over 3 years when I started my research and along the way many projects had been done around SanTour. Before I started my work on SanTour, a market study on hiking applications and a workshop with a feedback session been done on Santour. I will analyse the documents from these projects to see if they can help me in the development of SanTour.

1.1.1. Market benchmark (Modélisation des parcours touristiques)

In late 2016, a researcher working for the institute of tourism in HES-SO Valais conducted a state of the art in touristic itinerary services. This document described the basic information about hiking in Switzerland and it compared some of the services that offer hiking itineraries online. The document compared the services on a general level by describing some basic information about each service provider followed by a description of their service. This document also described the different ways in which itineraries are graded on their difficulty. The document explained the national way of grading itineraries by colour codes and the Swiss alpine club way of grading itineraries by a rating system from T1 to T6. This document gave me a great overview of the hiking services in Switzerland. It also explained some of the basic information and statistics in hiking well.

1.1.2. Tourism Professional Meeting workshop of December 2017

The Tourism Professional Meeting (TpM) is a professional platform that looks at current issues in the tourism field. The event is organized by the tourism sector of the University of Management & Tourism (HEG) of the HES-SO Valais (Tourism Professional Meeting, 2018). The goal of the TpM is to improve and innovate the field of tourism with the help of technology. The TpM consists of conferences and workshops along with opportunities to interact with stakeholders in the field of tourism.

SanTour was presented in a workshop at the TpM of 2017. In this workshop the participants were told the context and objectives of SanTour and then they had a chance to try out the first prototype of SanTour. After trying it out the users were asked to rate SanTour and brainstorm ideas for features that they wished SanTour had. Little bit over 40 participants graded the user experience of the first prototype on a scale of one to five where one was the worst and five was the best user experience. The results revealed that the average grade was 3.36 and the most voted grade was three. The service concept of SanTour was also rated on the same scale and the result was an average of 4.15 with four being the most voted grade. There was a lot of variety on the features that the participants wished for SanTour. Some things that multiple people mentioned were markers for the start and end points of the itinerary and weather and public transport information.

The workshop also highlighted a questionnaire which 325 people had answered. This quantitative questionnaire was conducted to gain information about the behaviours of hikers and possible shortcomings they might have. Some of the highlighted results were that 87% of the answered people hiked, 94% hiked in the mountains, 55% were interested in technological solutions for hiking, 64% were interested in SanTour and 71% were willing to inform the state of their health for SanTour. The results showed that people find the idea behind SanTour appealing and they are open to using it.

1.2. Understanding hiking & hiking with senior citizen

Before coming to Switzerland for my double degree studies in 2017, I had never hiked before. The closest thing to hiking I had ever done was walking in forests but none of it was anywhere near in the terrain that Switzerland has to offer. To understand the basics of hiking, I had to experience hiking myself.

I started out with an easy vineyard hike close to Sierre and moved my way up to more difficult hikes over time. After about a month had gone by, I had hiked more than 25 kilometres where my highest single incline was around a kilometre. When hiking, I tried not to take the easiest way. Whenever there was a challenging part, that's where I wanted to go. I hiked on snowy mountains, grassy hills, muddy slopes, and rocky mountain tops and I truly got to see some of the most amazing nature I had ever seen in my entire life.

To gather first-hand experience on SanTours target audience, I joined a group of Swiss senior citizen who were hiking in Italy. The distance of the hike was about 10 kilometres and it started from a city named Stresa to finished in the neighbouring city of Belgirate. My goal was to examine the performance of the hiking group and identify the points of difficulty, so I could document them.

Figure 2: Rocky terrain on the hike in Italy



Source: personal sources.

The overall difficulty of the hike was quite easy, which was to be expected. The hills were not very steep, and the altitude was not high. The weather was at times rainy, which made the hike slightly more challenging, but the group performed very well overall. Even though the hike was not very challenging, we were able to find some points of difficulties on the way. There was a river crossing, some rocky terrain and because of the rain, the rocky roads were slippery.

My plan was to interview all the hikers, but most of them only spoke Swiss German, so we did not share a common language. In the end I was able to interview our hiking guide Paul Arnold and one of the hikers. What Paul told me was that he must check all the new hiking itineraries beforehand to make sure that the paths are large enough for big groups of people. This is something that I had not thought of before. What also surprised me was that the hiker I interviewed had never had any issues or accidents on any of her hikes.

1.3. State of the art

The Internet offers many web services for hikers. All these services have differences in the ways they deliver information to the user. To get a grasp of the already existing hiking applications, I created a classification of the aspects of the user interface, that bring value to the users. I wanted to limit the scope of my classification to only web services, as I will be working on the web interface of SanTour.

In my classifications I graded the aspects of the itineraries on a scale of 1 to 5. All aspects graded have different requirements for each of the grades.

1.3.1. Expression of difficulty level

Expression of difficulty explains how easy or difficult an itinerary is for the hiker. This is a very important feature for the user because it helps them evaluate the skill level required for each itinerary. If the skill level is not expressed well enough, it can lead to dangerous situations for the hiker.

Table 1: Grading requirements for difficulty expression

Grade	Grading requirement
1	Itinerary has no grading for the difficulty.
2	Itinerary has a simple grade without any explanation. For example, easy, moderate, difficult or a scale from 1 to 10 etc.
3	Itinerary has a simple grade with a simple explanation on the grading or on the difficulty of the itinerary.

4	Itinerary has a grade with a descriptive explanation of the grading or the difficulty of the itinerary.
5	Itinerary has a grade with a descriptive explanation and visual aids to help the user understand the requirements for that itinerary.

Source: personal sources.

1.3.2. Itinerary visualisation

There are many ways of visualising itineraries on web services. Most common being a map view. Many hiking services offer different types of maps, with different pros and cons. The standard for hiking maps is a topographic map, as it gives a better view of the terrain.

Table 2: Grading requirements for itinerary visualisation

Grade	Grading requirement
1	Itinerary has no topographic map or visual aid about the terrain.
2	Itinerary is shown in a topographic map or a map with visual aids regarding the terrain.
3	Itinerary has a topographic view of the map or visual aids along with an altitude profile that describes the height difference along the itinerary.
4	Itinerary is shown in a topographic view with an altitude profile along with other views, such as satellite view, road map or other.
5	Itinerary has a topographic view with other views along with an altitude profile and a navigation system for the itinerary

Source: personal sources.

1.3.3. Points of interest expression

Points of interest help the user get more information regarding the itinerary. These points will tell for example if the itinerary contains land marks or historical places. Points of interest can teach the user about the history or the nature of the area. Points of interest can help the user decide which itinerary to go to.

Table 3: Grading requirements for points of interest expression

Grade	Grading requirement
1	Itinerary has no support for points of interest
2	Itinerary supports points of interest via text
3	Itinerary has points of interest marked on the itinerary view
4	Itinerary has points of interest marked on the itinerary along with descriptions

5	Itinerary has points of interest marked on the itinerary along with descriptions and pictures
---	---

Source: personal sources.

1.3.4. Points of difficulty expression

Points of difficulty tell the hiker about points in the itinerary, where certain difficulties may affect the hiker’s ability to move forward. Points of difficulty help the hiker identify the skill level of the itinerary. A point of difficulty can for example be a river crossing or a suspension bridge.

Table 4: Grading requirements for point of difficulty expression

Grade	Grading requirement
1	Itinerary has no support for points of difficulty
2	Itinerary supports points of difficulty via text
3	Itinerary has points of difficulty marked on the itinerary (map)
4	Itinerary has points of difficulty marked on the itinerary along with descriptions
5	Itinerary has points of difficulty marked on the itinerary along with descriptions and pictures

Source: personal sources.

1.3.5. Additional services & information

Most hiking services offer additional information on the itinerary location. This information can be public transport information, weather forecast or other information of value to the hiker. The information is not directly about the itinerary, but more about things related to it. As it is individual what kind of information is of value to each hiker, a point is given for each additional information/service on the page of the itinerary.

Table 5: Grading requirements for additional services & information

Grade	Grading requirement
1	1 service or information
2	2 services or information
3	3 services or information
4	4 services or information
5	5+ services or information

Source: personal sources.

1.3.6. Ease of use

Ease of use is one of the most important attributes of website. You can have a very useful service with lots of functionalities, but if your website is difficult to use, none of it matters. According to Jeffrey Zeldman, web users are driven by a desire for fast gratification. If they can't find what they're looking for within three clicks, they might move on to somebody else's site (Taking your talent to the web: a guide for the transitioning designer, 2001, p. 98). This unofficial rule of web design is known as the three-click rule.

We can test the ease of use of these hiking services by simply counting how many clicks it takes to search for a hiking itinerary starting from the home page. This way we will get a simple and objective grading system for the ease of use of each website.

Table 6: Grading requirements for ease of use

Grade	Grading requirement
1	5+ clicks
2	4 clicks
3	3 clicks
4	2 clicks
5	1 click

Source: personal sources.

1.3.7. Mobile support

According to Statista, a statistics portal, over 50% of web browsing in 2017 was done with mobile phones (Percentage of all global web pages served to mobile phones from 2009 to 2018, 2018). With this percentage of mobile users, it is crucial for a modern-day website to have mobile support. To grade the services on their support for mobile browsers, I will look at how well the websites support the use of a mobile phone.

Table 7: Grading requirements for mobile support

Grade	Grading requirement
1	No mobile support
2	Mobile support for web site only (no itinerary map)
3	Mobile support with non-interactive itinerary map
4	Mobile support with interactive itinerary map

5	Mobile support with itinerary map and navigation
---	--

Source: personal sources.

1.3.8. Results

Table 8: Classification results

Name	Expression of difficulty level	Itinerary visualisation	Points of interest expression	Points of difficulty expression	Additional services & information	Ease of use	Mobile support	Total points:
Outdooractive	3	5	5	1	5	3	5	27
Wegaw	3	4	2	1	5	4	4	23
Snukr	2	2	5	1	1	4	2	17
Switzerland mobility	2	5	4	1	5	3	5	25

Source: personal sources.

1.3.9. Outdooractive

Outdooractive provided a very good overall experience. It delivers very well on the itinerary visualisation with multiple options for map types along with an altitude profile. The map has point of interest on some of the itineraries. The points of interest include descriptions along with pictures. The web site fully supports mobile browsers including navigation via browser. Outdooractive also provided weather information, public transport information, a fitness calculator, printing options and multiple file formats for user to download for offline use.

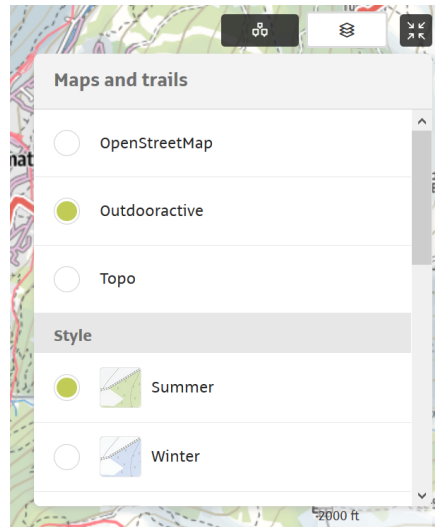
The itineraries I tested didn't have any points of difficulty on the map or anywhere on the itinerary page. Expression of difficulty on the itineraries was fairly basic with only an adequate amount of information regarding the skills required for the itinerary. Finding an itinerary took the minimum of 3 clicks with the presumption that the web site knows where you want to find an itinerary (saved in the user's web browsers cookies I believe).

Figure 3: Outdooractive point of interest



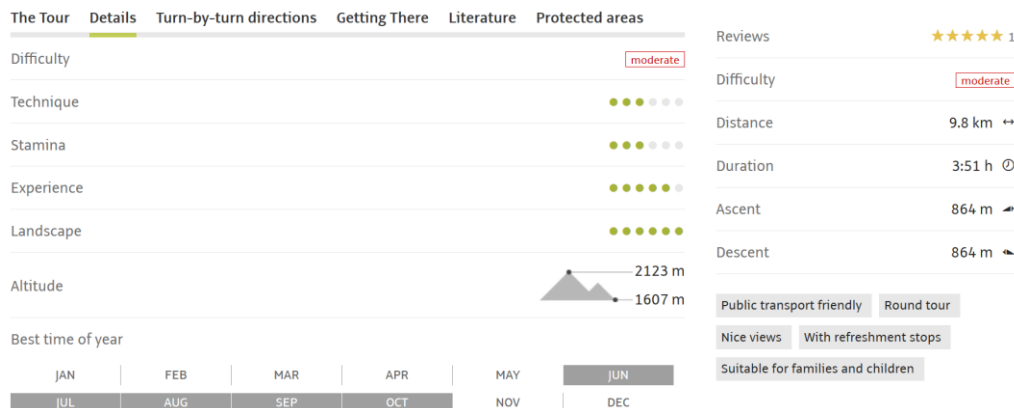
Source: <https://www.outdooractive.com/en/hiking-trail/wallis/edelweissrunde/10722761/#dm=1&dmdtab=oax-tab1>

Figure 4: Outdooractive map types



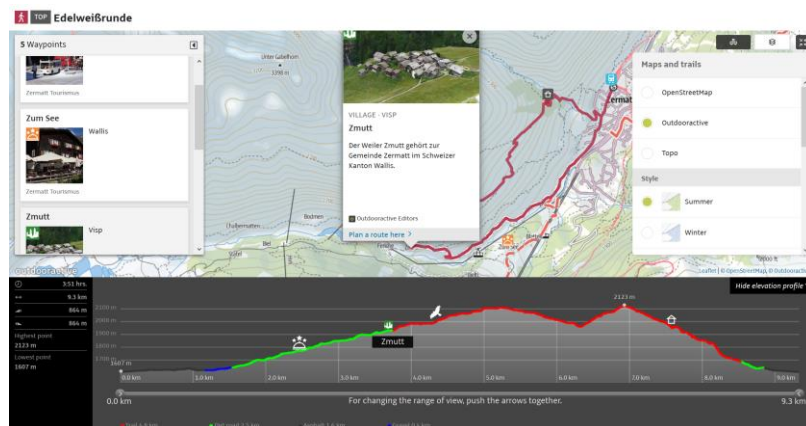
Source: <https://www.outdooractive.com/en/hiking-trail/wallis/edelweissrunde/10722761/#dm=1&dmdtab=oax-tab1>

Figure 5: Outdooractive expression of difficulty



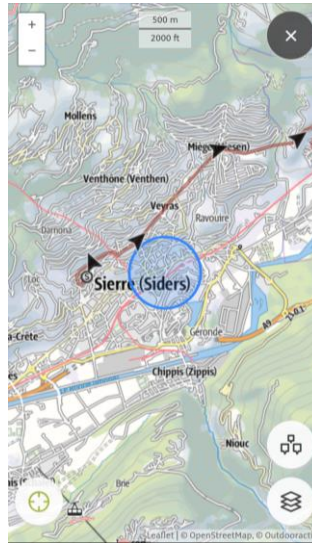
Source: <https://www.outdooractive.com/en/hiking-trail/wallis/edelweissrunde/10722761/#dmdtab=oax-tab1>

Figure 6: Outdooractive overall view of itinerary



Source: <https://www.outdooractive.com/en/hiking-trail/wallis/edelweissrunde/10722761/#dm=1&dmdtab=oax-tab1>

Figure 7: Outdooractive mobile view of itinerary



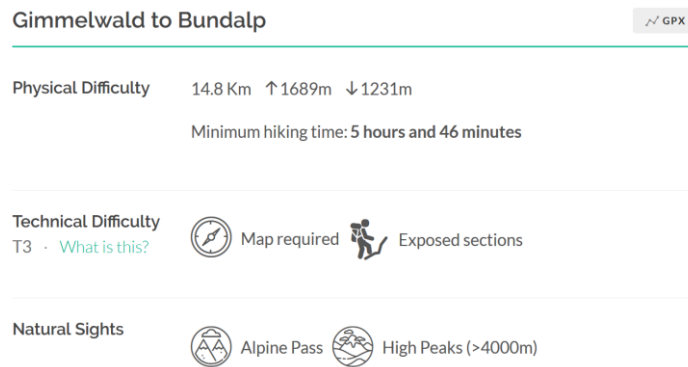
Source: <https://www.outdooractive.com/en/hiking-trail/wallis/edelweissrunde/10722761/#dm=1&dmdtab=oax-tab1>

1.3.10. Wegaw

Wegaw brands itself as “Social Outdoor Adventures” (Wegaw, 2018). The social aspect can be seen straight from the beginning with a mandatory login page in order to identify yourself. After logging in and finding the itinerary of your choice, you can choose the date and how many people you bring on your hike and Wegaw will take care of the rest. Wegaw describes this as “You lead. We do the boring stuff” (Wegaw, 2018). The itinerary page contains an altitude profile as the first thing you see, followed up with public transport information, itinerary description and more public transport information and finally the map of the itinerary. The map is a topographic map with a satellite view and a road map. You can also switch to an Opentopo map which at the time of my testing seemed not to work as intended. Wegaw offers you information regarding public transportation, weather, maps & GPS files and also information on what kind of clothing and equipment you should bring. All features are supported on mobile, but navigation on mobile browser did not seem to be an option. Finding an itinerary is fairly fast with the minimum of 2 clicks.

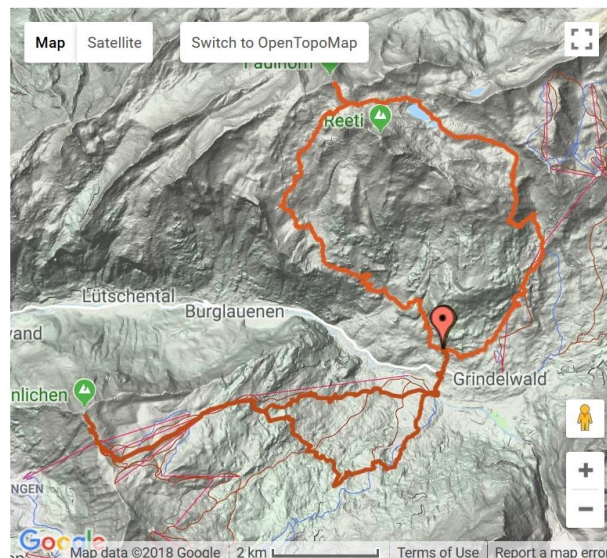
Wegaw has a grading scale of T1 to T4 as their expression of difficulty for itineraries. Itineraries contain a grade along with attributes describing the specific traits of the itinerary. Itineraries also have a segment for “physical difficulty” which has the length of the itinerary and lowest and highest altitudes for the itinerary. More information about the grading system can be read by clicking on the grading on the itinerary page. The itinerary page has general information regarding the points of interest called “Natural Sights” and points of difficulty with attributes of the itinerary grade. For example, an itinerary can have an attribute called “Exposed sections” and a Natural Sight called “Alpine pass”. This information can be paired with the information from the itinerary map, which contains some points of interests provided by google, such as restaurants and sights.

Figure 8: Wegaw POI and POD information along with expression of difficulty.



Source: <https://www.wegaw.ch/hike/gimmelwald-bundalp/>

Figure 9: Wegaw itinerary map



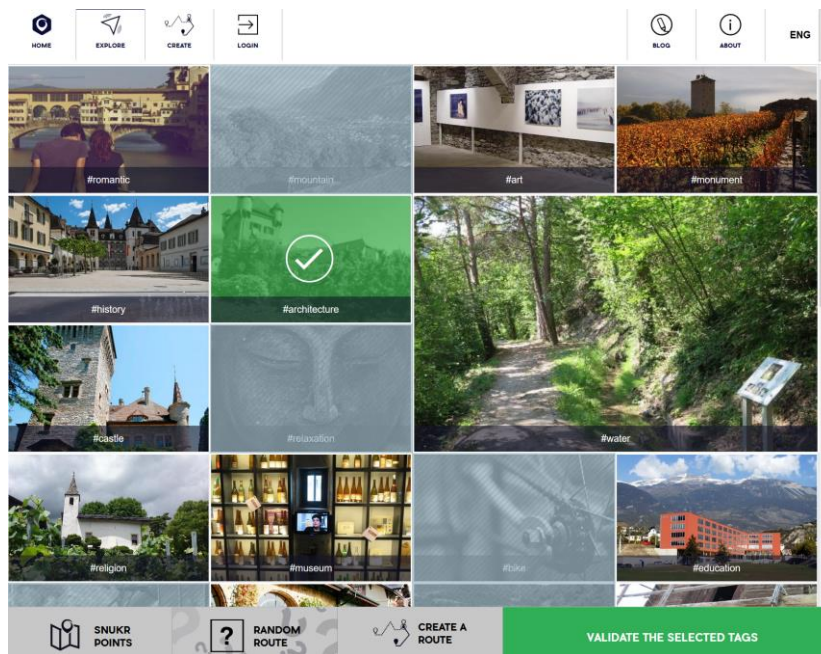
Source: <https://www.wegaw.ch/hike/gimmelwald-kandersteg/>

1.3.11. Snukr

Snukr is a service for customized itineraries. They describe the service as “Explore places according your choices, create and share your own routes with the Snukr community” (Snukr, 2018). At the time of the classification, the service was in the beta phase which means that the service was still being developed. Users start by writing the name of the place they want to explore after which they select tags that describe the itinerary of their desire. As a result, the user will get a list of itineraries with the selected tags. Each itinerary contains points of interests that are very well expressed. User can read about points of interests and even call or email them If possible. Finding an itinerary was done in 2 clicks if the user does not select any tags for the location they wish to explore.

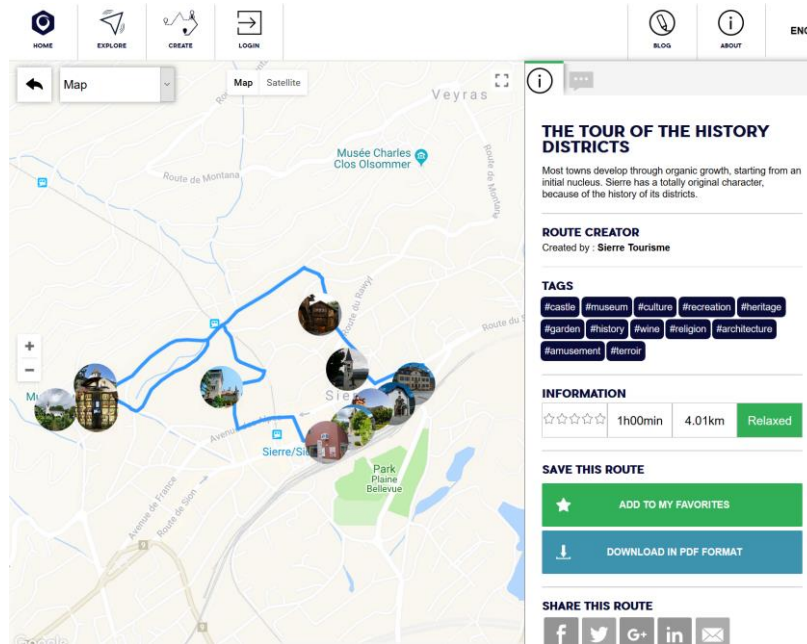
Itineraries contain a simple grading of “relaxed” or “intense” with no additional information about the grading standard or the scale of the grading. Itineraries can be visualized with a wide range of maps. By default, itineraries are shown in a google map view with roadmap or satellite view. The user can also choose from a variety of OpenStreetMap views including an outdoor map for hiking or biking, a street map and even a map called “pirates” which makes the map look like an old treasure map. For some reason none of the maps were shown for mobile screen sized browsers. Only additional service that can be found is the ability to download the itinerary as a PDF file. Mobile support via browser was not very well supported but the service did prompt the user to use the Snukr mobile app multiple times when browsing.

Figure 10: Snukr tag selection



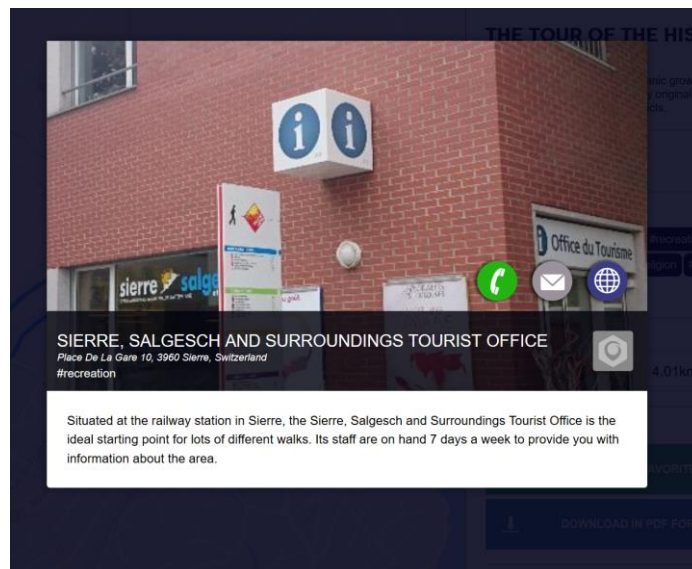
Source: <https://www.snukr.com/exploration-tags?city=Sierre,%20Switzerland>

Figure 11: Snukr itinerary view



Source: <https://www.snukr.com/exploration-details?id=57581190e4b0744d7d1ff3a4&city=Sierre,%20Switzerland&lang=en>

Figure 12: Snukr POI view



Source: <https://www.snukr.com/exploration-details?id=57581190e4b0744d7d1ff3a4&city=Sierre,%20Switzerland&lang=en>

Figure 13: Snukr alerting user to use the mobile app



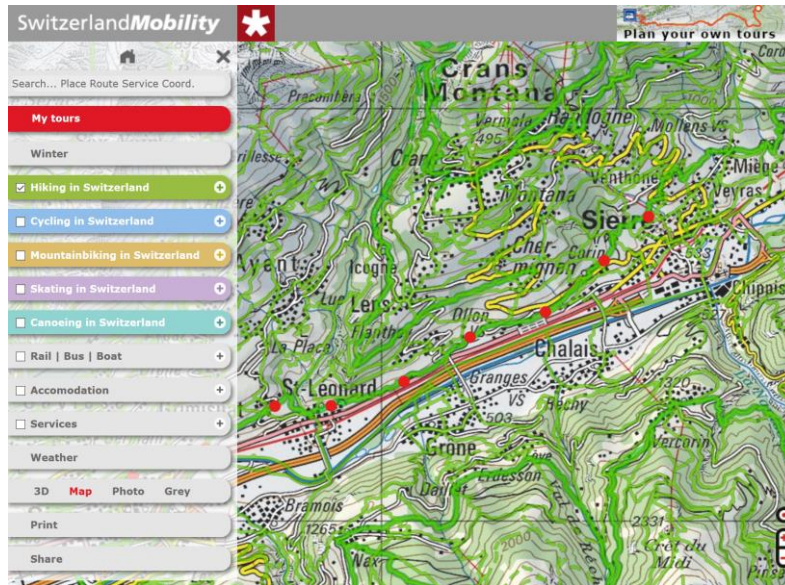
Source: <https://www.snukr.com/exploration-details?id=57581190e4b0744d7d1ff3a4&city=Sierre,%20Switzerland&lang=en>

1.3.12. SwitzerlandMobility

SwitzerlandMobility (a.k.a. SuisseMobile or SchweizMobil) is a Swiss outdoor service supported by the Swiss Confederation. SwitzerlandMobility has a wide range of itineraries for activities such as hiking, canoeing, cycling, mountain biking. SwitzerlandMobility offers a very standard hiking service in which you search for a location and select an itinerary on that location. Itineraries can be visualised on a map that has many functionalities, such as a topographic view, satellite view, 3D view, greyscale view, weather information and public transport all on the itinerary map. Points of interest can be viewed on the map with a name and a short description. SwitzerlandMobility offers you with a lot of services around the itinerary. You can look at accommodation, public transport, weather information, printable maps and even guided tours for the itineraries. Web browsing on mobile is supported very well. You can view itineraries in the same map view as on desktop and overall the experience does not differ much between the desktop and mobile browsers. Navigating the web site was fairly easy and finding an itinerary took 3 clicks.

Expression of difficulty is done with a simple grade and a fitness level. An itinerary can be easy as a hike, but it can be graded as a difficult on the fitness level. User can also see other basic information such as itinerary length, ascend, descend and time estimation. Itinerary map can be difficult to read at times as all the itineraries (including the one you selected) are highlighted in green on the map. A nice improvement would have been to see the altitude profile of the itinerary on the map view instead of it being in a separate pdf document.

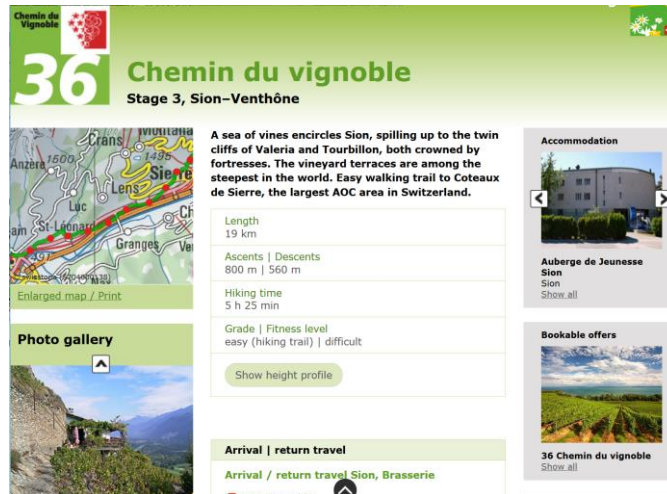
Figure 14: SwitzerlandMobility itinerary map view



Source:

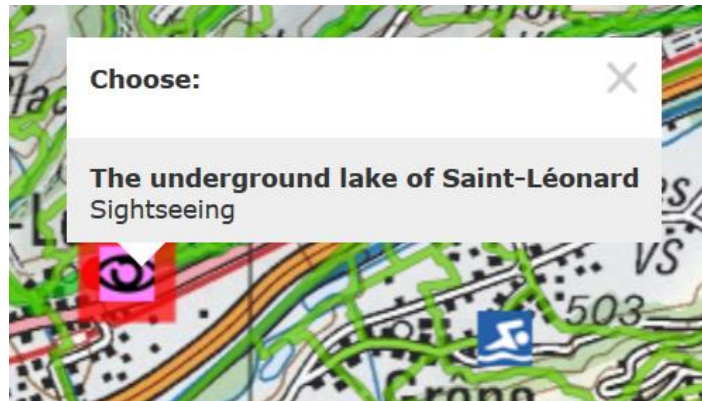
<https://map.schweizmobil.ch/?lang=en&land=wanderland&route=36&bgLayer=pk&season=summer&resolution=50&E=2594138&N=1119092&layers=Wanderland>

Figure 15: SwitzerlandMobility itinerary overview



Source: <https://www.schweizmobil.ch/en/wanderland/routen/route-036.html>

Figure 16: SwitzerlandMobility point of interest



Source:

<https://map.schweizmobil.ch/?lang=en&land=wanderland&route=36&bgLayer=pk&layers=Swisspark%2CAIpguardDog%2CWanderland%2CServices&season=summer&resolution=2.5&E=2599021&N=1122686>

Figure 17: SwitzerlandMobility mobile browser view of itinerary



Source:

<https://map.schweizmobil.ch/?lang=en&land=wanderland&route=36&bgLayer=pk&layers=Swisspark%2CAIpguardDog%2CWanderland%2CServices&season=summer&resolution=2.5&E=2605850&N=1125774>

1.3.13. Conclusion

Overall all the hiking services I classified provided at least an adequate hiking service. Most services were very close to each other in the total scores and they all provided a service that focused slightly on different aspects of hiking. The best score was given to Outdooractive which gave a very good experience with lots of features related to the itinerary and around it. Worst score was given to Snukr, which is understandable as it was at the time of the classification still in development. What was interesting to see was that none of the services classified had any support for points of difficulty. It was also interesting to see how all the services visualized the itinerary data and it gave me a good view on the technical solutions in the hiking itinerary services.

1.4. Interviews

To gain better knowledge and understanding about hiking routes and the dangers and difficulties around them, I did qualitative research by interviewing 4 key people, or “super users” in the field. In the interviews I asked the interviewees about the problems and dangers of a hike, so I can create an accurate questionnaire for the clients of SanTour. I also asked about general information regarding hiking services such as map types, what things to consider when going on a hike and other more specific questions so I can implement important elements and features for the SanTour. To get a formative evaluation from the super users, I also showed the first prototype of SanTour and an early wireframe of the next version I had made. Formative evaluation is primarily diagnostic; it is about collecting qualitative data to identify and fix UX problems and their causes in the design (Hartson & Pyla, 2012, p. 429).

Figure 18: Interviewing Julien Petit



Source: personal sources.

I wanted the interviewee to feel comfortable in the interview process and started out by explaining the interviewing process so that I was completely transparent with the interviewee. In the beginning of the interviews I told the interviewees that there were not trick questions and it was not a test and that I was only gathering their view to the questions. This way I wanted to make sure that I could get

honest answers straight from the interviewees mind. In the interviews I asked the interviewee questions and I let them answer freely without interruption. If the answer was not exactly on the question I was asking, I would specify my question with additional questions. I wanted to stay completely neutral while interviewing. Even if I didn't agree with the interviewees opinions, I still took their answers seriously. To me the interviewing was more about what makes the interviewee feel the way they do and not if they were right or wrong.

Table 9: List of participants in the interviews

First name	Family name	Description
Sylvie	Peter	Guide in Anniviers for middle mountain activities
Pascal	Zufferey	High altitude guide in Anniviers
Angelica	Brunner	Valrando responsible for Oberwallis
Julien	Petit	Responsible for Anniviers tourism

Source: personal sources.

1.4.1. Findings

The interviews were very interesting. They offered me insight on to different hiker's minds. It was interesting to see what things the participants agreed and disagreed on. The results gave me more data and ideas that I can use in my designs and development.

I found out that all the participants used apps on their mobile phone. Some of them used web sites but mostly the participants used mobile apps. Half of the participants said that they use SwitzerlandMobility as their main hiking app. It was inconclusive whether the participants thought the services were easy or difficult to use in general. The ease of use seemed to be a very individual and related to the services the participants used. Half of the participants used a GPS device like a Garmin while hiking and the other half used only their mobile phones. It was also mentioned by some that using these apps was not always necessary as the routes were clearly marked. One participant pointed out thought that sometimes the trails are not marked correctly.

The participants found it difficult at first to describe difficult parts on a hike. I found it best to explain the concept of the points of danger in SanTour to help put their mind in the right place. I used an example of a suspension bridge where a person with the fear of heights may find it very difficult to cross. Most of the participants mentioned that the narrowness or width of the hiking trail is a factor in the difficulty. Rocks were also mentioned by everyone as a point of difficulty. Most said also that snow made hikes more difficult as well because of the slipperiness it can cause. It was also mentioned that ropes and chains in the itinerary can be a point of difficulty.

The most common attributes for a difficult hike were the unclearness of the itinerary path and large height differences in the itinerary. The possibility of climbing was also mentioned to be a factor.

For easy hikes, most of the participants said that the attributes were clear and broad paths where the ground was even.

I asked the participants which grading system they preferred for hikes. Half of the participants said that the Swiss colour system of yellow for easy/normal hikes, red/white for mountain hikes and blue/white for alpine hikes was the best system. The other half did not have a strict preference but one of them did also mention that the colour system was good.

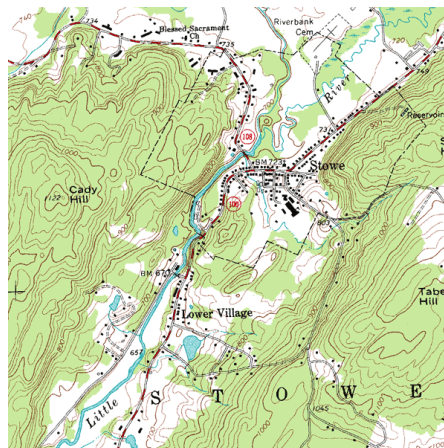
Things that the participants brought on hikes were food and drink, sunglasses, sunscreen, paper map, additional clothing and for safety reasons, most wanted to bring a mobile phone. Some unique things that were mentioned were medicine, small ropes and walkie talkie for emergencies.

Most of the participants had never had to go back from a hike because of a point of difficulty. Some had close call situations, but they always found ways around the points of difficulty. One of the participants had a few instances where he had to turn back because of bad weather or snowy and slippery ground. Some of the participants had also had fearful situations where they lost their way because of weather conditions or difficult terrain.

The most dangerous weather condition for hiking was unanimously a thunderstorm. The Participants explained that it was very dangerous because in the summer, the weather can change very fast into a thunderstorm. They said that if this happens you have to either turn back or find shelter somewhere. Snow and mist were also mentioned by some to be dangerous.

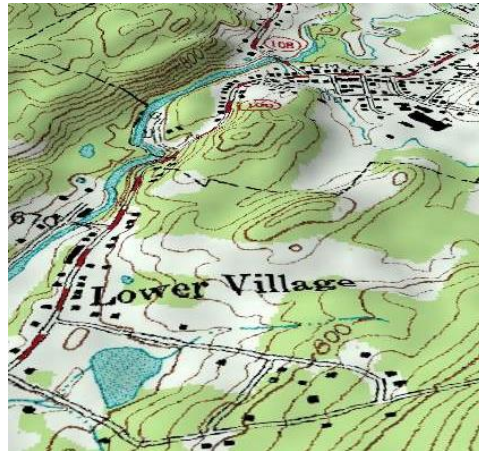
three out of four participants said that the classic topographic map was easily the best for hiking. One of the participants liked the google maps topographic map the best and even the planimetric map was good in the participants opinion. This individual did not like the topographic map.

Figure 19: Classic topographic map



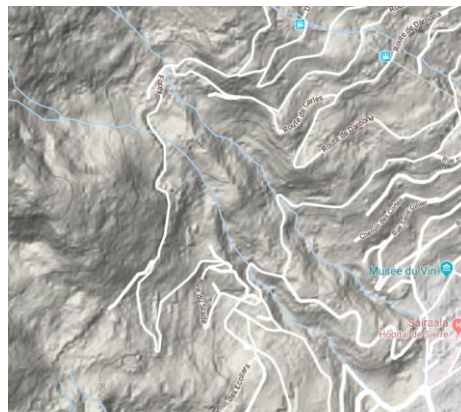
Source: https://upload.wikimedia.org/wikipedia/commons/7/79/Topographic_map_example.png

Figure 20: 3D topographic map



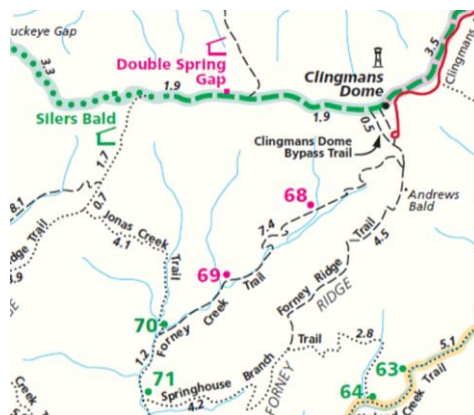
Source: <https://upload.wikimedia.org/wikipedia/commons/4/4c/Topographic-Relief-perspective-sample.jpg>

Figure 21: Google maps topographic map screen shot



Source: <https://www.google.com/maps/@46.2933886,7.5076072,15z/data=!5m1!1e4>

Figure 22: Planimetric map



Source: <https://royrogersfsu.blogspot.com/2014/04/planimetric-map.html>

I asked the participants also about other services around the hikes that they might use. Everyone mentioned that the weather and public transport information was important. Some other unique services were a mountain peak finding app, flowers app, tripadvisor for good restaurants on the of the hike and also accommodation information.

The participants feedback on the first edition of SanTour was that it was overall good and there were not too many questions on the questionnaire. One participants even said that the questionnaire had all the important questions. Some critical feedback was that the big rocks and small rocks should have separate preference ratings. I noticed that the participants were fast with the multiple choice questions but once the web site asked for their preference with sliders, it took the participants more time to choose the option they wanted. Some participants had trouble understanding the terms “cabossé” which translates to “bumps” and “cailloux” which translates to “rocks” or “pebbles”. These terms were used in the sliders on the obstacles section of the questionnaire.

Figure 23: Screen capture from the obstacles section of the first prototype of SanTour

Les obstacles

Évaluer de -10 (je déteste), 0 (ça m'est égal), à +10 (j'aime).

Racines: 0.00

Cailloux: 0.00

Cabossé: 0.00

Sources <http://www.santour.ch/>.

Finally I showed the participants my early wireframe of the vision I had for the next edition of the SanTour web interface. The feedback from everyone was that it was an improvement and simple. One of the participants felt that they would prefer some instructions on the service in the first page for example. The participant also said that a function for a group of hikers would be nice.

Figure 24. Early wireframe of the vision of SanTour



Source: personal sources.

1.4.2. Conclusion

I received some variety in the answers I got but there were also things that the participants were unanimous on. What I found important was that all the participants had mixed experiences with the ease of use of the hiking services they used. It tells me that there are services with good user interfaces, but it also tells me that its very individual how people feel about their experiences. It was

also interesting to hear that participants liked to use traditional GPS devices. To help these participants I could develop a feature which could send GPX files which these GPS devices could use. One thing that I had not considered before was the narrowness of the hiking path. This is something that should be taken into consideration in the questionnaire of SanTour. The swiss colour system was considered by the participants to be the easiest grading system and I think it should be incorporated into SanTour as well. Thunderstorms were unanimously considered dangerous. For this reason, I think it would be important to have a weather functionality on the itinerary page. The classic topographic map was considered the best by most of the participants and I should look into adding one to SanTour as well. Weather and public transport information was also considered useful and adding functionalities for both would be nice. The prototype of SanTour was considered good and most of the questions in the questionnaire were also adequate. Most participants were slower with the questions that had sliders and I feel that I should try to improve them. The instructions for some questions should also be improved. The participants felt that the early wireframe I showed was an improvement and it means that I am on the right track with SanTour. The next step was to turn the wireframes into mock-ups so that I could start developing.

1.5. Wireframing and Mock-ups

Wireframes, a major bread-and-butter tool of interaction designers, are a form of prototype, popular in industry practice (Hartson & Pyla, 2012, p. 340). Wireframes can be used to create “sketches” of websites. They are used to illustrate high-level concepts, approximate visual layout, behaviour, and sometimes even look and feel for an interaction design (Hartson & Pyla, 2012, p. 340).

When I started to create the first wireframes for SanTour, I wanted to make the website as simple to use as I could. One of SanTours targeted audiences is elderly people and because of that I felt that it was important to make the service easy and straight forward. The first wireframe could be described as a Horizontal prototype. A horizontal prototype is very broad in the features it incorporates but offers less depth in its coverage of functionality (Hartson & Pyla, 2012, p. 56). The wireframe I created had the main functionality of SanTour. It contained the questionnaire described with a few question types and the result page.

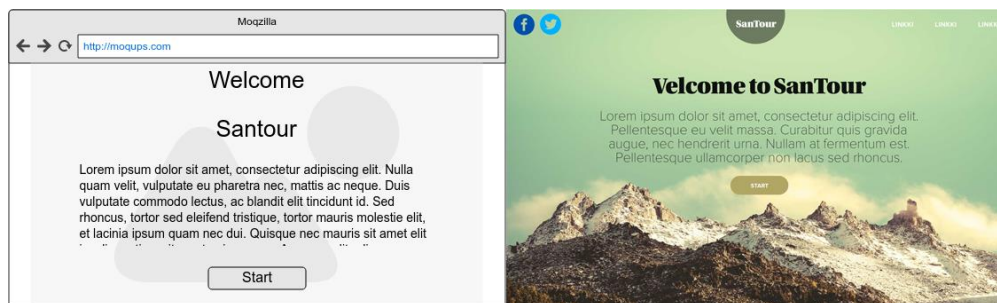
For SanTour it's very important to receive accurate data from the user. To improve the questionnaire of the page, I decided to divide each question into separate pages. In 2008 a web designer named Adam Silver worked on a website where he turned an ordering form from an accordion model into a single page model. As a result, the website gained extra 2 million orders a year (Silver, 2017). Doing this reduces the cognitive load on the user's brain. This can be compared to breaking down a mathematical function into smaller steps. It's the same for users trying to complete a form, or anything else for that matter. If there is less stuff on screen and only one choice to make, then friction is reduced to a minimum. Therefore, users stay on task (Silver, 2017).

After my first wireframes were done, I showed them to the super users I interviewed and asked for their opinions. The feedback I got was positive, every interviewee commented that the wireframe was an improvement on the current layout of SanTour and that it was simple. This was great news because it means that the users found the wireframe easy to use which meant that my design had its target.

After receiving the validation for the first wireframes, the next step was to bring more life into them by creating mock-ups. I don't have any experience in design or visualization, so I contacted a friend to help me out. My friend Jenni Kiviniemi works as a graphic designer and she was willing to help me out by visualizing my wireframes into mock-ups. I gave her all the pages I had created with wireframes along with descriptions and instructions. My instructions were to bring style and colour into the wireframes while keeping the layout as close to the wireframes as possible. The goal was to create a stylish and simple to use interface that would go along with my vision of SanTour.

After about a week, Jenni provided me with visualized layouts. Some minor adjustments needed to be done because of technological best practices, but in general they were following my vision and guidelines of the layout of SanTour.

Figure 25: Wireframe and mock-up of the front page of SanTour

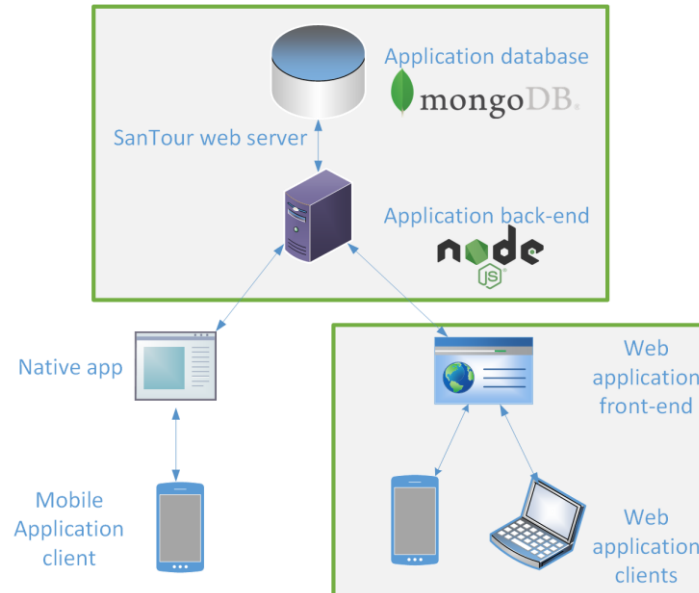


Source: personal sources.

1.6. Project technologies

As the SanTour project is still at a very early state, nothing concrete is defined yet on the technological side of the project. The final front-end technology will depend on the back-end and the overall architecture of the final service. As the current state of SanTour is a proof of concept, it would be a large task to create the whole architecture of the service and a very comprehensive front-end on top of that. I will instead be focusing my development on the front-end of the application. My goal is to create a good user experience that can be used for the next iteration of the development of SanTour. In the end my vision is that the front-end application will be able to read simulated back-end data from which it can recommend itineraries for the client. This back-end will be very simple, and it can be improved upon in the future. The back-end will communicate with a database of itineraries from which it will return a set of data whenever the back-end is called.

Figure 26: Schema of the architecture of SanTour



Source: personal sources.

For the development phase of my work on SanTour, it is necessary to choose a technology for the front-end development. There are many older and newer programming languages to choose from and many frameworks on top of that. As the development time of SanTour will be very limited, it is important to choose a language that I am already familiar with. I do not have enough time to learn completely new technologies and it would be beneficial to develop without too many technical issues. I will rate the possible options for the coding languages based on my skill level and experience on the language. I will also rate the adaptability of that language. Adaptability means how well the language can be adapted in the future if the services architecture is changed.

Table 10: Table of scores for front-end technologies

Technology name	My skill level / experience	Future adaptability	Total
PHP	5	4	<u>9</u>
C#	1	3	4
Java	2	3	5
Node.js	3	4	7

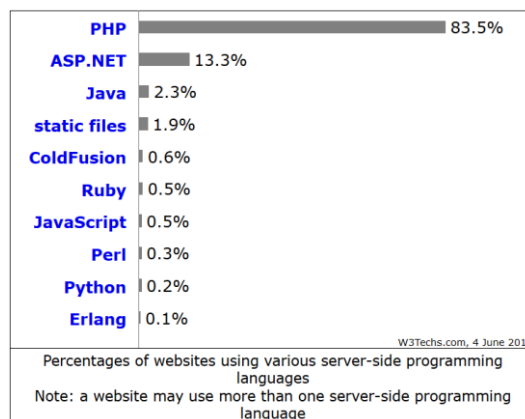
Source: personal sources.

1.6.1. PHP

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML (PHP, 2018). PHP is a loosely typed system. It means that for example that a variable can be text, numbers or even a list of items without ever needing to declare the type of the variable. PHP was released in the year 1995 but PHP experienced its biggest surge of popularity after Mark Zuckerberg, still in his Harvard dorm room, chose it to code Facebook in 2004. With a large popular site running it, PHP became an “it” language (Orsini, 2014).

In my developing experience I’ve worked a lot with PHP. I’ve used it in my working life and student projects. It’s a fast language for smaller projects and it has capabilities for larger web developing projects as well. PHP is a fairly old coding language, but it is still used by many websites. In June of 2018 w3techs.com reported that PHP is used by 83.5% of all the websites whose server-side programming language we know (Usage of server-side programming languages for websites, 2018). PHP is written into PHP files which can contain HTML and PHP code mixed together. This makes the possible transition away from PHP fairly easy, because the code structure of the project is heavily linked to the HTML presentation.

Figure 27: Percentage of websites using various server-side programming languages



Source: (Usage of server-side programming languages for websites, 2018).

1.6.2. Java

Java is a programming language and computing platform first released by Sun Microsystems in 1995 (Java, 2018). Java is a strongly typed system which means that for example the type of each variable has to be declared before it can be assigned. This means that if you have a text variable, it will be “String” type and if you have a number variable such as “1”, it will be declared as “int” type. Popular website that have used Java are Amazon, eBay and LinkedIn.

My first programming experience was with basic Java coding. I've coded Java at school and I've done some personal projects to train my skills in Java. I've coded with Java frameworks such as Spring and Spring boot and I've done some Java EE coding at school as well. In my experience I found that Java was very slow to develop for me and sometimes it would take me a very long time to develop a simple feature. In java you usually have the presentation layer with your HTML or XML and all of the websites logic and is separated into different parts of the program. Java has many different versions and frameworks and they all contain pros and cons. This makes my decision of Java even more difficult. This can make it difficult to transition, as the relation between back-end and front-end can become very complex. With java you can have very large back-end capabilities which makes it a powerful language but for my needs in front-end, I don't see it as a very useful one.

1.6.3. C#

C# is a programming language released in the year 2000. C# is developed by Microsoft for the .NET platform. You can use C# to create Windows client applications, XML Web services, distributed components, client-server applications, database applications, and much, much more (Wenzel, et al., 2015). C# has a fairly strongly typed system similar to Java. Some popular websites written in C# include Stack Overflow, and many Microsoft websites such as the XBOX website.

My experience with C# is not very long. I first coded C# in spring of 2017 on a few school projects and I haven't coded with it since. In my experience it was very similar to Java and I found it somewhat complicated and slow to develop with. Although there are express installs provided by Microsoft that I could use, the structure of the project would take time for me to understand. With the time limits I have, I think that C# is too new and complex for me to start developing on and I would need more experience with it.

1.6.4. Node.js

Node.js is a free opensource JavaScript runtime-environment released in 2009. JavaScript was originally run on client side in the user's web browser but with Node.js JavaScript is run on the server side. Node.js is based on Googles v8 JavaScript engine. As an asynchronous event driven JavaScript runtime, Node is designed to build scalable network applications (Node.js, 2018). Since Node.js is JavaScript, it's also a loosely typed programming language similar to PHP. Popular websites using Node.js include Yahoo, Walmart, Netflix and Uber.

My first contact with Node.js was in spring of 2017. I found it to be an easy language to develop, as it is JavaScript running on the server side. I've developed with JavaScript before in my working life, so it was familiar to me from the beginning. It is a language that is quite fast to develop, and it has a lot of potential. Node.js would be a good option for SanTour as it combines a good mix of front-end and back-end capabilities. If I had more experience with Node.js, I believe it would be a good

choice for SanTour. I'm too afraid to choose Node.js as I don't really have room for trial and error in my development process.

1.6.5. Back-end technology

Since the back-end of SanTour will not be the focus of my work, I will be keeping it very simple. The back-end will be called from a localhost address and it will always return all the itineraries that are saved in the database. The back-end will be written Node.js. To save time I will be using a back-end API solution that I've worked with in the past. This solution was for a very similar service to SanTour and it can be utilized in the future by native Android apps, iOS apps or it can be scrapped and switched to something better in the future since it's not a very complicated system.

1.6.6. Database

For the database of SanTour I chose MongoDB. MongoDB is a free and open source NoSQL database. NoSQL systems store and manage data in ways that allow for high operational speed and great flexibility on the part of the developers. Many were developed by companies like Google, Amazon, Yahoo, and Facebook that sought better ways to store content or process data for massive websites. Unlike SQL databases, many NoSQL databases can be scaled horizontally across hundreds or thousands of servers (Yegulalp, 2017). MongoDB saves data into documents which contain data that is in a very similar form to JSON. JSON is a form of data that is commonly used for APIs, which makes MongoDB a good choice when building an API. MongoDB also provides drivers and thorough documentation for Node.js which makes the development faster and easier.

1.6.7. Conclusion

For the overall architecture of SanTour it is difficult to say which language is the best. The final languages will depend on the complexity of the back-end functionalities and the complexity of the database. To keep the project simple and adaptable while considering my skills in each language, PHP is the best option for the front-end. I will also be using scripting languages such as JavaScript and libraries like jQuery which will be mixed into the PHP code. This will make the content of the pages more dynamic and its standard practice for modern day websites. To make the code fast to read for web browsers, I will use SASS for the styling and a tool that will minify the SASS and JavaScript's into minified files. This will increase the performance of the site and it's what you would find on any professionally made websites. I believe that a Node.js API with a MongoDB database is a more than adequate solution for SanTour at this stage of development. As far as I can see, the capabilities of both Node.js and MongoDB should support even a fully working back-end and database. To be sure, I won't be going too deep on the development of the back-end and database. I will try to keep them so that if necessary, they can be completely changed in the future.

1.7. Tools

After choosing the technologies of my development, I must also choose the tools which I will use for my development. These tools will allow me to utilize technologies while making them easier and faster to develop with.

1.7.1. Git, GitHub & Source Tree

To have version control for my project, I will be using Git. Git is a fast, scalable, distributed revision control system with an unusually rich command set that provides both high-level operations and full access to internals (GitHub, 2018). Git allows me to save code online into repositories. If I have any issues with my code or if I lose some code for some reason, I can look at previous versions of files that I committed in the past. Git is a great tool for collaborative coding but since I will be working alone, I won't be benefitting from those features.

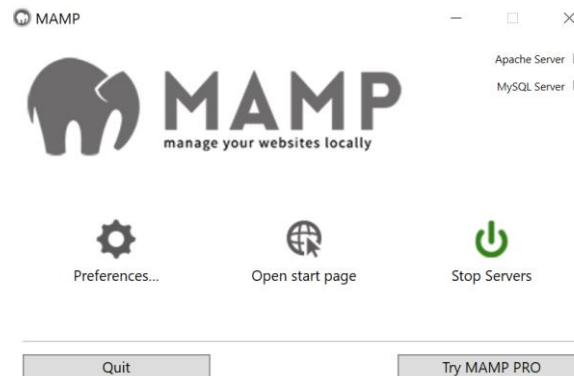
For the hosting of the Git service, I will be using GitHub. I have a student account for GitHub which offers me unlimited private repositories. It makes more sense to use a Git service that I already have an account for, instead of creating a new one as the services that competitors offer are very similar to each other.

The internet offers many tools for controlling Git. Git can be used from the computers command line or from a graphical interface. For my project I chose a Git tool called SourceTree. SourceTree offers a wide range of features such as a GUI, a command line, easy interface and it's completely free. SourceTree is developed by Atlassian. Atlassian is an Australian IT company behind popular business level IT tools such as Jira, Trello, Bitbucket and many more.

1.7.2. MAMP

For the local development I will be using solution stack called MAMP. MAMP offers a local Apache server with PHP already installed. It's very easy to use and configure. There are many similar tools such as WAMP and XAMP, but for my needs, I chose MAMP because I have a lot of prior experience using it and it offers all the features that I need for my local development.

Figure 28: MAMP user interface



Source: personal source.

1.7.3. Atom

Every developer has their own preference when it comes to the integrated development environments (IDEs). For most it's just preference of the user interface and features. For of my project, I will be using Atom for the PHP development. Atom is considered by many to be one of the best development environment tools for PHP. Atom is a modern text editor built by GitHub folks and offered free of cost under MIT license. Atom has an ecosystem of its own with huge community behind it and tons of plugins and packages available to extend its functionality (noeticsunil, 2017).

1.7.4. WebStorm

For the back-end development I will be using WebStorm. WebStorm is an IDE designed for JavaScript development. WebStorm has a great autocompletion system which makes developing JavaScript very fast and easy. It's also a very useful tool because it contains a command line and basically everything you need integrated right into the interface where you can easily modify and run the code. This is convenient for me because I will be creating a back-end server which is developed from the IDE and run from the command line.

1.7.5. Studio 3T & MongoDB community compass

To manage my MongoDB database, I will be using Studio 3T for large operations such as exporting, importing and clearing collections. 3T studio offers many powerful tools for the management of MongoDB. For smaller scale operations such as updating fields, managing and browsing single documents, I will be using the MongoDB community compass. MongoDB community compass offers a very intuitive user interface for simple operations. The downside is that the suite of features it offers is very small.

1.8. Defining project management

To make sure the developing phase will run smoothly, I will be using a project management framework. In software development projects time is a very important asset. Even more important is how you use your time. To better manage my time, I will be using a modified implementation of Scrum. Scrum is a project management framework made for teams of 3 to 9 developers but as I am developing SanTour alone, some of the features of Scrum won't be necessary.

There are many online tools for Scrum management, but I feel that for my needs I can use a simple Excel sheet with all the information and tracking related to my project. I will divide the time I have for the development phase into sprints and at the end of each sprint I will have a sprint review. In the sprint reviews I will choose user stories for the upcoming sprints and validate user stories from previous sprints. My thesis supervisor Alexandre Cotting will act as a product owner in the sprint reviews.

2. Development

2.1. General information regarding development

The development phase of SanTour started on the 18th of June 2018. In scrum, development time is split into smaller periods called “sprints”. Sprints are used to divide the time you have, and it allows your workload and the speed of your development to be estimated and calculated. I decided to split my time into one-week sprints until the 22nd of July which totalled to 5 sprints of development. I will choose user stories for each sprint and I will be turning those user stories into smaller tasks inside each sprint. This will make the production of each user story easier.

Table 11: List of all user stories for the development of SanTour

US Nr.	As an/a ...	I want to ...	in order to...
1	Developer	Setup my environment for developing	start the development of the project
8	User	Select the Canton I want to travel	get recommendations from that specific area
2	User	Navigate to the frontpage of SanTour	Find out more information about it
5	User	Answer to questions with thumbs up/middle/down	answer questions according to my preference
6	User	Answer to questions with radio buttons	answer questions according to my preference
7	User	Answer to questions with a slider that contains a preview of each step in slider	answer questions according to my preference
3	User	See the results of my recommendation	choose the best itinerary
20	Developer	Have a more intuitive preview for the slider element	have a better user experience for mobile devices
21	Developer	Have a database setup for the itineraries	store the itineraries I have in a database
19	Developer	look at the correct form elements for each of the questions in the questionnaire	create a better experience for the user
22	Developer	Database that can receive calls	communicate with the database and the front-end
4	User	See a map view of each itinerary	get a better view of the itinerary
9	User	Have the option to skip a question	move forward with the questionnaire
11	User	See how compatible each itinerary is to my preferences	to help me choose the correct itinerary
14	Developer	Have a database that I can use to make calls to and receive data	get a more functioning system
16	User	Get the weather information regarding the itinerary I choose	get more information about the itinerary
18	User	Download itinerary as a GPX file	have the itinerary in my GPS device
12	User	Get more detailed information about compatibility of each itinerary	give me more knowledge about the itinerary and my skills
13	User	Have more details about each itinerary	know more about the itinerary
24	User	Have a caption for the slider images	have a better description for the images
23	User	Have a better user interface for the data acquisition itineraries into SanTour	have a better user experience
10	User	Enter my name into a form that will save my preferences for later	make faster searches for itineraries
15	User	Have language support for French and German	understand the website in my native language
17	User	Get public transport information to the itinerary	help me arrive to the itinerary
25	Developer	Optimize the web page	have better load times
26	User	have a done percentage in the questionnaire	get a better overview of the progress
27	Developer	Inform the user that our website uses cookies	follow European laws

Source: personal sources.

Each user story has a number that can be read from the left side of the table of user stories. This number will be used to link the tasks and user-stories together. For example, the task with the ID 1.1 is the first task of the user story with the number 1.

For the first two sprints of development I didn't have as much time to work on the development as I would have wanted to because I was very busy with the preparation to the module exams. My plan was to make up for this time lost in the sprints afterwards with extra working hours.

2.2. Sprint 0

Table 12: Tasks for Sprint 0

ID	Task Name
1,1	HAVE A LOCAL ENVIRONMENT WITH PHP INSTALLED
1,2	INSTALL AN SASS AND JS MINIFIER
1,3	CREATE A STRUCTURE FOR THE PROJECT
2,1	CREATE FRONTPAGE
2,2	CREATE NAVIGATION
2,3	CREATE FOOTER
8,1	CREATE CANTON MAP

Source: personal sources.

On sprint 0 my focus was to setup everything and start up with some of the main elements of website. Before I could start my developing, I had to install the local developing environment called MAMP. After that I had to have a way of turning SASS files into CSS files. I also wanted to minify the JavaScript and CSS that I would be implementing. For this I installed a Node module called gulp. The purpose of gulp is to "Automate and enhance your workflow" (gulp, 2018). With gulp I installed plugins that allowed me to have a workflow that checked whenever I edited a JavaScript file or a SCSS file in the project, the program would turn them into minified files which the website would read automatically. To make SanTour responsive for desktop computers and mobile phones, I needed to have a grid. For the base grid of SanTour I ended up choosing an existing grid called "Simple grid". I chose an existing grid as the base because I felt it was unnecessary to build a grid from the ground up. I also created an interactive map of the Swiss cantons, so the users could choose the location of their hikes. I wanted to work on this on the first sprint because I was not entirely sure if the map asset that I had was going to work on a website. In the end I was able to make the map work perfectly.

2.3. Sprint 1

Table 13: Tasks for sprint 1

ID	Task Name
5,1	Create styling for a form compatible way to choose to thumb up / middle / down
5.2	create mobile support
6.1	Create styling for a form compatible way to choose radio options
6.2	create mobile support
7.1	Create styles for the slider and preview
7.2	Create scripts for slider and preview interaction

Source: personal sources.

For sprint 1 my goal was to make the basic elements for the questionnaire. This included the yes/no/maybe option module and slider with a picture preview and a typical radio button option. The challenge for this sprint was to make custom elements that would work with a form. Modifying the styles of the default form elements is not very easy, as web browsers do not always support it. The standard practice for custom form elements such as checkboxes and radio buttons is to actually hide the element and put a custom element on top of it and that can sometimes be challenging. I added a randomizer which changes that background of the page whenever you go to the next question. This makes it easier to manage the questionnaire as you don't need to worry about the background of the page for every question.

2.4. Sprint 2

Table 14: Tasks for sprint 2

ID	Task Name
3,1	create visual elements for the results page
3,1	create mobile compatibility
20,1	tweak the slider so it's better for mobile screens
21,1	setup database for local environment
21,2	setup database for deployment environment

Source: personal sources.

In the beginning of sprint 2, we added some new user stories into the backlog. Some of the elements on the form needed to be adjusted and all the questions from the original SanTour prototype needed to be adapted to the new prototype. A database also needed to be setup. For this I chose a

NoSQL database called MongoDB. It made a lot of sense for me to store the data in a NoSQL database, as the data could be stored in a logical form and it could easily be called and transferred onto the webpage in almost identical form.

On sprint 2 I also worked on the results page where all the recommended itineraries would be shown. From a technological perspective, I saw it best to do some changes from the original layouts. In the layouts there was one map for each of the itineraries listed as recommendations. I changed the layouts so that there was only one map on the page that would be updated as the user changed the active items on the recommendation accordion. I also removed the weather button and made it so that it would trigger when the user expands an itinerary on the accordion view.

2.5. Sprint 3

Table 15: Tasks for sprint 3

ID	Task Name
19.1	Transform original questions into questions that are suitable for the new questionnaire
19.2	Find pictures for all slider examples
22.1	Setup database for server
3.1	Have a map with all itineraries shown in it
3.2	Have POD and POI in the map
9.1	Create a skip button
11.1	Create a scoring function that compares attributes from user and itineraries
13.1	Create a connection between front-end and database
16.1	make a call between weather service and front-end
16.2	create a page that acts as a proxy for weather service to hide API key
18.1	Create a link that directs to a corresponding GPX file of the itinerary
12.1	Create a graph detailing the attributes of user and itinerary and add more detailed information to itineraries
13.2	Add description and details about itinerary
24.1	Add a caption that changes with slider options

Source: personal sources.

On sprint 3 my main focus was to have real data on the results page and the questionnaire. I had more time this sprint to work on SanTour, so I did a lot of catching up. I started by establishing a connection to the NoSQL database which I created. After a connection had been established, I started

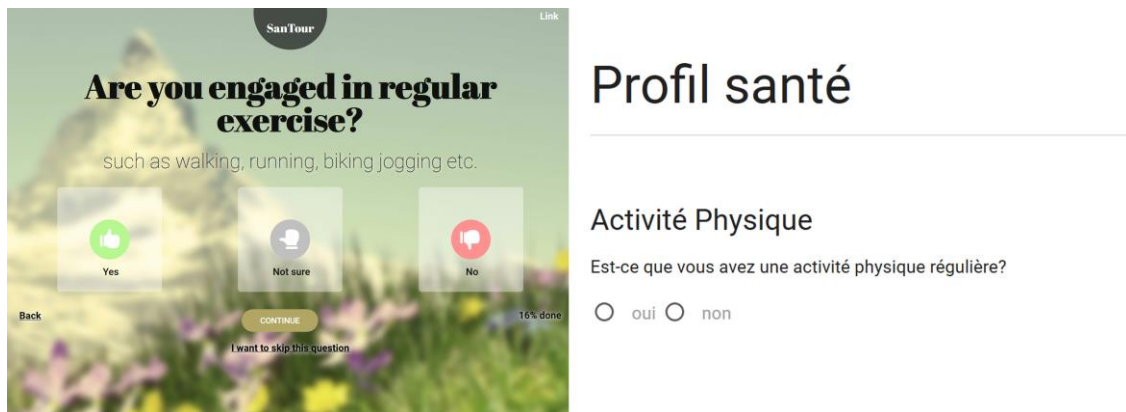
to fill the database with real data. The itineraries in SanTour were previously recorded with the Snukr app and unfortunately there was no way of exporting the GPS data. To get the GPS points for each itinerary, I had to look at the source code of Snukr, so I could pick all the GPS points from itineraries that had been recorded for SanTour. This process took a long time and I discovered that there was no altitude data included in the GPS points. Later on, I decided to re-draw one of the itineraries myself using a tool made my SwitzerlandMobility. What I discovered was that the GPS data generated by this tool had far less data points for the same itinerary and the GPX files provided by the tool also contained altitude data. After some minor modifications, I was able to convert the GPX file into JSON data. After conversion I pushed it into the database and I noticed that the file size of the itinerary had decreased from 200kB to 20kB. This was due to cleaner data. I decided to re-draw all the itineraries, so I could get a cleaner set of data and better performance from my database. Once I had the elevation data as well, I used it to print the altitude profile of the itinerary. To visualize the altitude profile, I used a graph from a JavaScript library called Graph.js.

For the points of danger and interest, I took the data from the source code of Snukr. I decided to link the images of the points of interest and danger to the URLs provided by Snukr instead of having the files linked to my own server. To store this kind of information I think it would be best to have a dedicated file server and setting up one is not really in the scope of my thesis. While I was working on the list of itineraries, I figured it was best to also work on the live weather service. I made it so that once the user clicks to open more info about an itinerary, an asynchronous function is started which calls for a function that gets the weather information at the first GPS point of the itinerary. The weather provider I used was called OpenWeatherMap. They provide a free and open source weather service that gives me all the features I needed. To make the service more secure, I wanted to hide the API key provided by OpenWeatherMap. To do this, I created a php page that worked as a kind of proxy. This page called for the weather service with 2 parameters in the get method of the page. This way I could safely call the weather service through the server while keeping my API key hidden from the users.

After I had real information on the results page, I continued working on the questionnaire. I took all the questions from the current version of SanTour and transformed them into a suitable form for the new version. Some of the questions required small transformations in the wording and some of them required custom elements in the questionnaire form. I also added a capability to skip a question. This can help in the future once there is stricter validation in the form. To make the questionnaire more user friendly, I added example images on the slider elements of the questionnaire. This required me to search for images that would represent the different levels of difficulty that each of the sliders presented. The task was time consuming, as some of the examples were not easy to find. I used various open source websites that provided free images without the need to give credits to the photographer of the image. To standardise the image sizes, I decided to make all the images 600 pixels high and 800 pixels wide. I wanted to keep the load times faster, I kept the quality of the

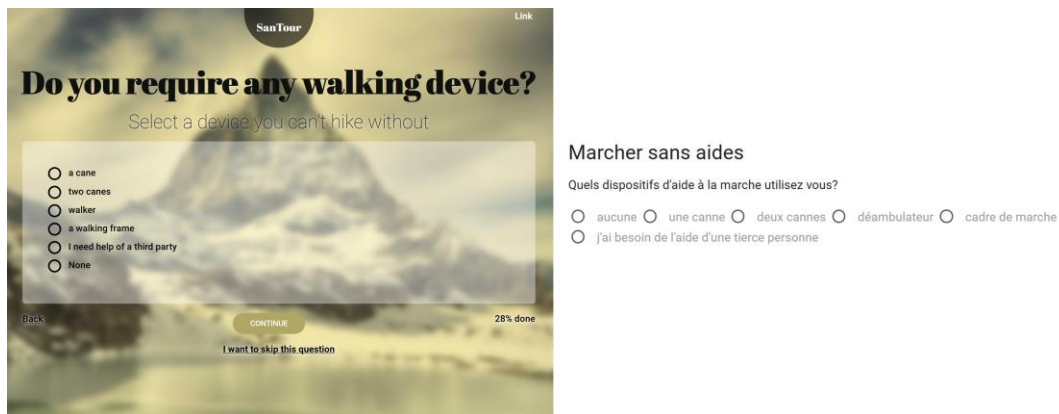
images quite low at under 100kB per image. In the end the questionnaire ended up being around 30 questions that are separated into around 25 pages. The total length of the questionnaire depends on the answers of the user. This is due to the branching logic of the questionnaire. In my tests of the questionnaire, I experienced that the user needed to do more clicking because questions are separated into pages. While this can be frustrating for some users, I feel that the quality improvement of data from the user will outweigh the downsides.

Figure 29: Yes or no question before(right) and after(left) picture



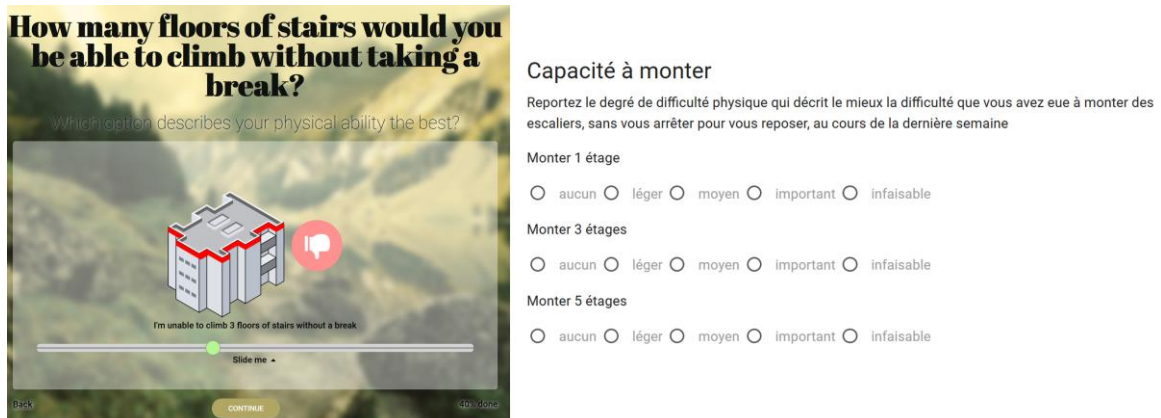
Source: personal sources.

Figure 30: Multiple choice question before(right) and after(left) picture



Source: personal sources.

Figure 31: A 15 option question turned into a slider



Source: personal sources.

Figure 32: Slider question before(right) and after(left)



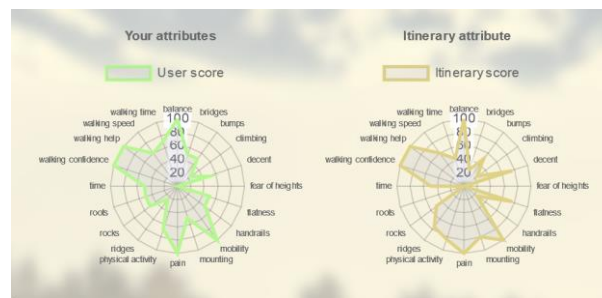
Source: personal sources.

Once I had the questionnaire finished, I could start working on the scoring of the itineraries. The scoring is something that in the future should be done in the back-end of SanTour, but since that's not my focus, I made a simple scoring system in the front-end. To get some insight on how the scoring was done in the first prototype of SanTour, I met up with Jean-Paul Calbimonte Pérez, who works in the Institute of Information Systems at HES-SO. Jean-Paul created the original scoring system and explained some of the thought process behind the elements and logic in the first prototype of SanTour. With the knowledge given to me by Jean-Paul, I decided to create a similar, but slightly simplified way of scoring the itineraries. In my system I gather an array of points that score the users physical capabilities and itinerary preferences on a scale of 0 to 100. 0 is the worst score and corresponds to having the worst physical condition on each of the physical attributes. 0 also means the least in the itinerary preferences. For example, 0 on the rock preferences means that there are no rocks in the itinerary. 100 on the other hand means that the user is in excellent physical condition and on the itinerary attributes it correspond to for example extremely large rocks. The user gathers an array of these values while they fill in the questionnaire. Each itinerary in the database also has an array

called “attributes” which contains the same ratings of physical condition and itinerary preferences, where the values correspond to the requirements for the itinerary. Once the user has filled in the questionnaire, the system compares the array of user provided attributes and the attributes of the itineraries and it calculates the percentage of differences in the arrays. This gives a percentage rating of the compatibility of each itinerary that is then used to sort the list of itineraries from the most compatible to incompatible.

With all the itineraries shown with a compatibility rating, I wanted to show the user the data that was used to recommend the itineraries. To visualize this, I chose a radar chart. I tested having the data of the itinerary and user overlap in the same radar chart, but in the end, I decided to split them into separate charts. This made them easier to compare in my opinion.

Figure 33: Radar chart view of itinerary’s attributes and user’s attributes



Source: personal source.

2.6. Sprint 4

Table 16: Tasks for sprint 4

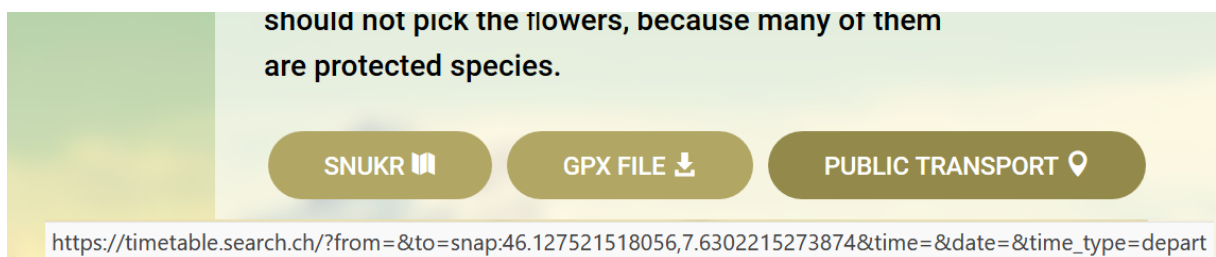
ID	Task Name
23.1	Create layouts for the data acquisition
23.2	Create side by side comparisons of the layouts
10.1	Save user info into cookies
10.2	Load all user info from cookies
15.1	Create a system for multilanguage
15.2	Create translations files
17,2	Create a way to get public transport information to the itinerary location
25.1	Scan web page for improvements and follow suggestion improvements
26.1	Create a dynamic way of presenting the done percentage of the questionnaire
27.1	Create a cookie info box and a page for the cookies information

Source: personal sources.

My goal for sprint 4 was to finish all the user stories that were left. I started by adding support for multilanguage. I had done something similar in a previous school project, so the developing was familiar to me. I created a simple get method that would look for attributes with language codes “En”, “Fr” or “De. If a language code is recognized, a file would be chosen that would contain the appropriate language translations. The language preference is then saved into the user’s browser cookies. If no language is found from cookies or post, the English file is chosen. This code is printed at the top of every page, so that the whole page can be filled with the correct language information. The largest task was transferring every single written sentence into an English file and then copying the information over to the French and German files as a template. Since I don’t speak French or German, we agreed with Alexandre Cotting that the translations for the French and German files were not required from me.

The next task I did was implementing the public transport information for the itinerary results. To implement this, I went online and looked at existing services that provided public transportation information. I wanted to implement a light weight solution that would still serve the user with accurate information. I ended up finding a website called search.ch. This website provided public transport timetable information with support for GPS location. This was perfect for my needs so all I needed to do was to implement a get call to the search.ch page with the destination information of the itinerary starting GPS point. After performing some tests, everything worked as designed. The results page public transportation button re-directs the user to the search.ch page of public transport timetables where the user only needs to insert their starting location and after that, they can receive the timetables.

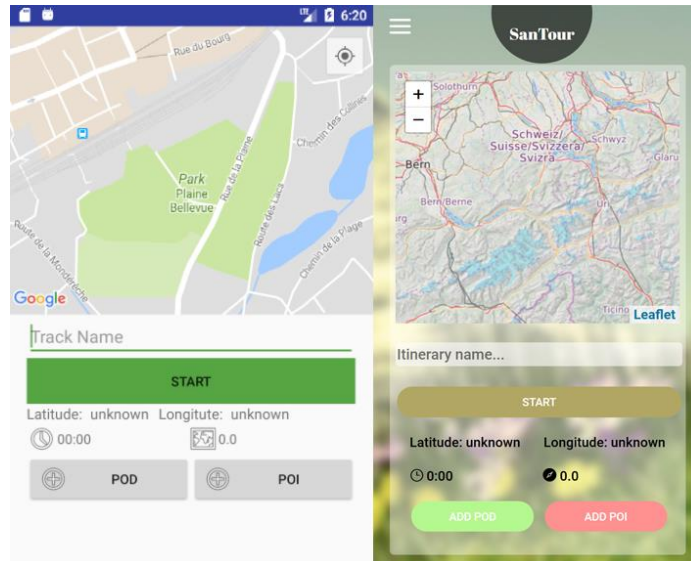
Figure 34: Public transport information button with link location



Source: personal source.

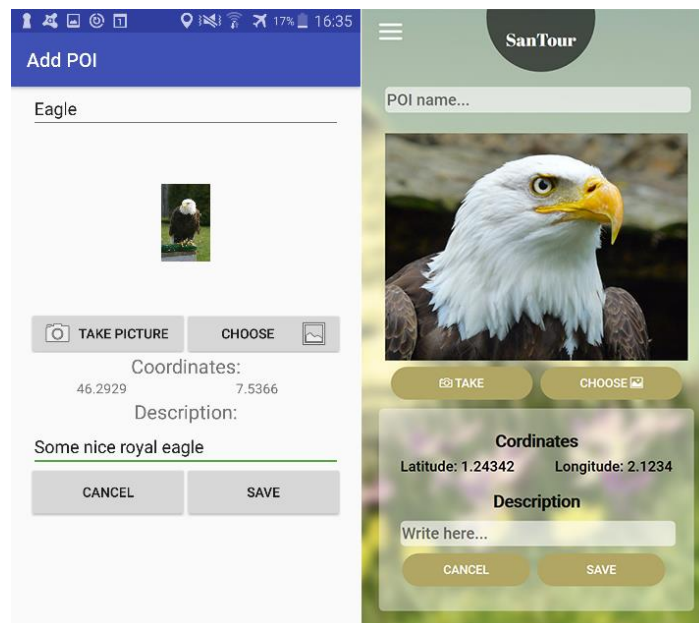
One of the tasks required from me was to improve the ergonomics of the data collection and visualisation process. To accomplish this, I took screen captures of a prototype mobile app that I had developed in a previous course at school for the data collection process of SanTour. I re-created them layouts with the new look of SanTour. I didn’t want to start building a completely new service for data collection, as it would have required a lot of work with security, file servers, and validation, so I chose to create the layouts for these pages so that they can be utilized in the future.

Figure 35: Main view of itinerary recording



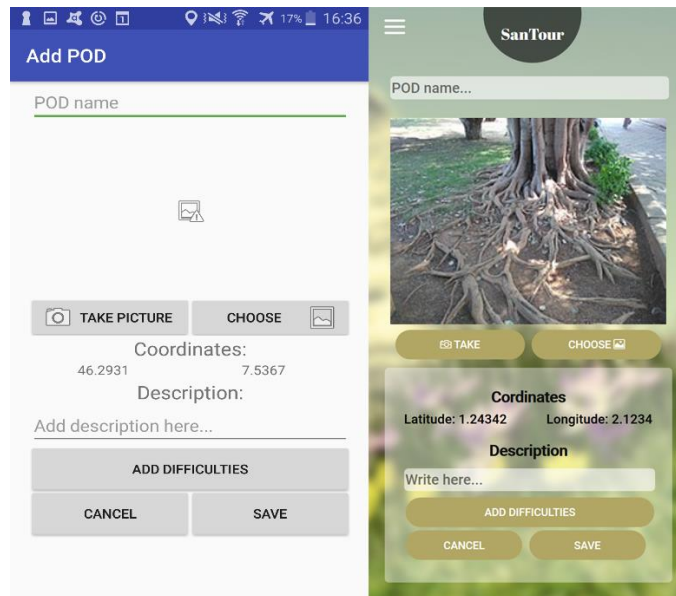
Source: personal source.

Figure 36: View of adding a point of interest



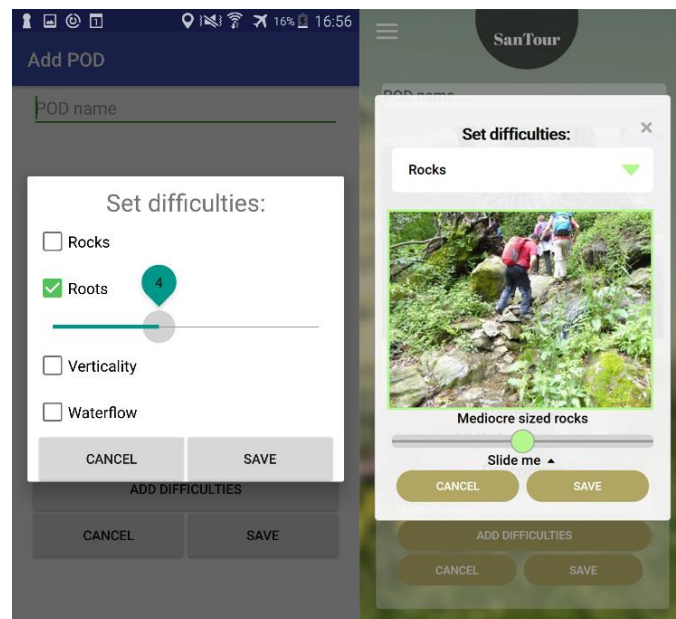
Source: personal source

Figure 37: View of adding a point of difficulty



Source: personal source.

Figure 38: View of setting the POD value

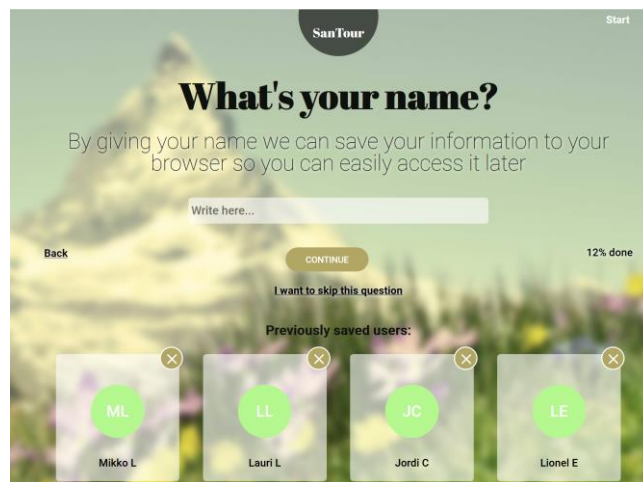


Source: personal source.

To help the recurring users of SanTour, I designed a system that would save the users preferences into the user's web browsers cookies. The user could then choose a previously used profile before starting the questionnaire and they could skip straight to the results. I developed this by taking the list of user attributes that are sent into the results page for scoring and I save them into an array that is stored in the cookies as a serialized string. Cookies do not allow storing arrays, so the data had to be turned into a string by serialization. The data is then taken from the cookies when the user loads the questionnaire page and a hidden form is printed for each user stored. The form contains all the

attributes of the user in input fields. When a profile is loaded, a JavaScript will simply submit the form that belongs to the users. I found this to be the cleanest and easiest solution. To remove a user from the cookies, a JavaScript is called that reads the browser cookies. The script then unserializes the data and removes the specific user. After the user data is removed, the data is serialized again and put back into the cookies. To make it possible for JavaScript to serialize and unserialize data, I had to download a JavaScript library that contained functions that could handle the PHP serialization. I decided to limit the number of stored users to 4. This could be increased or decreased in the future. I wanted to make it easy to delete the stored users, so I made a big close button on the top corner of each stored users buttons. This way the user has easy control over the information that is saved about them.

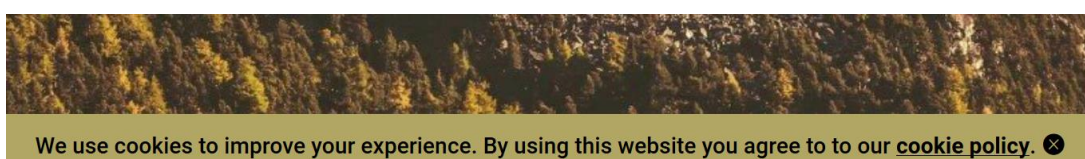
Figure 39: Screen where user can select saved profile



Source: personal source

After I was done with setting the user attributes, I wanted to add a prompt to inform the user that cookies were being used. Even though to my knowledge this is not required by law in Switzerland, I wanted to make it so that the website complied with the European cookie laws. This required me to create a prompt that informs the user that cookies are being use, and a page which informs the user about cookies and the cookie policy. Since the legal side of cookies is not the focus of my work, I added a cookie policy template from a website called TermsFeed (TermsFeed, 2018). This is something that I wanted to include but it can be improved in the future with the help of experts in the field.

Figure 40: Cookie prompt

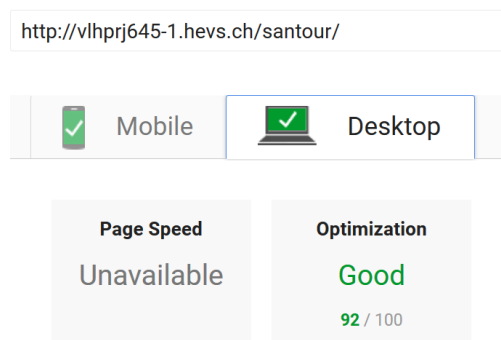


Source: personal source

To get improved performance from the web page, I wanted to look at possible optimizations. I started out by using a service by Google called PageSpeed Insights. PageSpeed Insights reports on the real-world performance of a page for mobile and desktop devices and provides suggestions on how that page may be improved (Google, 2018). PageSpeed Insights looks at your websites speed and optimization and gives you a score on both areas. On the speed of the page, PageSpeed Insights scores the service into one of three categories: fast, average or slow. For a website to get a grade of fast, every metric of the page needs to be fast. For the website to get a grade of slow, any metric of the page is slow. If a website gets a score of anything in between, the site gets a grade of average. PageSpeed Insights also looks at your websites possible optimizations. PageSpeed Insights evaluates how well a page follows common performance best practices and computes a score from 0-100 that estimates its performance headroom (Google, 2018). The scores for optimization are divided into one of three categories as well: good, medium or low. For a site to the low grade, the page is not very well optimized, and the score is under 59. For a medium grade the page needs to have common optimizations and the score needs to be between 60 and 79. The good grade is given sites that have most of the best practices and optimizations in place and the score is over 80.

The first time I scanned SanTour with PageSpeed Insights tool, I received a grade of low on mobile and on desktop. There were images that needed to be compressed and some scripts were not minimized and blocking the loading of the web page. The server caching of images was also not turned on. To solve these issues, I went through all the images of and I compressed as much as I could without losing quality on the image. I minimized the scripts and added async or defer attributes to all the scripts that were not required in the loading of the web page. By implementing these optimizations, I was able to reach the score of medium. The only Issue I had was the caching of the assets on the website. To fix this I needed to add rules to the “.htaccess” file of the server I was hosting SanTour on. Since the server I was hosting SanTour was owned by HES-SO, I wanted to ask help from someone working in HES-SO. With the help of research assistant Roger Schaer, I was able to enable browser caching on the server. After enabling the browser caching, the grade for desktop and mobile rose to good. Unfortunately, Google speed Insights was only able to give me the score for the optimizations on the website and not on the speed of the page, but I feel that the optimizations are more important regarding my work than the speed of the page.

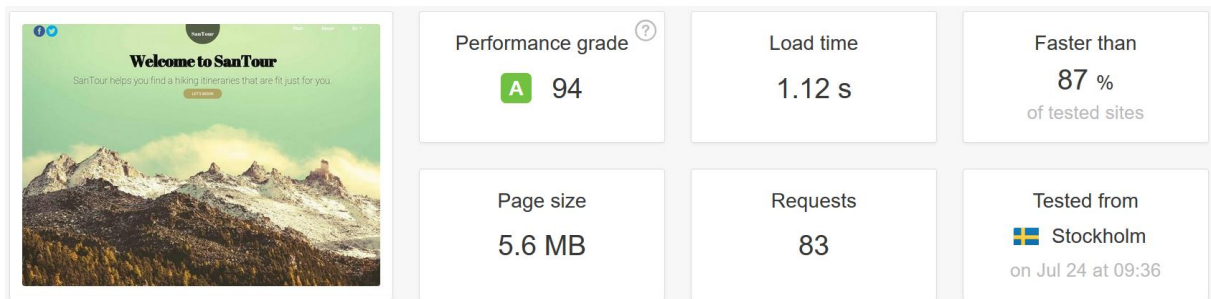
Figure 41: Google PageSpeed Insights score and grade



Source: <https://developers.google.com/speed/pagespeed/insights/?url=http%3A%2F%2Fvlhprj645-1.hevs.ch%2Fsantour%2F&tab=desktop>

The second website I looked at for optimizations was Pingdom. Pingdom offers a full-page test which checks very similar things to the Google PageSpeed Insights tool. The tool offers you a more detailed look into the load times and elements that are being loaded from the website. The tool grades the tests on an alphabetical scale of F to A where F is the worst and A is the best grade. After the first scan to the I received a grade of A with a score of 94. According to Pingdom, the page was faster than 87% of the tested sites.

Figure 42: Pingdom full-page test results



Source: <https://tools.pingdom.com/#!/ePmA10/http://vlhprj645-1.hevs.ch/santour/>

With the optimizations completed, I had come to the end of Sprint 4. By the end of Sprint 4 I had completed all user stories from the product backlog without any rejected user stories. I the end I compensated my working hours from sprint 0 and 1 in sprints 3 and 4. The project went smoothly once I had the database, back-end and front-end questionnaire completed and I think that my implementation of Scrum helped me with the time management and it's part of the reason everything went so smoothly.

3. Evaluation

To validate my prototype of SanTour, I wanted to invite back the super users I had interviewed previously. My plan was to evaluate the user experience of SanTour by applying rigorous empirical evaluation methods. We define rigorous UX evaluation methods to be those methods that maximize effectiveness and minimize the risk of errors regardless of speed or cost, meaning to refrain from shortcuts or abridgements (Hartson & Pyla, 2012, p. 433).

3.1. Planning

The goal of my evaluation is to receive feedback on ease of use of SanTour. I can spend 3 days on the evaluation and my goal is to evaluate at least 3 people. The prototype that the participants will be testing is the final prototype that was completed at the end of the development sprint 4. The testing will be conducted at the Bellevue campus of HES-SO in Sierre.

My plan is to start the evaluation by describing the evaluation process to the participant. I don't want the participants to feel like I'm testing them, but rather that they are helping me test the application. I will give the participants tasks that they need to complete without giving any hints on how the tasks should be done. I will ask the participants to think out loud while they perform these tasks. To collect data, I will be recording the time it takes for the participants to complete each task. In addition, I will be monitoring the reactions that the participants have. After each task is complete, I will ask for the participants feedback and how they felt during the task. I will listen to their feedback without trying to defend any of my design choices or explain why things were done the way they were done.

After I've done all the evaluations, I will analyse the results and compare the times it took to complete each task and how the participants felt after each task. I will be creating an Excel sheet out of all the data that I'm able to analyse.

3.2. Evaluating

Once sending invites to all the participants of the previous interviews, I was able to get two of the four participants for the final evaluations. To compensate for the low attendance, I decided to also invite Jean-Paul Calbimonte Pérez to evaluate as an expert participant. Expert users are good at generating qualitative data. These expert users will understand the tasks and can tell you what they do not like about the design (Hartson & Pyla, 2012, p. 512).

Table 17: Participants of the final evaluation

First name	Family name	Description
Sylvie	Peter	Guide in Anniviers for middle mountain activities
Julien	Petit	Responsible for Anniviers tourism
Jean-Paul	Calbimonte Pérez	Creator of the first prototype of SanTour

Source: personal sources.

The evaluation consisted of me sitting down with the users and explaining the evaluation process and why I'm doing it. After the explanation I would give the participant a list of tasks and I would tell them to think out loud everything that they did. This was done so that I could get their immediate feelings about everything they saw and experienced while using SanTour. I also told the participants that I would be timing them but that it was not a competition but just for analytical data.

Once users started the evaluation, they would do one or a few tasks at the time and after I would ask them how they felt about each of the tasks they did. With Jean-Paul I also asked about the technical aspects as well. It was important to me to hear his opinion on the technical solutions as he was the creator of the first prototype. I wrote down all the things that I heard the participants think out loud along with their feelings after performing the tasks. In the end I asked the participants their overall feelings about the application and how they thought the new prototype was when comparing it to the previous one.

3.3. Analysing

For the analysis part of the data, I took all the information that I gathered from the evaluations and I started to look at all the key points. I started out by looking at all the issues that the participants had

I listed all the issues onto a spreadsheet where I described the problem, counted how many times the problem was encountered, estimated how much time it would cost to fix the problem, what the solution would be, and I also estimated how important the issues were. After listing all the issues, I sorted the list spreadsheet by first the number of times the issue was encountered and then by the importance of the issue.

After listing all the issues, I wanted to list all the feelings the participants had. I separated all the keywords that people said during each task and I counted how many times the same or very similar things were said. Once I had all the feelings listed, I sorted them by the task and then by the number of times the feeling was mentioned.

Once I had listed all the feelings, I took all the timings that I had recorded from each participant while performing each task. The size of the set of data I had was not very large, but I still wanted to see the average timing for each task.

Finally, I wanted to list some of the improvement Ideas that some of the participants said during the evaluation.

3.4. Findings

The evaluation process proved to be very revealing. I was received interesting feedback and overall, I think that the evaluation process went well.

After analysing all the issues that the participants had, I was able to find some things that could be improved. The main problem that all the participants had was with the saved profile. All the participants were looking for the profile from the navigation bar and they didn't expect it to be in the same page where the user adds their name to the questionnaire. It took the participants a few minutes to figure out that the saved profile was inside the questionnaire but once they were on the right page, they immediately saw the saved profile and used the functionality without any issues. In a real-world situation this might not be an issue as the functionality is designed for recurring users. Once the user comes back to the SanTour website and starts to fill out the questionnaire, the user would be able to find the saved profile and use it if necessary. Further testing on this would be interesting but a logical fix would be to move the functionality to the top navigation or to create a link from the top navigation to the saved users page since the top navigation was location where all the participants expected the functionality to be. Another related issue was that the participants didn't feel informed that their information was saved at any point. This is a communication problem between the user and the website that should be addressed. There is a text on the saved users page explaining that the users are saved if a name is, but it didn't seem to be clear enough. An improvement on this would be either a clearer way of informing the user about the saving of the user profile or a direct question or a prompt asking if the user wants their information to be saved.

The next popular issue that some of the participants had was that they didn't understand what the level or the score meant in the points of difficulty. They weren't sure for example what exactly it meant if you had a steep slope with the level of 2. Another point was that the participants weren't sure if 1 meant that the level was the most difficult or if 5 was the most difficult level. This is something that could definitely be improved in my opinion. When creating the markers for points of difficulty, it was not something that I put a lot of focus on. A new way of expressing the difficulty level for example with a scale of very easy to very difficult could be an improvement.

The next issue that some participants had was that the thin text under the questions of the questionnaire were not clear enough to read. This is something that I was aware of before and I tried to address it in my development by adding some white shadowing behind the text. It seems that there is still room for improvement and a possible solution could be to make the text slightly bolder or changing the entire font of the text.

Another notable issue that most participants had at some point was that some of the questions in the questionnaire were not clear enough. This is something that I think as well should be addressed in the future maybe with the help of someone in the field of physiology.

Table 18: Table of the issues that participants had during the evaluations

Problem	Importance (1-5)	Solution	Cost (1-5)	Instances
Struggling to find saved profile location in SanTour	5	Make saved profile easier to find	3	3
Not clear to user that information is saved to a profile	5	Make it clearer for the user that their information is saved	3	2
Hard to understand pod difficulty levels	4	Find a better way to show difficulty level	4	2
Thin text below questions was not easy to read	3	Improve the visibility of the text	2	2
Bumps is a difficult question to answer	3	Adjust the question	2	2
On the flatness question, the final pictures don't have a clear difference.	3	Find a better describing picture	3	1
Path width question is hard to answer	3	Adjust the question	2	1
Skipping question was not a clear option	3	Make skipping clearer to see	3	1
Question about sweating difficult to answer	3	Adjust the question	2	1
Walking devices question was not easy to understand (French)	3	Adjust the question	2	1
expecting POD/POI picture enlarger when you click on it.	2	Add a way to enlarge picture	4	1

Source: personal sources.

When looking at the feelings that people had after performing each task, it could be seen that most of the tasks were considered easy to do or at least not difficult. The only exception is with task 6 which was to the task to use the saved profile for the itinerary search. The overall feelings that the participants had were positive and all of them considered the application to be an improvement on the first prototype. Most participants also liked the visual aesthetics of the website.

Table 19: Table of highlighted feelings the participants had about each task

Task no.	Feelings	Instances
1	Simple to follow	3
1	Seemed to take a long time to complete	2
1	Intuitive	1

1	Seemed to take a shorter time to complete	1
1	Results were more precise	1
2	Easy to use	2
2	Intuitive	1
3	Easy to use	2
3	Reliable	1
4	Easy to do	2
4	It was fine	1
5	Easy to do	2
5	It was how I expected	1
6	Not easy to find	3
7 (overall feelings)	improvement on the previous	3
7 (overall feelings)	visually pleasing	2

Source: personal source.

Task 1 which was to search for a hiking itinerary using SanTour, took by average 6 minutes for the participants to do. One participant thought the questionnaire process was faster while other participants thought it took a longer time to complete. Task 2 was to choose an itinerary and look if it contains any points of interest or points of difficulty. This task took on average two minutes to complete and most of the participants thought it was easy to do. Task 3 was to look at public transportation to the itinerary using the button provided by SanTour. This action was performed in one minute by average and the feedback was positive. On task 4 the user was asked to download the GPX file of the itinerary from the SanTour website and the task was performed in averagely one minute. The feedback from the task was that it was not difficult to perform. The task number 5 was to change the language of the website and the participants performed the action in averagely one minute. This action was also thought to be easy to perform. In task number 6 the participants had to use the saved profile and the task was performed in averagely 2 minutes. The participants didn't find this action easy to perform.

Some participants gave improvement ideas while evaluating SanTour: a seven-day weather forecast option, darker red icons for the points of difficulty that are more challenging and a progress bar instead of a percentage to present the completion of the questionnaire. What Jean-Paul also recommended as the expert participant was a quantitative research on what the general population thinks of the service and the user interface.

In the end it was very interesting for me to see how other people used the SanTour prototype I worked on. I found it interesting when people had similar opinions about things and it was especially interesting when the participants had completely opposite feelings with each other. I think that the problems that the participants had were understandable and they should be improved upon in the future.

Conclusion

This research has allowed me to learn about hiking and hiking services. I've learned a lot about user experience, user testing and the development that goes into hiking services. The developing of SanTour allowed me to gain first-hand experience in NoSQL databases, JavaScript and PHP.

The goal of my research was to improve the interface of the first SanTour prototype. After the evaluation process of SanTour, I can say that the results of my work were considered by the participants of my evaluation to be an improvement on the previous prototype of SanTour. The overall feedback from the evaluation was positive, but improvements could also be found. Personally, I think that the interface is visually beautiful and easy to use on desktop and mobile devices.

A good starting point for improving SanTour would be to look at the problems that were found in the evaluation part of my research. The questionnaire is something that I think could be refined with the help of a professional in the field of physiology. The mobile interface of SanTour was never specifically focused on. SanTour was made to be responsive which means that mobile support is included but I feel that more work could be done on the interface and features offered to the mobile users.

The work that I've done in the overall architecture of SanTour is not very large, but I hope it will be useful for the future of SanTour and I hope that it can be improved upon. More research could be done in the science behind the questionnaire process of SanTour and I think it's one of the most important parts of the service. The data set that I had for the itineraries of SanTour was not very large, and I think that by increasing the number of itineraries in SanTour, the service will become much more powerful. To accomplish this, more research into the points of difficulties in new itineraries would bring a big improvement. I hope that the work that I've done in the database and the back-end of SanTour will be helpful for the future development of the project. I hope that the research and development of SanTour continues with the further developments of the native app, back-end and database of SanTour and I hope HES-SO Valais can benefit from my research in the future.

4. References

- (2018). Retrieved from Snukr: <https://www.snukr.com/>
- GitHub. (2018). *Git*. Retrieved from GitHub: <https://github.com/git/git>
- Google. (2018). *About PageSpeed Insights* . Retrieved from Google Developers: https://developers.google.com/speed/docs/insights/about?hl=fi-FI&utm_source=PSI&utm_medium=incoming-link&utm_campaign=PSI
- gulp. (2018). *gulp*. Retrieved from gulp: <https://gulpjs.com/>
- Hartson, R., & Pyla, P. (2012). *The UX Book: Process and Guidelines for Ensuring a Quality User Experience*. Amsterdam: Morgan Kaufmann.
- Java. (2018). *What is Java technology and why do I need it?* . Retrieved from Java: https://www.java.com/en/download/faq/whatis_java.xml
- Node.js. (2018). *About*. Retrieved from Node.js: <https://nodejs.org/en/about/>
- noeticsunil. (2017, July 4). *PHP IDE: The 10 Best IDEs for PHP Programmers*. Retrieved from noeticforce: <https://noeticforce.com/best-php-ide-for-programmers-windows-and-mac>
- Orsini, L. (2014, August 11). *PHP, Once The Web's Favorite Programming Language, Is On The Wane*. Retrieved from readwrite: <https://readwrite.com/2014/08/11/why-learn-php/>
- Percentage of all global web pages served to mobile phones from 2009 to 2018*. (2018). Retrieved from Statista: <https://www.statista.com/statistics/241462/global-mobile-phone-website-traffic-share/>
- PHP. (2018). *What is PHP?* Retrieved from PHP: <https://secure.php.net/manual/en/intro-whatis.php>
- Silver, A. (2017, May 22). *Better Form Design: One Thing Per Page (Case Study)*. Retrieved from Smashing Magazine: <https://www.smashingmagazine.com/2017/05/better-form-design-one-thing-per-page/>
- TermsFeed. (2018). *Sample cookies policy template*. Retrieved from TermsFeed: <https://termsfeed.com/blog/sample-cookies-policy-template/>
- Tourism Professional Meeting. (2018). *About us*. Retrieved from eTourism Monitor: <http://etourism-monitor.ch/tpm/fr/content/about-us>
- Usage of server-side programming languages for websites*. (2018). Retrieved from w3techs: https://w3techs.com/technologies/overview/programming_language/all

Wegaw. (2018). Retrieved from Wegaw: <https://www.wegaw.ch/>

Wenzel, M., Latham, L., Wagner, B., tompratt-AQ, Erlend, Levin, I., & B, M. (2015, 07 20). *Introduction to the C# Language and the .NET Framework*. Retrieved from Microsoft: <https://docs.microsoft.com/en-us/dotnet/csharp/getting-started/introduction-to-the-csharp-language-and-the-net-framework>

Yegulalp, S. (2017, December 7). *InfoWorld*. Retrieved from What is NoSQL? NoSQL databases explained: <https://www.infoworld.com/article/3240644/nosql/what-is-nosql-nosql-databases-explained.html>

Zeldman, J. (2001). *Taking your talent to the web: a guide for the transitioning designer*. Indianapolis: New Riders.

Appendix I: SanTour specification report

Source: personal sources.



SanTour specification report

March 2018

Student: Mikko Lerto

Teacher: Alexandre Cotting

Table of contents

1.	THE PROBLEM.....	1
2.	THE SOLUTION	1
3.	TECHNOLOGIES & MANAGEMENT.....	1
3.1	PROPOSED TECHNOLOGIES.....	2
3.2	PROJECT MANAGEMENT.....	2
4.	PHASES	2
4.1	ANALYSIS.....	2
4.2	DEVELOPMENT	3
5.	DATES & DIVISION OF WORKING HOURS	3
6.	CONCLUSION	4

INTRODUCTION

SanTour is a hiking application that was first introduced in 2015. SanTour is divided into a mobile app and a web application. The mobile app is used to collect data for hiking tracks and the web application is used by clients to find a suitable track for their needs. In this project we will be focusing on the SanTour web application.

The current version of Santour is prototype with a form that when filled tells the client the compatibility of tracks that are pre-inserted into the web application. The user interface of the application is not very refined and should be improved so that it can be easier to understand

SanTours aim is to propose hikers with tracks that serve their limitations and needs. In those tracks the user can see different points of interests (POI) and points of difficulty (POD). With this data, the user can find a track that is most suitable for their needs.

1. The problem

The current state of SanTour is that the user interface of the application is very poor. On the first prototype, the interface was not the focus, but the proof of concept. The goal of this project is to improve the user interface of the web application so that it may be easy to use by a variety of users.

SanTour helps users find hiking tracks within certain physical and mental limitations like the fear of heights or inclines that may be dangerous for people with a higher chance of joint trauma. As a result, SanTour should be easy to use for the elderly as well as younger users.

2. The solution

The SanTour web application should be easy to understand and use by a variety of people with a variety of devices. The application should be responsive, so it may be used on a phone or a tablet and the track search should be done easily and intuitively. SanTours aim is to help people choose the correct hiking track based on data that is presented to them through the web application. The presented data will be gathered from the user with a series of questions that will assess the user's abilities and limitations. The user will be able to see points of danger and points of interest in the hiking trails and they can then make the decision on which track to hike on. The user may also get current data from the area of the track, such as weather data.

3. Technologies & management

Because SanTour is still at a very early state, the technology behind the hiking track search should not limit the future development of the product. Because of this, the back-end should be done with

a simpler coding language like PHP, where the mark-up will be written in HTML and the styles are written in CSS. If the technology will be changed in the future, the HTML can simply be extracted from the PHP files and the back-end code can be replaced with an alternative. This way the future development is not limited to one language.

3.1 Proposed technologies

My proposed plan is to create the web markup with HTML and styles with SASS or LESS. The scripts could be written in JavaScript and JavaScript based libraries like JQuery. The scripts and styles can then be minified from multiple files into single minified js and css files that will make the service faster to load. Any back-end coding could be done with for example vanilla PHP and if needed, a framework could be applied.

3.2 Project management

As project management I will use a simpler adaptation of scrum. In this adaptation I will separate all the tasks related to this project. After mapping all the tasks, I will execute them in sprints. This way I will make sure that I have enough time to for all the required tasks for this thesis.

4. Phases

4.1 Analysis

I will need to go on hikes to understand the basics of hiking and the problems that hikers have and the problems that SanTour is attempting to solve. I will also need to understand and analyse the needs of long time hikers and elderly people, so the application can serve the targeted audience.

I should get my results with a qualitative analysis of data. This data will be gathered by interviewing approximately 5 hikers with different backgrounds or people related to hiking. The interviews will be conducted at the beginning and the end of this thesis project.

I will also study books such as The UX Book: Process and Guidelines for Ensuring a Quality User Experience by Rex Hartson, Pardha S. Pyla and information online to help me understand the fundamentals, tools and methodologies of UI and UX design and development. I should also analyse already existing products such as Outdoor active, Snukr, Wegaw, so I can learn from them and improve from them. I will also use existing data for my analysis such as a workshop that was conducted with 60 people (TPM of December 2017) and a market study (Modélisation des parcours touristiques) in the Santour RCSO project.

In my research I seek answer to the following questions:

- What are the specific needs of hikers?
- What functionalities are hikers looking for in a hiking web application?
- What information are hiker looking for in a hiking service and how should it be provided to them?
- How to make a link between special conditions of the users and the attributes of hiking tracks?
- What's a clear way of expressing the challenges in hiking tracks?
- What kind of user interface are hikers looking for in in relation to SanTour?

I will create criteria based on my research questions and I will collect my information based on the criteria. After collecting the data, I will compare all the data with criteria to come up with all the wanted attributes for Santour.

4.2 Development

After collecting and analysing the data, I should create wireframe mock-ups based on the data and proposed it to the coordinator for approval. After the mock-ups are approved, layouts should be created based on the approved mock-ups.

A web-application should be developed based on the mock-ups and layouts. The end result should represent the layouts and mock-ups and closely as possible.

4.3. Validation of the results

At the end of the development, the final product should be evaluated and compared to newly developed version the previous prototype. This comparison should be done with the same people that were interviewed at the beginning of the project.

5. Dates & Division of working hours

15.2.2018 Project planning

15.3.2018 Data gathering and analysis

15.5.2018 Creation of mock-ups and layouts

30.5.2018 Development phase

15.7.2018 Validation of final product

30.7.2018 project finished

5.1 Division of working hours

	%	HOURS
ANALYSIS	40 %	144
DEVELOPMENT	35 %	126
VALIDATING RESULTS	25 %	90
TOTAL HOURS:	100 %	360

6. Conclusion

This document specifies the needs and the initial plan behind the SanTour web-application. This plan is not binding, as it may change when new information is discovered during the analysis and development.

Appendix II: SanTour interviews summary

Source: personal sources.

SanTour Interviews summary

Question 1: Please describe yourself and what is your relation hiking?

<p>Angelica Brunner: Director of the association of walking/hiking in Valrando guiding people on hikes working with communities and government</p>
<p>Julien Petit: Marketing director for Val d'Anniviers. My office sells the hiking tours</p>
<p>Sylvie Peter: I am a tracking guide, I guide in Val d'Anniviers</p>
<p>Pascal Zufferey: Mountain guide in Val d'Anniviers I go to mountains and I hike a lot.</p>

What hiking services do you use online and what do you like about them? (web sites, apps, etc.)

<p>SwitzerlandMobility, valrando.ch, SwitzerlandMobility is simple and all routes are visualised, and you can choose your own routes and you can see public transport information and restaurants.</p>
<p>Yes, google maps tool, valdanniviers.ch, Outdooractive,</p>
<p>Yes, SwitzerlandMobility, Swissmap</p>
<p>Yes, I use app/website called gpstracks.com</p>

In general, do you find hiking services / apps easy to use or difficult?

<p>SwitzerlandMobility is simple and all routes are visualised, and you can choose your own routes and you can see public transport information and restaurants.</p>
<p>Not very easy</p>
<p>Not at all, usage is more to use at home for planning.</p>

Yes, quite easy. It's quite easy to find a path with different interests

Do you use your phone or a mobile device while hiking? If yes, what do you find good about it?

GPS, Garmin because not all signs are correct, so its good to know the location if there are issues in the on the map. and battery is good

I may use a GPS, but I know the trails well, I just follow yellow signs.

I use GPS on my phone to be sure I'm on the right way.

Sometimes I use the phone. In my phone I use Swissmap

Could you give list me all the types of difficulty that you can come up with on a hike?

Trees on the route, much snow, as a result of much snow there is more water, rocks, routes that are gone with the avalanches. Bikers can cause trouble. Width of the path can be dangerous and Bisses/Suonen can be dangerous.

bridge upwards, height difference, paths without trails, big rocks on the paths.

Chains, also technical difficulty in ropes and chains. It can be a difficulty for some people. T4 / blue & white trails are difficult. Slippery rocks can also be dangerous also the size of the rocks and the structure can be difficult.

Sometimes there are very narrow paths with rocks. Sometimes paths are in a bad condition because of the weather (ice, snow).

What attributes would you say a difficult hike has / what makes a difficult hike difficult?

width of the path is narrow, sometimes there is no path, there are parts where you might have to climb for a few meters.

height difference, if you walk for long upwards, it can be difficult. Time is not a factor in my opinion

The altitude difference and slope height difference. Altitude is also a factor. The energy you need for high altitudes is more.

Conditions. If it's wet or slippery. You need equipment and weather conditions can change fast. Sometimes the path is not clear. Also, they are dangerous.

What attributes would you say an easy hike has / what makes an easy hike easy?

large path, you have a fence to help on difficult parts, you can go with sneakers, normally they are under 2000 meters.

if its easy to follow. large forest trails.

Paths are very large. ground is even.

Clear path, no too steep, no too rocky, dry.

What would you consider to be a good way to describe the difficulty of a hike? A number, a word, visual element? Any example of a good way?

The swiss official difficulty system is good: yellow = easy, white/red = moderate, white/blue = hard

For me it's the colour coded trails (yellow, white/red, white/blue).

It's difficult to say. The actual categorization of t1-t4 is not very clear always. Sometimes not all trails are displayed. The colours make more sense than the t1 to t6. The colours need some explanation, but the colours are a better way.

I personally don't look at the difficulty ratings in hikes

When you go on a hike, what kind of things do you need to consider or look up? (things to take with you etc.)

for easy hikes: not many things, shoes, food/drink, phone. For moderate hikes: additional clothing, GPS and map, weather info, app for emergencies, food/drink

Backpack with water, pullover, wind jacket, I prefer to take more clothes than less. If its sunny I take sunglasses and sun cream, I always have my phone. I don't like to hike alone so I usually go with someone.

I take with me Medicine, small ropes, climbing tools, food, drink, stick, radio for emergencies, phone, shoes, wind jacket or warm jacket. Sunglasses (category 3 or 4), sun cream (30c or 50c). Maps (printed). I take these when I go for hikes I've never been to.

Water, good equipment depending on a hike, sunglasses, sun cream, paper map,

Have you ever had a client, or a friend turn back on a hike because of the difficulty level or a point of danger or no passage?

Not really, but if I see that there are parts where you cannot cross, I will tell others. It's a problem that people go on paths even if there is no path.

I've never had to come back but once it was very close, we did a hiking tour and there was a big difference in height and we had to climb on a rope ladder and we almost had to turn back because of the scared of heights.

One time in there was a rock fall. It was notified but I did not pay attention to it. I had to go on the bottom of the valley in order to go past. I will try to find another solution to go around so I don't have to go thought. I will avoid going back always.

Yes, few times. Most of the times the weather is too bad or too slippery because it was snowing.

What kind of weather conditions do you find challenging or dangerous for a hike?

Most dangerous is: thunder storm, because you have to come down from high altitude in case there is a thunder storm. Mist can be an issue because you can't see far, and you have no orientation.

In summer, thunderstorms and rain. The weather can change fast. If you see the black clouds coming, you have to find a safe place soon.

Big storms, summer storms at the end of the day. Rain and lightning. Rain and snow are not that dangerous. When water turns into ice, it will become slippery and dangerous. Snow may also hide the trail.

Thunderstorms are the most dangerous in summer. Also, snow can be difficult in the summer.

Have you ever had a dangerous experience or an experience where you've feared for your life? What kind of thing do you fear for on a hike?

2 things: once I lost the way because I went up and then I could not go down. And once I saw a horde of animals (steinbock) in the forest and it could have been dangerous.

Not until today

Sometimes there are snow on the trails and it gets dangerous as it is slippery. There can be rocks below and they make it very dangerous. Also, I had a bad experience when we were going down from a hut and there was snow and I tried to go around and there was fog and it made me walk around a 180.

Never when I hike. But 2 times when I was in the mountain. One time it was an avalanche.

What kind of map type is best in your opinion?

Topographic map is easily the best.

Google maps topographic view is best because it gives me the information easiest. Planimetric map is also easy to read for me but it could have more information about the path.

classic topographic and 3d topographic

Topographic map

What kind of services AROUND hikes are you using?

weather and rain radar, public transport

public transport and weather, I also check the points of interest on the way like restaurants on trip advisor or accommodation on the tourism website.

Weather, online GPS location. Flower finding app, peak finder which shows me a simulated view which mountain peak is where. Another app is staying alive. It maps all defibrillators in the world.

Weather is the most important, car postal

Current SanTour version feedback

overall good, not too difficult, not too many questions. Overall it was good.

Its good but some questions are difficult answer. "Les obstacles" -> "Cabossé" was difficult to answer. In my opinion there where not too, many questions.

Small rocks and big rocks should be separate points of difficulty. Not too many questions. "Les obstacles" -> "Cailloux" & "Cabossé" difficult to understand without explanation. The stairs question is difficult to understand for me. The activity question is difficult to estimate per day. Easier per week.

Unable to look at website

Show SanTour wireframe feedback

It is an improvement on the previous

I like it, its simple and the design is simple. Maybe explain what is in the end result. Some filter for more specific locations like a part of Valais. Maybe it would be nice to implement a function for a group of hikers.

It's good and simple.

Unable to show map

Appendix III: SanTour layout visualization instructions

Source: personal sources.

SanTour layout visualization instructions

Background:

SanTour is a webservice for people with physical or mental limitations. Many people in Switzerland hike but they might have the fear of heights or weak joints in their legs for example. In the service the user fills out a form after which the user is given a list of recommended itineraries.

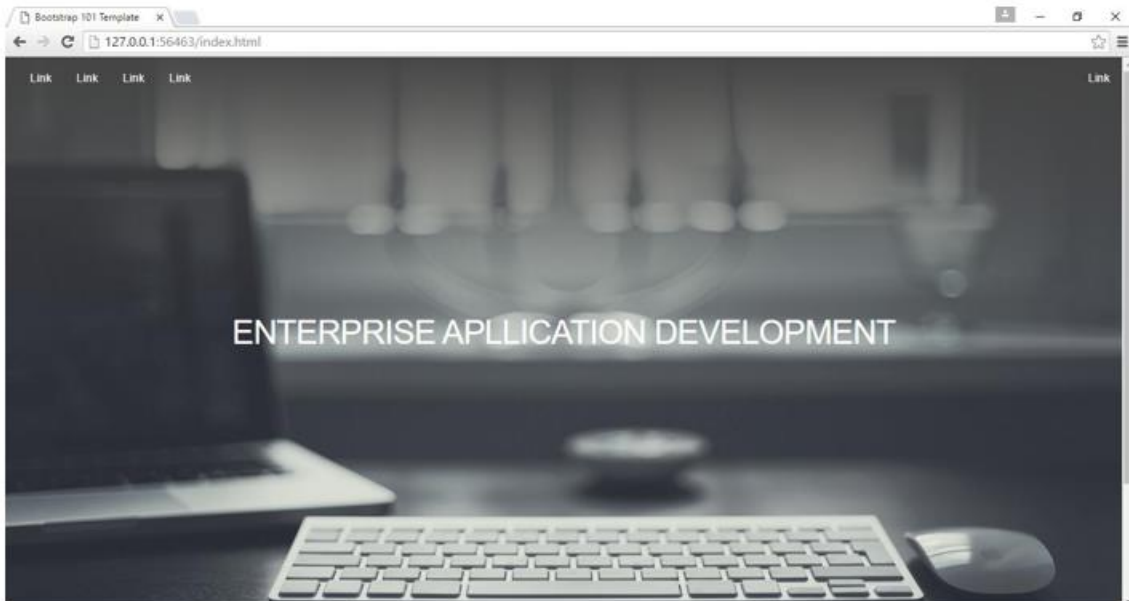
Mock-ups



Welcome page:

I'm trying to keep the layout simple. When the user starts, there will be a short intro which explains what SanTour is about and there will also be a button to begin the questionnaire. In the background it would be cool to have like a background of a mountain or something like that.

The page doesn't show it, but there should be a navigation bar. I was thinking of something like this:

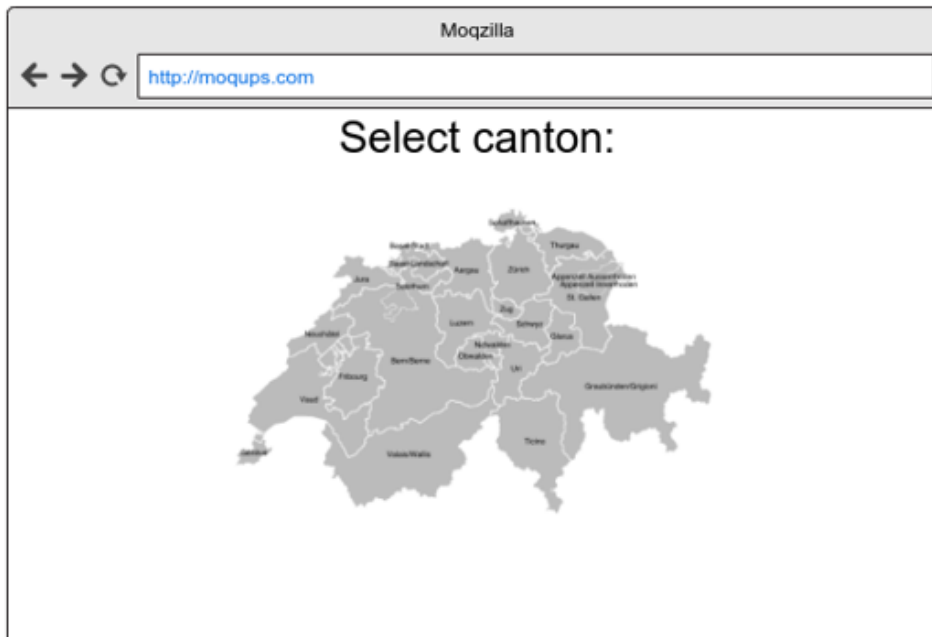


This would give the background more attention.



User info page

The users name is taken either on the first page or the last before giving the results. In this page, the user will fill in their name, so it can be saved in the browser for their next visit. Below will be a list of saved users. The user shouldn't have an avatar, but I was thinking that their initials would be better. The button position is not final



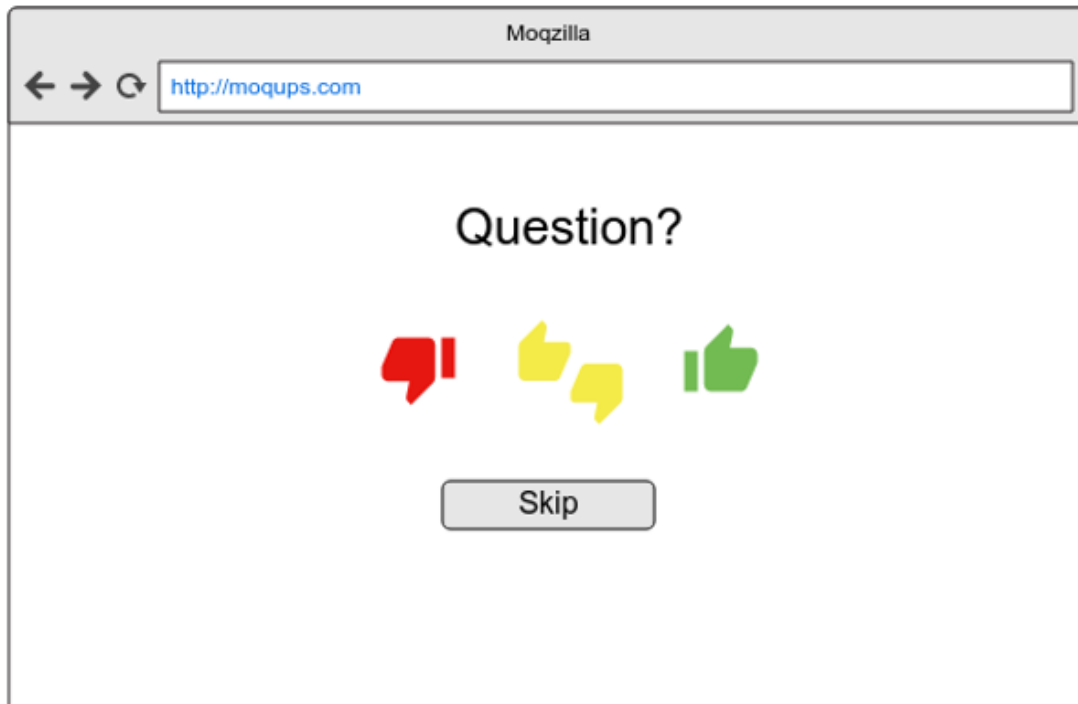
Canton selection screen

On this page, the user chooses the canton or the state in which they would like to hike in. Each canton is an option.

I have an example file which works, but due to royalty and copyright, I cannot use it. Could you make something similar? Basically, I need the borders of each canton as a path.

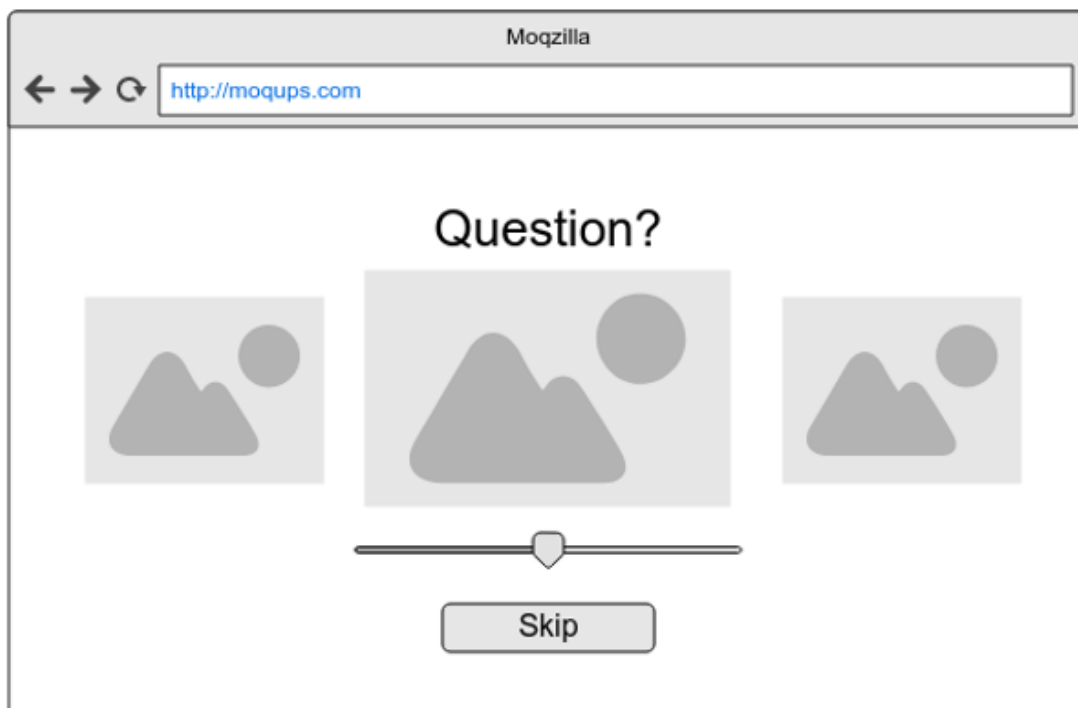
I would do this myself, but I have no skill in adobe illustrator.

If this is too much asked, you don't have to do it.



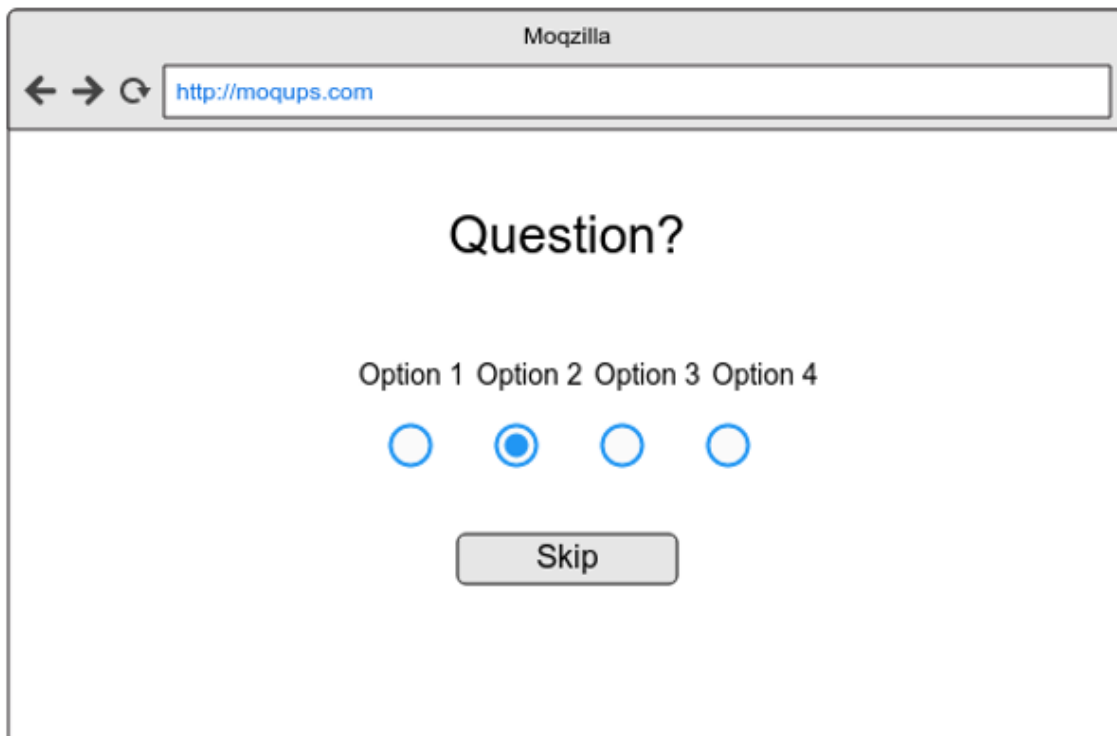
Question example 1

Here is an example of a question the theme is to keep the layout simple, so that it's easier to use. Above will be the question and the user can choose either thumbs up or down or middle.



Question example 2

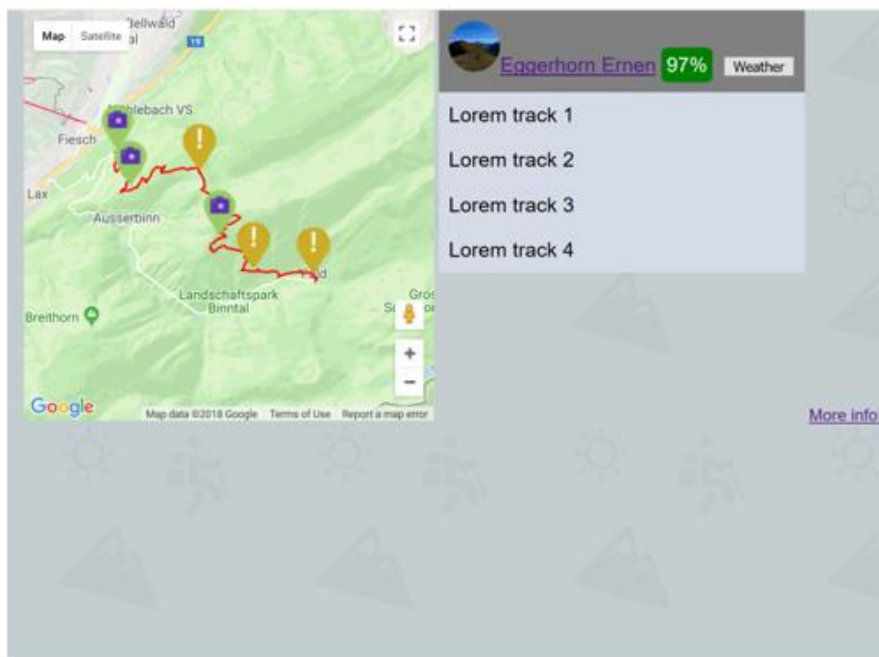
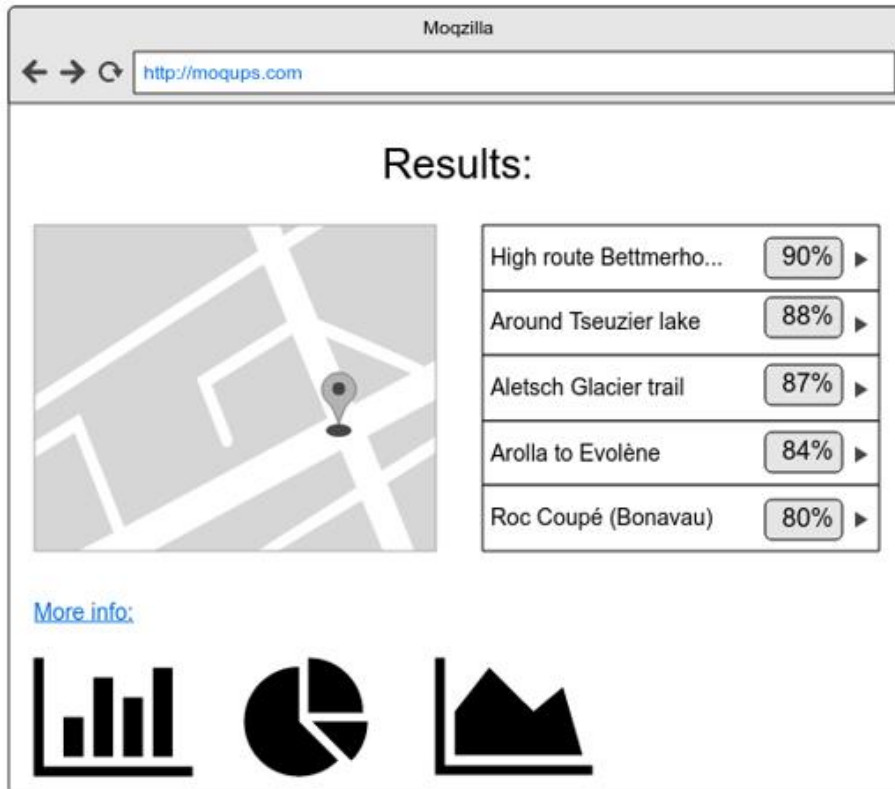
User chooses an option with a slider. Each option is one picture. That picture will then be highlighted when selected.



The image shows a browser window titled "Mozilla" with the address bar containing "http://moqups.com". The main content area displays the text "Question?" in a large font. Below this, there are four radio button options labeled "Option 1", "Option 2", "Option 3", and "Option 4". The "Option 2" radio button is selected, indicated by a blue dot in the center. Below the options is a "Skip" button.

Question example 3

Simple radio button form element



Super early version of results page

Results page

On this page the user will see the recommended itineraries and their score. On the map you have the route and 2 different kinds of markers. Point of interest (green) and point of danger (yellow) Point of interest can be a beautiful mountain, building, flowers etc. a point of danger means a difficult spot (not necessarily dangerous), which may give the hiker challenge. Would be nice to have your opinion on the visualization of these markers. I can provide you with example images. One function is also a button, which gets the weather information for the user. If the user wants, they can get more information about the itinerary by clicking on the "more info" button. It would then give the user some graphs.

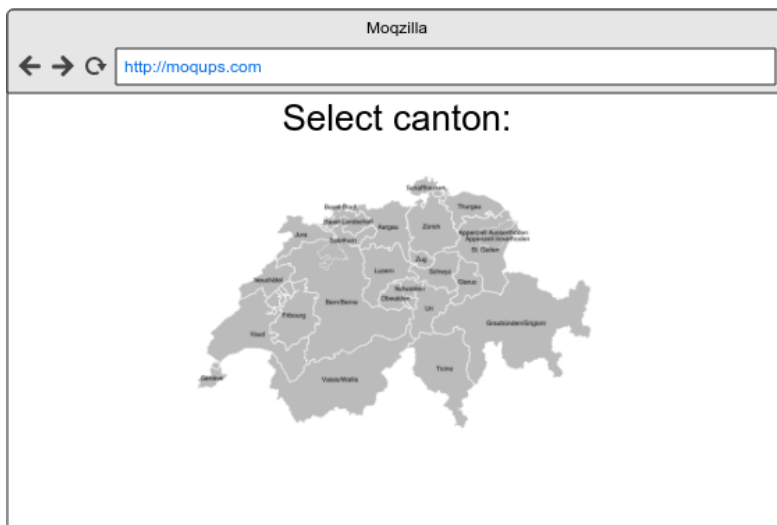
My wish is that you would bring some style into these wireframes. Currently they are very bland, and they have no colour palette. I trust your intuition with this, but I wish that you would follow the wireframes as much as possible. It's important to keep the layout simple because the users of SanTour might be senior citizens, so ease of use is a big part.

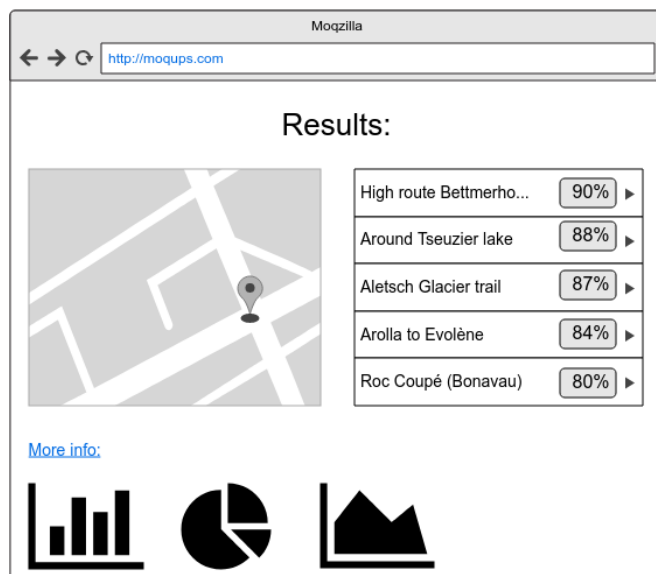
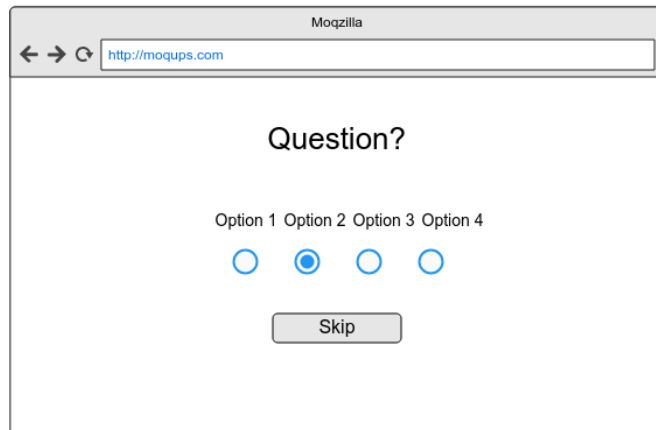
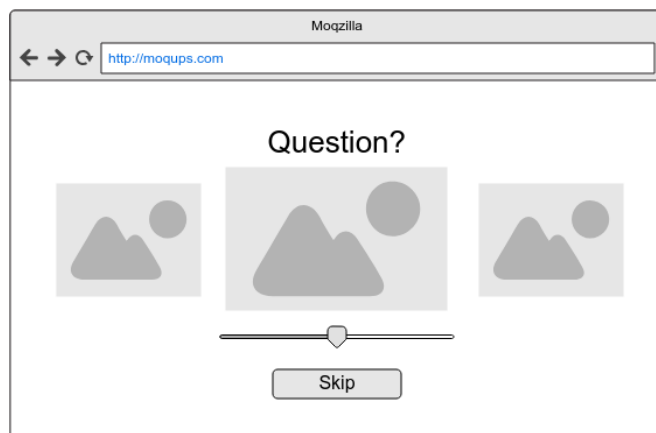
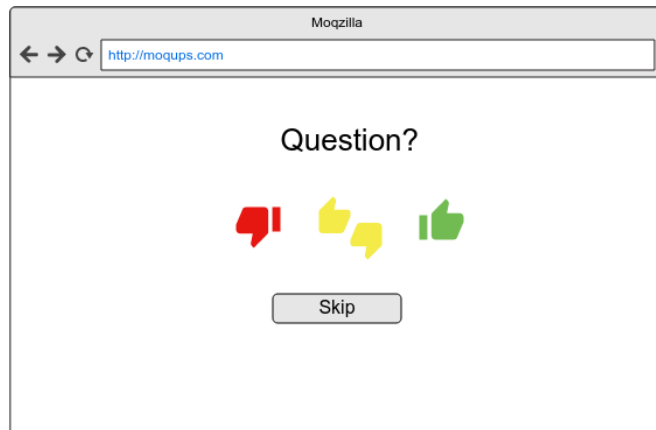
Here is the current prototype of SanTour (not made by me)

<http://www.santour.ch/>

Appendix IV: SanTour wireframes

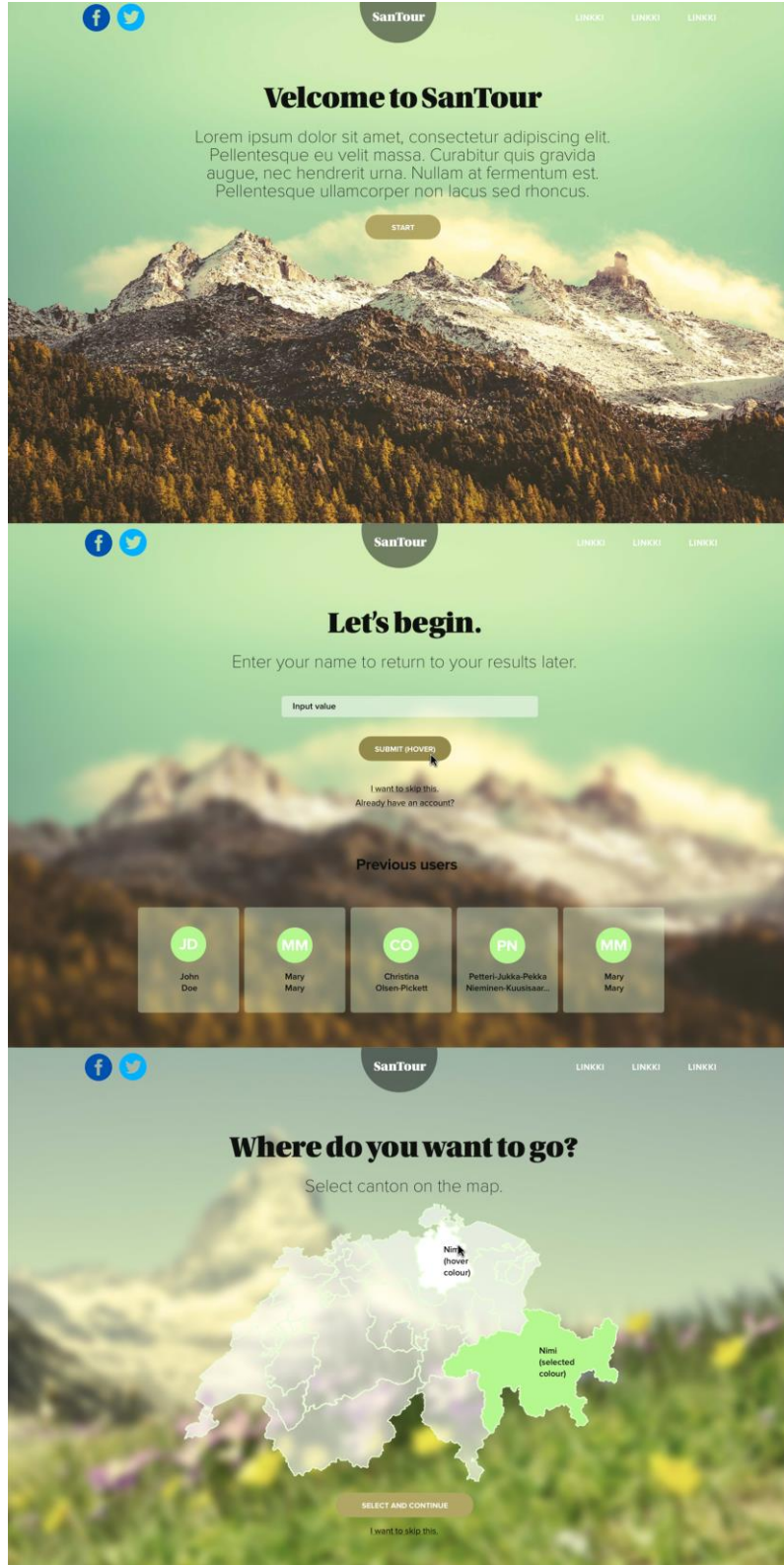
Source: personal sources.

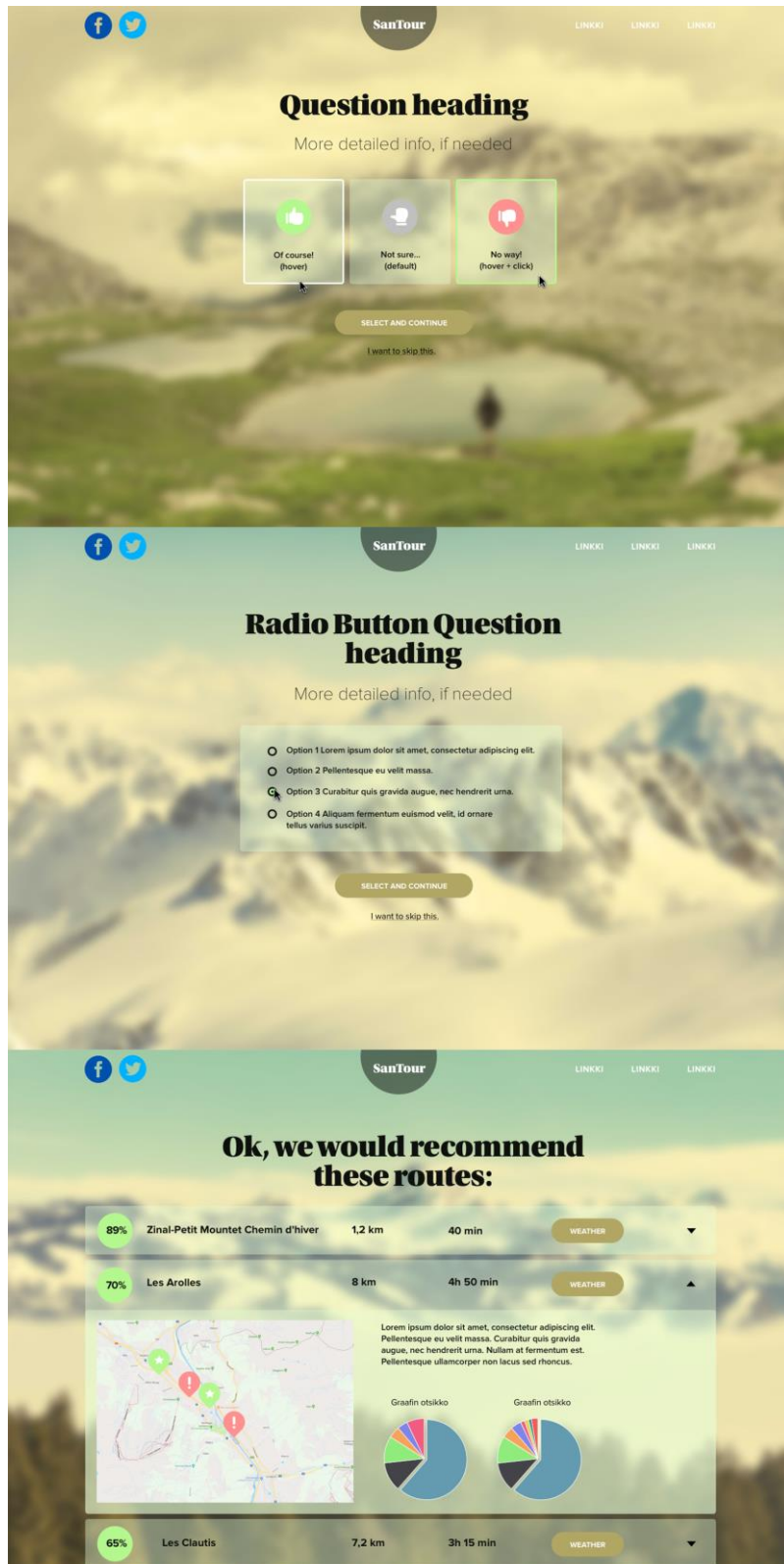




Appendix V: SanTour mock-ups

Source: personal sources.





Colours, forms, buttons

COLOR NAME #000000	COLOR NAME #0F110F	COLOR NAME #FFFFFF	COLOR NAME #F0F0F1	COLOR NAME #C0C0C0	DEFAULT
COLOR NAME #B1A664	COLOR NAME #649BB1	COLOR NAME #B6FF90	COLOR NAME #93894B		DEFAULT HOVER
COLOR NAME #DFD285	COLOR NAME #BDDCE8	COLOR NAME #E9FFD6			

FORM ELEMENTS (ENABLED)

Text area content

Input value

Placeholder Label

Select Option

Radio Button selected

Radio Button default

Checkbox Label

Checkbox Label

Of course!
(hover)

John Doe

No way!
(hover + click)

Typography (Desktop <750px)

Ikonit ja symbolit fonttikirjastoista:
ElegantIcon

h1. This is a very large header.

```
/* Text: h1: */
font-family: UtopiaStd-BlackHeadline;
font-size: 55px;
color: #0F110F;
letter-spacing: -1px;
text-align: center;
line-height: 54px;
```

h2. This is a large header.

```
/* Text: h2: */
font-family: ProximaNova-Bold;
font-size: 29px;
color: #0F110F;
letter-spacing: -0.5px;
text-align: left;
line-height: 31px;
```

h3. This is a moderate header.

```
/* Text: h3: */
font-family: UtopiaStd-BlackHeadline;
font-size: 28px;
color: #0F110F;
letter-spacing: -0.5px;
text-align: left;
line-height: 27px;
```

h4. This is a medium header.

```
/* Text: h4: */
font-family: ProximaNova-Bold;
font-size: 20px;
color: #0F110F;
letter-spacing: 0;
text-align: left;
line-height: 20px;
```

H5. THIS IS A SMALL HEADER.

```
/* Text: h5: */
font-family: ProximaNova-Bold;
font-size: 16px;
color: #0F110F;
letter-spacing: 0.5px;
text-align: left;
```

This an introduction text. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Cras dapibus vulputate diam eu pretium.

```
/* Text: Introduction: */
font-family: ProximaNovaF-Thin;
font-size: 33px;
color: #0F110F;
letter-spacing: -0.14px;
text-align: center;
line-height: 33px;
```

Body text example. Pääministeri Sipilän hallituksen suuri missio sosiaali- ja terveyspalvelujen uudelleen organisoimiseksi ja maakuntahallinnon pystyttämiseksi on nyt kaikkien arvioitavissa. Lakiluonnokset, keskeneräisinä, mutta kohta kuntiin lausunnoille tulevina, ovat netissä luettavissa.

Kun kahlasin läpi lakiluonnokset päällisin puolin ja tutustuin muihin aineistoihin, jäin miettimään, mitä tästä jää käteen? Päällimmäiseksi jäi suuri epäluottamuksen tunne kuntia kohtaan. Sen mukana ne eivät kykenisi ymmärtämään, millaisen muutoksen edessä ollaan, vaan valtiovallan on otettava tiukka kuristusote asioihin. Kunnat ovat kuitenkin hoitaneet sosiaali- ja terveyspalveluita yli 150 vuotta. Ironista asiassa on, että keskusta on aina ollut suurin kuntapuolue ja kokoomus peesaa hyvin perässä.

```
/* Text: Body: */
font-family: ProximaNova-Regular;
font-size: 16px;
color: #000000;
text-align: left;
line-height: 24px;
```

- List item with a much longer description or more content.
- List item
- List item

1. List item with a much longer description or more content.
2. List item
3. List item

YNGVAR YHTEYSTIETO
Mannerheimintie 1
00100 Helsinki
esim@example.com

Body text 2 esimerkki: laatikot, lisätiedot ym. Pääministeri Sipilän hallituksen suuri missio sosiaali- ja terveyspalvelujen uudelleen organisoimiseksi ja maakuntahallinnon pystyttämiseksi on nyt kaikkien arvioitavissa. Lakiluonnokset, keskeneräisinä, mutta kohta kuntiin lausunnoille tulevina, ovat netissä luettavissa.

```
/* Text: Body: */
font-family: ProximaNova-Semibold;
font-size: 16px;
color: #0F110F;
text-align: left;
line-height: 21px;
```

Body2 text Link
Body2 text Link hover
Body2 text Link visited

Appendix VII: SanTour user guide

Source: personal sources.

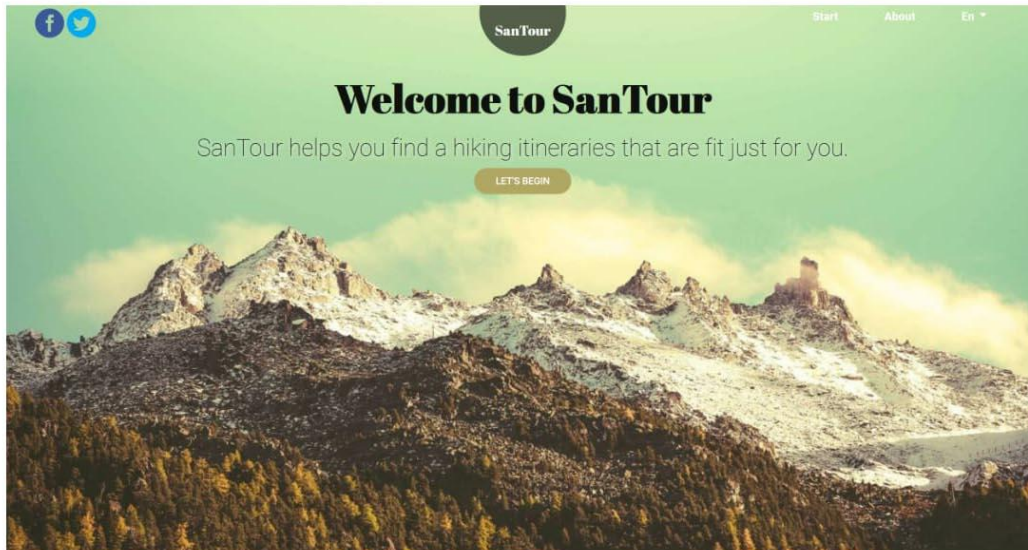
SanTour user guide

2018

TABLE OF CONTENTS

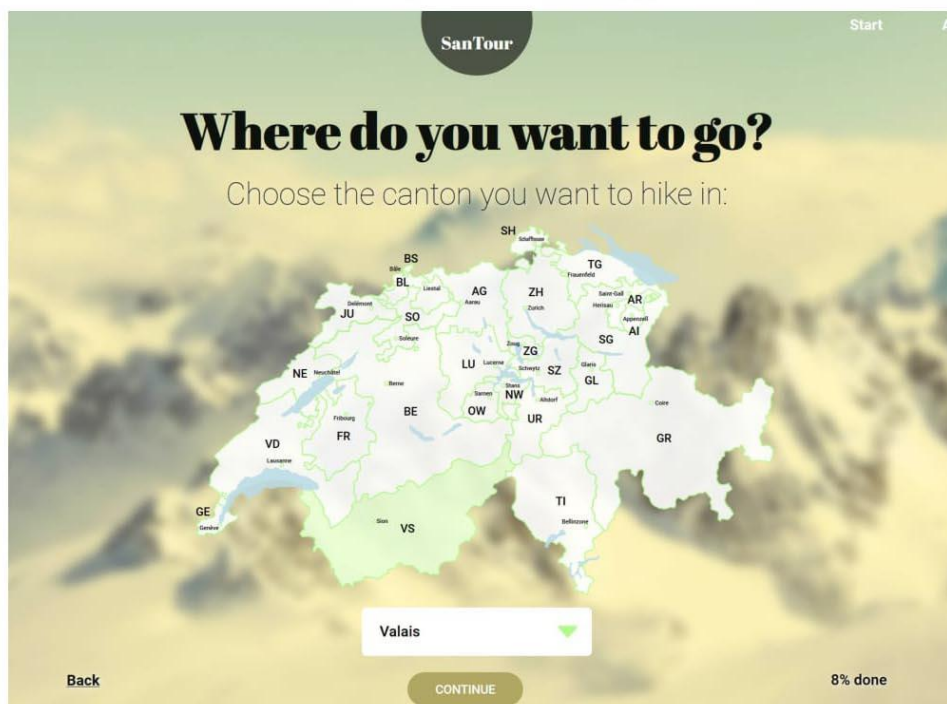
1. OVERVIEW.....	3
2. SANTOUR EVALUATION PROCESS.....	3
3. THE RESULTS.....	6
4. SAVED PROFILES.....	8

1. Overview



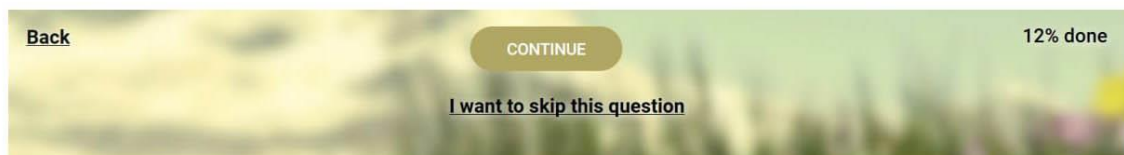
When you first open up the SanTour website, you are prompted with a welcome screen. You can change the language of the page by clicking on the top right corner of the screen where you can see the language code of your current language. To start the SanTour evaluation process click on the “Let’s begin” at the centre of the screen.

2. SanTour evaluation process

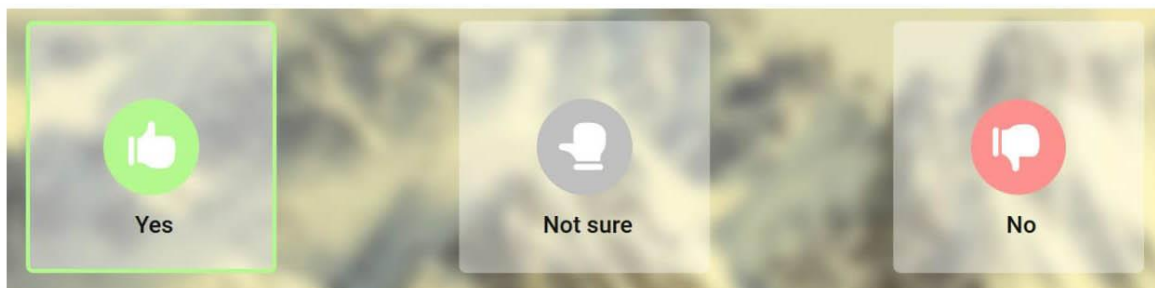


On the first page you will find a map of Switzerland. This map will allow you to search itineraries from different cantons around Switzerland. Please note that at the summer of 2018, only Valais is available in the canton selection screen.

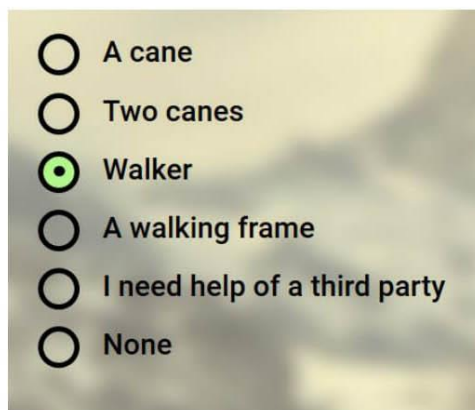
Note that every page on the SanTour evaluation has the option to skip a question or go back. You can also see how far you are in the evaluation from the bottom right corner. Once you have chosen your option each page, you can click the continue button to move forward.



When presented a question with the yes, not sure or maybe options, click on the thumb icon and choose continue :



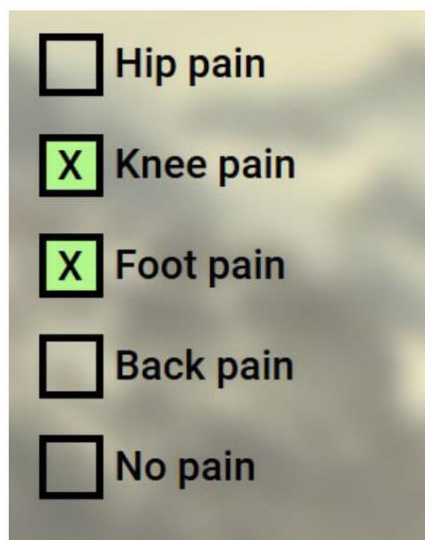
When presented with a multiple-choice question, click on one of the options and click continue:



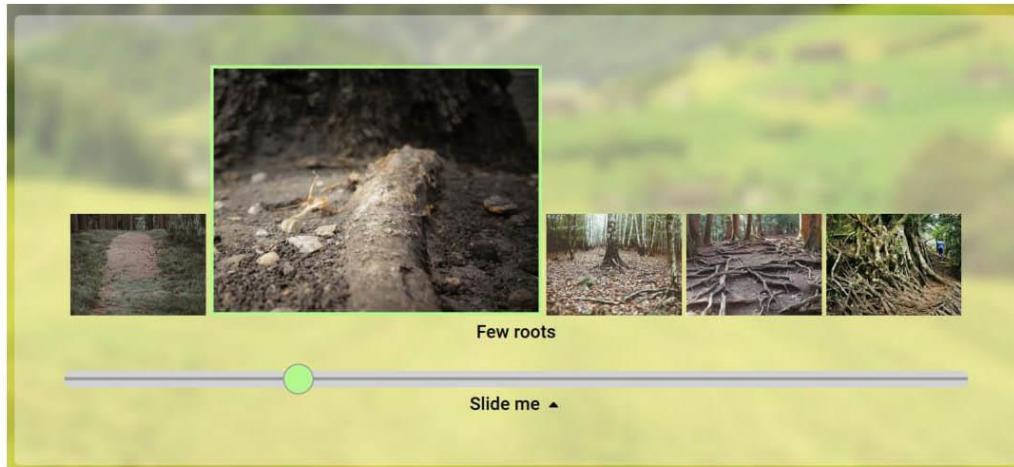
When presented with a slider question, slide the slider to see the different options available and click on continue once you've chosen the option you want:



Once presented with a question containing check-boxes, choose one or multiple and press continue:



When you encounter a question regarding your preferences about the itinerary, you can either slide on the bottom slider or you can choose one of the preview images if you are using SanTour on a larger screen. Once the slider is set to an option that you prefer, you can press continue.



3. The results

Once you are done with the questionnaire, you will be directed to a page which contains the recommended itineraries that are rated on a scale of 0 to 100. 100 means that the itinerary is exactly what you wish for and 0 means that the itinerary is not at all compatible with your profile.

Score	Itinerary Name	Distance	Duration
86	Zinal-Petit Mountet chemin d'été	10.8km	3h
71	Zinal-Petit Mountet Chemin d'hiver	12.6km	3.5h
38	Les Arolles	6.8km	2.75h
33	Les Clautis	3.55km	1h
14	La Lee	3.73km	1h

When you are on this page, you can click on one of the names on the right side of the screen and more information will show up.

86 Zinal-Petit Mountet chemin d'été 10.8km 3h ▲

Description
Walk along either bank of the river Navisence. Once you are at the end of the Plats de la Lée, take the small forest track that goes up to the right, with a fine view of the waterfalls. Continue to the Cabane du Petit Mountet, which stands above the Zinal glacier. The Petit Mountet mountain hut is fairly easy to reach and makes an ideal destination for family walks and also for watching the wildlife. A brochure entitled "Flore du Petit Mountet" (French only) gives details of some of the plants and flowers to be seen on this walk, and is on sale at the hut and the Zinal Tourist Office, price CHF 2. You should not pick the flowers, because many of them are protected species.

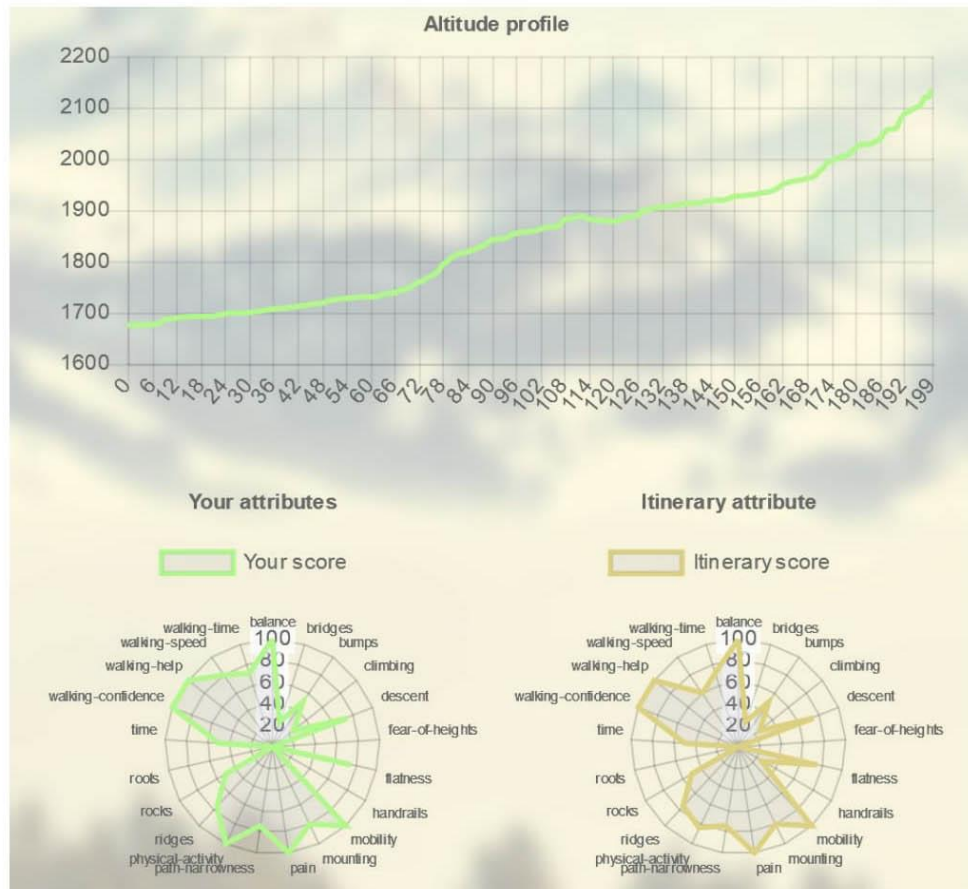
Weather
☁️
22.13°C
Trail type: mountain trail

SNUKR 📱 GPX FILE 📄 PUBLIC TRANSPORT 📍

On the right side of the page you can see the description of the itinerary. Right next to the description on the right side you have the current weather information for the itinerary. Under the weather you can see the itinerary type. The itineraries are categorized by the swiss national colour signals. To find more information about them, you can click on the question mark link.

Under the description you have options to view the itinerary in Snukr. Snukr is an app for outdoor adventures. It can be useful if you want to follow the itinerary on your phone. If you want to follow the itinerary on your GPS device such as a Garmin GPS, you can download the GPX file for the itinerary. If you're interested in the public transport to the area of the itinerary, you can press the public transport button. This will take you to a website called search.ch, which can tell you the public transport information.

If you look even further down from the buttons of the itinerary, you can find the altitude profile of the itinerary. This describes the altitude in meters for the itinerary. Below this you can see a radar graph of your profile data and the profile of the itinerary.

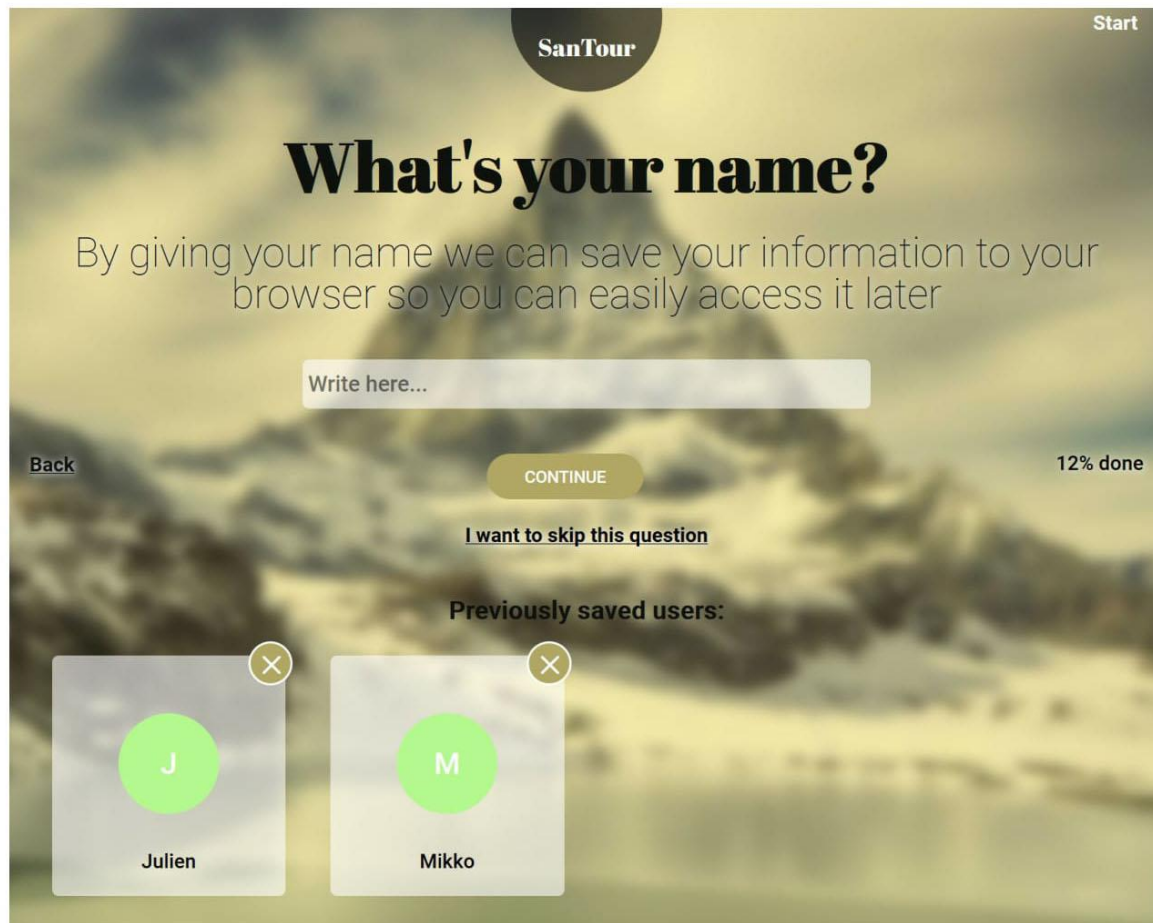


On the left side you can see the itinerary map. You can zoom in and out in this map and you can move the map around with your mouse. In this map you also have markers for points of danger and points of interest. When you click on the icons, you will get more information about these points.



4. Saved profiles

If you gave your name at the SanTour evaluation process, your information was saved on your own browser. This information is not saved anywhere else except the web browser you used SanTour on. If you want to use your profile again, navigate to the SanTour frontpage and go to name page of the SanTour evaluation. In this page you will find all the users that are saved under the name input field:



To delete a saved profile, simply click on the X on the top right corner of the profile. To use a profile, simply click inside the white square surrounding the profile name.

Appendix VIII: SanTour technical guide

Source: personal sources.

SanTour technical guide

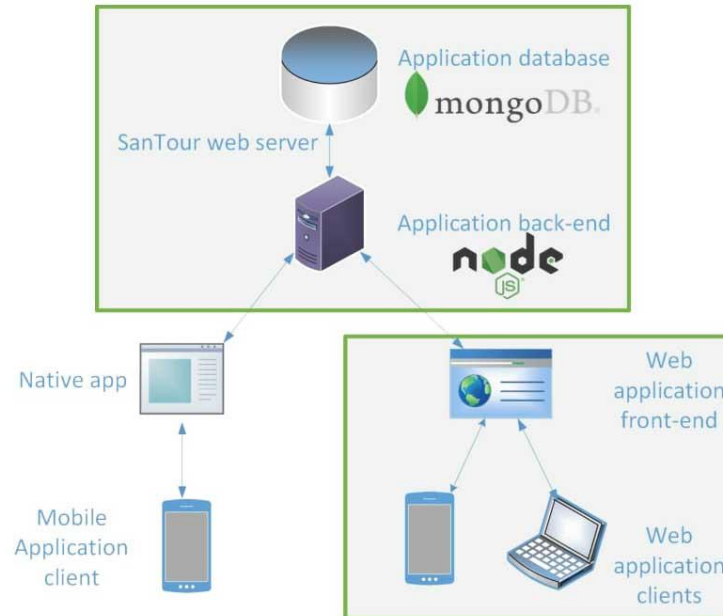
2018

TABLE OF CONTENTS

Contents

1. PROJECT ARCHITECTURE.....	3
2. PROJECT OVERVIEW.....	4
3. GULP.....	5
4. HOW TO SETUP ON A LOCAL ENVIRONMENT.....	5
5. ASSETS.....	7
6. FRONT-END.....	8
7. DATABASE.....	11
8. BACK-END.....	15

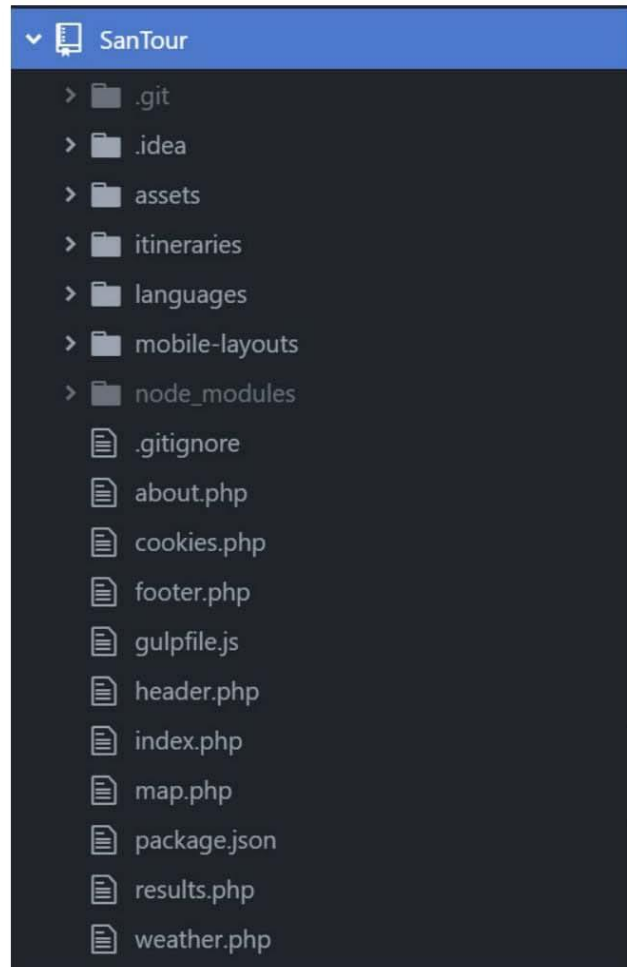
1. Project architecture



SanTour consists of 3 parts: Native app for data acquisition, web interface for the data presentation and a back-end for the data storage and data processing. The focus on my work was in the front-end of the web interface. To make everything work together, I also had to create a simple back-end and a database as well. The back-end of the application is a simple API that was written in Node.js. The Node.js back-end receives data from a MongoDB database whenever it is called without any kind of additional logic. The native app of SanTour was not included in the scope of my work, so it was not taken into account while developing the SanTour back-end and front-end. In theory, any native application should also be able to connect to the API as long as the application can read JSON data.

2. Project overview

- SanTour is coded in PHP. The main files for the service are the index.php and results.php files. The index.php file contains the welcome screen and the questionnaire. The results screen shows the recommended itineraries based on the options the user chose.
- Header.php and footer.php contain the header and footer of each page as the name implies. These pages should be included or required on a page if a new one is created.
- The map.php contains the svg map of Swiss cantons. This was separated into its own file so that the code is easier to read.
- The weather.php calls a weather API which gets the weather from given latitude and longitude values. This was done for security reasons through a php file instead of using the API from client side with scripts.
- About.php and cookies.php are text pages. The about page has general information and the cookies page contains legal information regarding the use of cookies.
- The mobile layouts folder contains layouts that were made for the data acquisition process of SanTour. These pages were created without any logic and they can be utilized if necessary in the future.
- The languages folder contains all the different language translation files.
- The itinerary folder contains all the itineraries that are recoded for SanTour. The itineraries are in JSON form.



- The assets folder contains all the pictures, scripts, styles, fonts etc. that were used in the development. The folders also contain original images for the form elements for example, so that if necessary they can be re-used.
- Node_modules, package.json and gulpfile.js files are related to gulp. In my development I used a node module called gulp to turn SCSS files into minified CSS and js files into minified js files.

3. Gulp

If you want to start developing, SanTour, you first have to turn on gulp. If you don't turn on gulp, the styles and scripts won't update. To install gulp, you might have to use the command "npm install" on your terminal. To turn on gulp you must also use terminal. In this terminal you want to write "gulp watch" this command will check when css and js files are modified and it will automatically check the syntax and turn them into minified files. If you want to configure gulp, you can do so by editing the gulpfile.js.

4. How to setup on a local environment

For the local environment of SanTour you need the following:

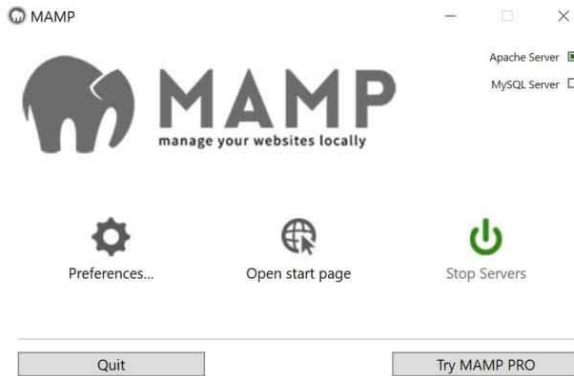
- A local server with apache and PHP 7+ installed (I used MAMP)
- MongoDB, local installation
- A MongoDB browser (I used MongoDB community compass and Studio 3T)
- Terminal or IDE to run the node back-end (I used WebStorm)

If you need help installing MongoDB, follow this guide:

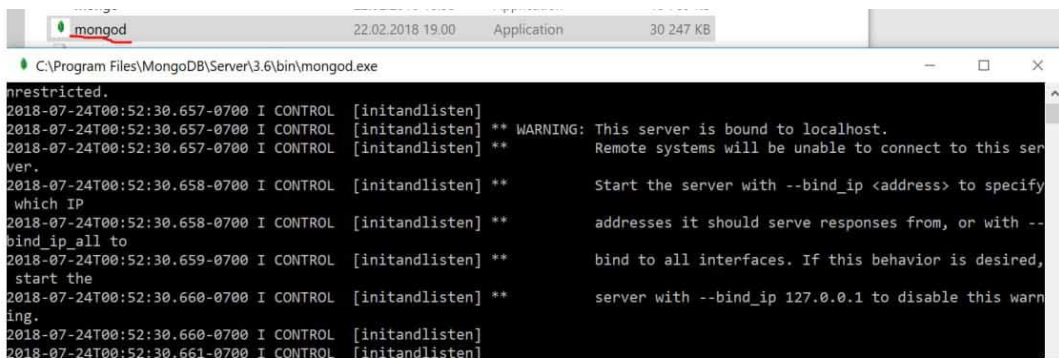
<https://docs.mongodb.com/manual/tutorial/install-mongodb-on-windows/>

3.1. How to run:

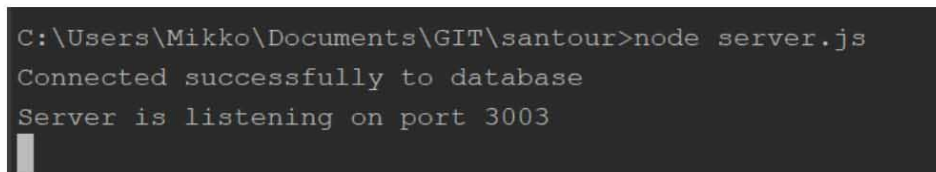
1. Put all the SanTour files to your server
2. Turn on your server (MAMP or XAMP or whatever you want to use)



3. Turn on your MongoDB database



4. Turn on your back-end server



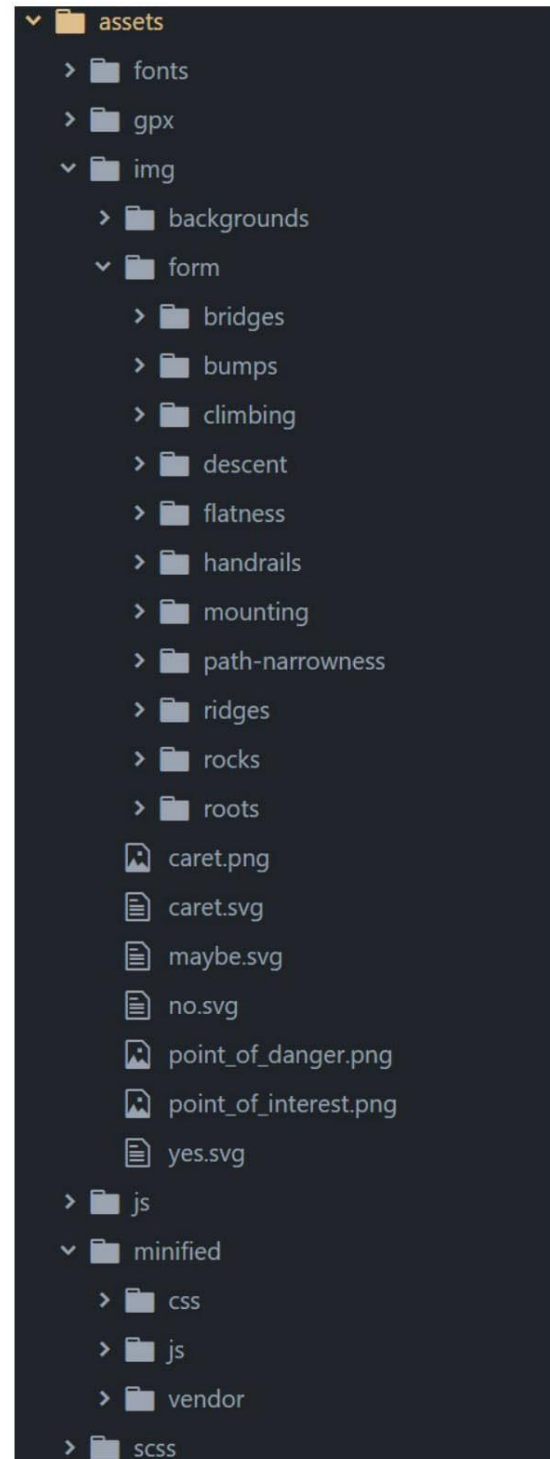
Now if you go to your localhost address where you have SanTour, it should work:



5. Assets

The assets folder contains all the visual elements of SanTour.

- Backgrounds folder contains all the backgrounds for all different screen sizes.
- The root of the img folder contains common and general images.
- The form folder contains all the images that were used in the SanTour questionnaire. All the small images contained are optimized by google. The original images for each form image are also included if there is need to modify them. The form images are named after the category they present in the form.
- The js folder contains all the unminified JavaScript files. This is where you want to add new js files or edit existing ones.
- The minified folder as the name hints contains all the minified js and css files. The vendor folder inside has all the already minified js files that were given by jquery for example.
- The SCSS folder contains all the SCSS files. The file called main is the root of all the SCSS files. All the other files are linked to the main.scss file.
- The gpx folder contains all the gpx files for each itinerary. They are called when a user wants to download the gps file for any itinerary



6. Front-end

The index.php starts with the main element. This is the container of all the data inside all the pages. The bg1 is a class that adds the background. There are classes from b1 to bg9 and they are changed randomly with JavaScript. The noblur class is used in the frontpage to remove the blur on the welcome screen

```
<main class="bg1 noblur">
```

Each “page” on the index.php is divided into sections. Every section has the ID of each of the pages. This ID is used to change the pages when user click on continue and back. The page class makes the width and height into full width and the active class makes the page show up. The “echo \$lang[‘something’]” is used for the multilanguage. Each echo is a call for one row of the language files. The language selection is done in the header.php

```
<section id="page-1" class="page active">
  <div class="container">
    <div class="row">
      <div class="col-12 center">
        <h1><?php echo $lang['INDEX_WELCOME'] ?></h1>
        <p class="thin-text"><?php echo $lang['INDEX_INTRO'] ?></p>
        <button class="next-page"><?php echo $lang['INDEX_BEGIN'] ?></button>
      </div>
    </div>
  </div>
</section>
```

Profile saving:

The profiles of users are saved into the cookies of the browser. The saving is done in the top of the results.php page and the user data is only saved if the user enter their name into the questionnaire when filling it. The max size of profiles is 4 and the check is done on the results page. The profiles are saved into cookies as serialized string and they are loaded with JavaScript by using a unserializer and serializer JavaScript library. The users are then loaded to the index.php page if the cookie is not empty. When the user clicks on one of the saved user, a simple javascript will just submit one of the hidden forms that is printed to the top of the index.php page.

1: Saved users printed to the top of index.php

```
<?php $cookie_name = "saved-users"; ?>
<?php if (isset($_COOKIE[$cookie_name])): ?>
    <?php $saved_users = unserialize($_COOKIE[$cookie_name]); ?>
    <?php foreach ($saved_users as $key => $user): ?>
        <?php $name = $user['username'];?>
        <?php $user['username'] = ""; ?>
        <?php $user['canton'] = ""; ?>
        <form class="cookie-form" hidden id="user-<?php echo $key ?>" action="results.php" method="post">
            <?php foreach ($user as $key => $user_info): ?>
                <input hidden type="text" name="<?php echo $key ?>" value="<?php echo $user_info ?>">
            <?php endforeach; ?>
        </form>
    <?php endforeach; ?>
<?php endif; ?>
```

2: the user data saved and managed at the results page

```
//save the users preferences if the username is set
if (!empty ($user_info['username'])) {
    $cookie_name = "saved-users";
    if (isset($_COOKIE[$cookie_name])) {
        $saved_users = unserialize($_COOKIE[$cookie_name]);
        $nmbr = count($saved_users);
        if ( $nmbr >= 4) {
            //if over 4 users saved, delete one before adding a new one
            $saved_users = array_slice($saved_users,-3,3);
            array_push ($saved_users, $user_info);
            setcookie($cookie_name, serialize($saved_users), time() + (86400 * 7), "/"); //save for 7 days
        }else {
            array_push ($saved_users, $user_info);
            setcookie($cookie_name, serialize($saved_users), time() + (86400 * 7), "/"); //save for 7 days
        }
    }else {
        //if no users saved, create an array and add user info to it
        $cookie_value = array(); array_push ($cookie_value, $user_info);
        setcookie($cookie_name, serialize($cookie_value), time() + (86400 * 7), "/"); //save for 7 days
    }
}
```

Custom form elements:

All of the elements in the form give a value from 0 to 100. 100 means that the user is healthy or prefers the most extreme option and 0 means that the user is either unhealthy or wants the least extreme option. Most of the custom form elements are made with custom css. Basically, how they work is that you hide the original radio button or checkbox and you put something on top and give it custom values. Here is an example of who it works:

https://www.w3schools.com/howto/tryit.asp?filename=tryhow_css_custom_checkbox

The label tag is usually used as a container for the custom inputs. Every element is slightly different, so changing them should be done individually.

```
<label class="thumb">
  <span><?php echo $lang['NO'] ?></span>
  <input class="physical-2" type="radio" name="physical-activity" value="67" />
  
</label>
```

The image sliders are all done in the same way. There is a container div with the class img-carousel. This is key for this element. The count-5 class tells that there are 5 images or options in the slider. There are classes for count-3 and 4 as well. The switching of the images is all done with javascript and it works by using th values from the images and the classes as well. The values are set to the slider from the images if user click on the images. The visual part of showing each image at the correct point of the slider is done by using the classes.

```
<div id="roots" class="img-carousel count-5">
  " />
  " />
  " />
  " />
  " />
  <span class="img-0-roots selected"><?php echo $lang['PAGE_ROOTS_OPTION_1']; ?></span>
  <span class="img-25-roots"><?php echo $lang['PAGE_ROOTS_OPTION_2']; ?></span>
  <span class="img-50-roots"><?php echo $lang['PAGE_ROOTS_OPTION_3']; ?></span>
  <span class="img-75-roots"><?php echo $lang['PAGE_ROOTS_OPTION_4']; ?></span>
  <span class="img-100-roots"><?php echo $lang['PAGE_ROOTS_OPTION_5']; ?></span>
</div>
<input type="range" min="0" max="100" value="0" step="25" class="slider" name="roots">
<span class="slide-tooltip"> <?php echo $lang['SLIDE_ME']; ?> <i class="arrow_triangle-up"></i></span>
```

Results page

The results page works like this: php makes a call to the database and gets all the itineraries. After this the cookies are set if possible after which some validation is done by making all missing values 0 and some values are added together to create the final value.

After this the map is initialized. The map is by Leaflet and its and OpenStreetMap.

Tutorials:

<https://leafletjs.com/examples.html>

The reason OpenStreetMap was chosen was because it offers a topographic map with good support for markers and polygon lines while being completely free.

After the map is initialized, the scores are calculated for each of the itineraries. This is done by simply comparing 2 json arrays and it's not very complicated as it was not my focus. After a score percentage is given to each of the itineraries, they are set into the json data of each itinerary.

After this all the itineraries are sorted so that lowest score is on the bottom and largest and best score is first.

After that's finished, the itineraries are listed into the accordions. The accordion is custom made and the it works with JavaScript. On the head of the accordion, there is a trigger for a JavaScript to update the leaflet map. The id is printed after the call name so that each of the calls is unique. A simple key of the foreach loop would also work. The code for the map update can be found from the bottom of the accordion body.

The weather information for the results is searched when the user opens the accordion. The code can be found from the scripts file. The weather is received through the weather.php file for safety reasons. The button for the GPX file to download is a link to a file with the name of the itinerary. The public transport information is a get call to search.ch through a link. And the Snukur button will link to the link from the itinerary "url" attribute.

The itinerary altitude profile is printed into the graph by looping the last value from the GPS information in the itinerary document of the database. The library for all graphs is called chart.js.

Documentation:

<http://www.chartjs.org/docs/latest/>

After the altitude profile is printed into a graph, the user attributes and the itinerary attributes are also printed into a radar graph. This is so that the user can compare their score and the itinerary score.

In simplicity that is how the results.php page works.

7. Database

The screenshot shows the MongoDB Compass interface. On the left, a sidebar lists databases and collections. The 'santour' database is selected, and the 'itineraries' collection is highlighted. The main area displays a document from the 'santour.itineraries' collection. The document is a JSON object with the following structure:

```

{
  "_id": ObjectId("5b51cef02a5233c9c8af1bb"),
  "name": "Zinal-Petit Mountot Chemin d'hiver",
  "url": "https://www.snokr.com/exploration-details?id=59ce2d40798c500bf04bf0e8...",
  "image": "https://d25u9ndbbhic1z.cloudfront.net/points/5a842fefaf2ba08f28eed52...",
  "description": "Walk along either bank of the river Navisence. Once you are at the end...",
  "info": {
    "distance": "12.6km",
    "time": "3.5h",
    "canton": "VS",
    "trail-type": "mountain"
  },
  "attributes": {
    "physical-activity": 83,
    "walking-help": 100,
    "walking-speed": 80,
    "walking-time": 86,
    "mounting": 80,
    "fear-of-heights": 0,
    "balance": 100,
    "pain": 38,
    "mobility": 100,
    "roots": 0,
    "rocks": 25,
    "bumps": 0,
    "climbing": 25,
    "descent": 75,
    "flatness": 75,
    "bridges": 25,
    "ridges": 75,
    "path-narrowness": 75,
    "handrails": 25,
    "time": 50,
    "walking-confidence": 100
  },
  "poi": {
    "name": "Parking of La Lee",
    "description": "View on the Besso from the parking of La Lee"
  }
}

```

The data in the MongoDB database is saved into a collection named “itineraries”. This collection contains every itinerary in a separate document. The data is saved in MongoDB is very similar to JSON.

```

_id: ObjectId("5b51cefd82a5233c9c8af1bb")
name: "Zinal-Petit Mountet Chemin d'hiver"
url: "https://www.snukr.com/exploration-details?id=59ce2d40798c500bf04bbf0e&..."
image: "https://d25u9ndbhiciz.cloudfront.net/points/5a042fefa3f2ba0bf28eed52-..."
description: "Walk along either bank of the river Navisence. Once you are at the end..."
info: Object
  distance: "12.6km"
  time: "3.5h"
  canton: "VS"
  trail-type: "mountain"
attributes: Object
  physical-activity: 83
  walking-help: 100
  walking-speed: 80
  walking-time: 86
  mounting: 80
  fear-of-heights: 0
  balance: 100
  pain: 30
  mobility: 100
  roots: 0
  rocks: 25
  bumps: 0
  climbing: 25
  descent: 75
  flatness: 75
  bridges: 25
  ridges: 75
  path-narrowness: 75
  handrails: 25
  time: 50
  walking-confidence: 100

```

Each itinerary is saved in the same way. The first root fields are name url, image and description. Name is the name of the itinerary, url is the url to the Snukr page, image is the avatar of the itinerary from Snukr, description is the itinerary description. The info object contains some statistical information. Inside you have the distance, time it takes to complete and trail type. All this information is saved as string but in the future, it could be transformed into something else for cleaner data. The attributes object contains all the data points that are used to compare the user's preferences with the itinerary attributes when making the score for the current results page. This is done by comparing the differences between 2 arrays of data.

```

    ❏ poi: Array
      ❏ 0: Object
        name: "Parking of La Lee"
        description: "View on the Besso from the parking of La Lee "
        image: "https://d25u9ndbhiciz.cloudfront.net/points/59ce50a2798c500bf04bbf0f-..."
      ❏ latlng: Object
        lat: 46.12698493529682
        lng: 7.630337812013522
  
```

The poi array is an array of point of interest objects. Each object contains the name, description and image of the point of interest. What's also included is the longitude and latitude information of the point.

```

    ❏ pod: Array
      ❏ 0: Object
        name: "Technical verticality (chain)"
        description: "Point of danger"
        image: "https://d25u9ndbhiciz.cloudfront.net/points/5a20246d9ea40a0bf1b1596d-..."
        type: "Chain"
        level: 3
      ❏ latlng: Object
        lat: 46.10213319298055
        lng: 7.634435196168283
  
```

The pod array is very similar to the poi array. It contains all the points of danger for the itinerary. Inside the pod objects you have the same info as the point of interest but in addition you also have the type of danger and also the level of the difficulty. This information is not very accurate and should be standardized. The information is then just used when printing out the information for each of the POD and POI markers.

```

    ❏ latlng: Array
      ❏ 0: Array
        0: 46.12720851805545
        1: 7.6301475273849375
        2: 1674.2099999999998
      ❏ 1: Array
        0: 46.1271715180554
        1: 7.630148527384593
        2: 1674.1700000000000
  
```

The latlng array contains all the gps data. Inside the you on the 0 index the latitude, on the 1 index the longitude and in the 2 index you have the elevation of the itinerary at that specific point.

The elevation data is used to print the elevation profile to the results page. The longitude and latitude are used to print the polygon line in the map of the results page.

8. Back-end

The back-end of SanTour is a very simple Node.js API. It simply connects to the MongoDB server and if it's called with a post call, it will return all the itineraries no matter what the parameters were. The most important files in the back-end are itineraries-routes.js, database.js and server.js.

Itineraries-routes.js contains the code for whenever the API is called. By default, it is called on <http://localhost:3003/itineraries/> . Basically all it does is return all entries from the itineraries collection

```

itineraries-routes.js x
1  var ObjectId = require('mongodb').ObjectId;
2
3  module.exports = function(app, db) {
4
5      // calling the collection from the DB
6      db.createCollection('itineraries');
7      var collection = db.collection('itineraries');
8
9      //get all location entries
10     app.post('/itineraries/', (req, res) => {
11         // try and catch error handling
12         try {
13             // put all results in array
14             collection.find().toArray((err, result) => {
15
16                 // extra error handling
17                 if (err) {
18                     res.status(500).send({'error': 'An error has occurred'});
19                 } else {
20                     res.status(200).send(result);
21                 }
22             });
23         }
24         catch (e)
25         {
26             console.log(e);
27         }
28     });
  
```

The database.js file contains the connection information of MongoDB.

```
database.js
1 module.exports = {
2   url: 'mongodb://localhost:27017/santour'
3 }
```

The server.js runs the API and it's the file you call when you want to start the API server.

```
server.js
12 app.use(bodyParser.urlencoded({ extended: true }));
13
14 // parse requests of content-type - application/json
15 app.use(bodyParser.json());
16
17
18 MongoClient.connect(dburl.url, (err, client) => {
19   assert.equal(null, err);
20   if (err) return console.log(err);
21
22   // Call db name
23   const db = client.db('santour');
24   //client.close();
25   console.log("Connected successfully to database");
26   require('./app/routes')(app, db);
27   app.listen(port, function() {
28     console.log("Server is listening on port "+port);
29   });
30 }
```

To start server locally use command:

“node server.js”

To start server in the development server, use the node forever module:

“forever start server.js”

AUTHOR'S DECLARATION

I hereby declare that I have carried out this final research project on my own without any help other than the references listed in the list of references and that I have only used the sources mentioned. I will not provide a copy of this paper to a third party without the permission of the department head and of my advisor, including the partner company with which I collaborated on this project, with the exception of those who provided me with information needed to write this paper and whose names follow:

Alexandre Cotting

30.7.2018

Mikko Lerto