

Halfway

Designing a mobile application to facilitate spontaneous outdoor meetings

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ABSTRACT

Applications and services for meeting and communicating in digital contexts has seen a rise in popularity in recent times, with regards to the Covid-19 pandemic. Due to social and health aspects, there is however, also a need to facilitate socially distanced physical meetings in outdoor settings. Therefore, we propose the development of technology for easy spontaneous physical meetings through the creation of the native iOS application, Halfway. Halfway lets users, in a swift and easy manner, calculate the half-way point between themselves and a friend and enables temporary location sharing in secure navigation-sessions. These sessions feature real-time location updates for both parties as well as GPS navigation to a shared half-way point. User research as well as application evaluation tests constitutes the basis for decisions made in the design process. The application and user tests are evaluated and discussed to determine the validity of the proposed functionality as well as optimal ways of implementation. Results indicate a need for this functionality and that a simple and clear approach, where features are limited to those of the core functionality, is the preferred method of implementation.

1. INTRODUCTION

Mobile applications that utilize map- and navigation services have seen an increase in recent years and are a natural part of most people's everyday life today. Due to the Covid-19 pandemic in 2020, more people choose to meet up in outdoor settings for social scenarios in both private and work-related contexts. When meeting at unknown or hard-to-find locations, a common way to navigate is to use mobile applications such as Google Maps, Apple Maps or Waze. Aside from providing basic maps and navigation,

these apps feature functionalities such as finding locations, saving places by dropping pins and displaying traffic information. Although highly focused on searching for and navigating to specific locations, these functionalities are lacking in terms of interaction between users. For instance, if two people were attempting to meet each other on-the-fly in an unknown location using Google Maps, they would either have to decide on a time and location beforehand, or both parties would have to make their location visible to the other and maintain contact to ensure they end up in the right place at the right time. Thus, there is a lack of features for spontaneous meetings in these applications.

For many people video conferences, using such software as Zoom¹ or Google Meet², is the new norm in terms of communication [1]. At the time of writing, late 2020, work and university studies are largely performed from home, utilizing different types of digital communication tools and services to minimize the risk of spreading infection. The contact with family and loved ones is also, to a large extent, handled remotely. Even though these digital tools and services provide an array of possibilities for interaction between people, it is hard to produce the same sense of togetherness and connection using digital means as it is in real life. Hence, there are benefits that stem from social interaction in the physical space that are lost in the digital domain. One being that face to face interaction encourages mimicry to a greater extent which leads to increased bonding between people [2]. Another advantage is the option of being close to nature which has positive psychological effects [3]. Studies also show that an overuse of digital channels are strongly linked to depression [4].

With this background and above mentioned applications in mind, we propose that new technologies that will facilitate meetings between people should be developed and employed. Through the design and evaluation of Halfway (see figure 1), an iOS-application, we aim to accomplish this. Halfway will let users, in a swift and easy manner, calculate a half-way point between themselves and a friend and send invitations to secure shared navigation-sessions.

¹ <https://zoom.us>

² <https://meet.google.com>

other users' location - does not currently exist for this application. Apple Maps⁵ share many of the traits of Google Maps and is the default map and navigation app for Apple products.

The application "Meet in town" by Pintumo UG [12] is an iOS- app that lets the user find the route to a halfway-point between two or more people, by typing in their starting address. This can be done for up to four starting locations and the final destination can be changed to a nearby café, restaurant, park etc. The app does not have real-time location updates and navigation but acts more as a planning tool to decide on where to meet.

For the android platform, Kim and Moyers [13] developed an application in 2012 designed to help, primarily blind but also sighted, people to find each other. The app was designed to dynamically give routing information for two moving targets, using one's own location as the starting point and the other party's as the destination. Even though the implemented technology was rather novel at the time, the app utilized a crude UI and did not focus on usability primarily. Furthermore, as the app was developed primarily for blind people, it heavily utilized non-visual modalities such as auditory and haptic feedback, which may not be suitable for certain situations.

Apart from these navigation based apps, there are many other apps of interest related to this study. A few of these are "Find My" by Apple⁶, "Beer with me"⁷ and "Snapchat"⁸. In the "Find My" app, the core functionality is to see where friends and devices are located, live on a map. Beer With Me is another map based app that lets users give notice to their friends when they are out drinking as well as share their location so they can meet up. Snapchat is the only app mentioned here where location and navigation is not the core functionality. Users of Snapchat can, as a subset functionality, see where other users' are located on a map as well as location based content.

3. AIM AND HYPOTHESIS

The aim of this study is to design mobile technology to facilitate communication between people by providing a system for easy, safe and fast meetings. Under the somewhat special circumstances we find ourselves, with regards to the ongoing pandemic, we also believe there is a need for alternative methods of meeting in outdoor settings. The desired outcome is thus to develop functionality for easy on-the-fly meetings between people and to build a tool, in the form of an iOS application, housing these features. The core concept is to let users send invitations to friends, letting them temporarily see each other's positions, and allow the application to suggest locations in which to meet up.

⁵ <https://www.apple.com/maps/>

⁶ <https://www.apple.com/icloud/find-my/>

⁷ <https://beerwithme.se>

⁸ <https://www.snapchat.com>

The app strives to optimize time and distance for all parties and to suggest separate real-time navigation to a joint meeting point in an attempt to make meeting up as easy as possible.

Through the development and evaluation of this application we also aim to contribute to the field of interaction design for mobile applications. This project poses the following research questions:

How do we use and design mobile technology to facilitate communication and promote safe ways of meeting up in physical space using digital means?

Is there a need for a service/functionality that facilitates meetings in an outdoor setting? In this case, how does one best implement this feature?

Our hypothesis is that there is a need for this kind of functionality. We plan to investigate this by letting previous user experience research as well as user studies aid us in designing and building an iOS-app housing this functionality. The application will then be evaluated through usability testing with users.

3.1 Limitations

Halfway is a meetup application that will focus on calculating the closest meeting point between users' locations. Other features, such as a chat functionality or status updates, will not be implemented as we do not deem them essential. We believe that even though a chat function would be relevant to house in our app, the user-base is already used to other ways of communicating and can do this more effectively through text messaging or other chat apps.

This application's main point is to have temporary sessions, similar to Zoom, rather than being an all-in-one social media application. This means that Halfway will not display where all users are located at all times, contrary to how other apps like Snapchat and Find My work. The location of friends will only be revealed to the user once the request of meeting up has been accepted, and only for as long as the session lasts.

4. METHOD

4.1 User Research Survey

To be able to make informed decisions in the design process, a survey was conducted. For example, this form contained questions regarding peoples' opinions on sharing their location as well as on security issues when doing so. Further, it brought up their thoughts on map and navigation applications as well as when and to what extent people use these. Most of the 17 people who answered the form were of a rather homogeneous group of people, namely master

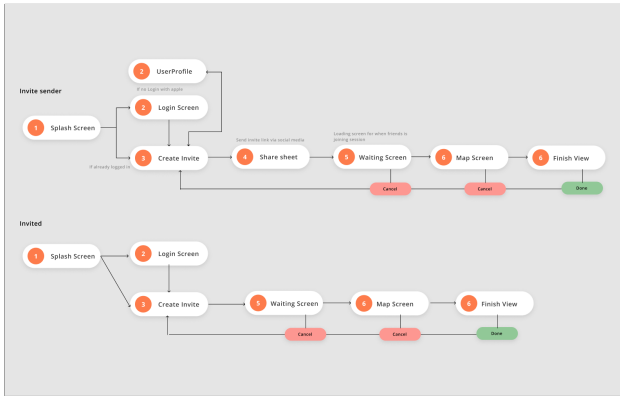


Figure 2. A flow-chart of the clickable prototype

students of media technology or computer science. However, the results do provide hints and indications about key aspects of the design work and some valuable insight was gained that is summarized in the results section.

4.2 Clickable prototype

A clickable high-fidelity design prototype was created and evaluated in the early stages of the design process using the prototyping tool, Figma⁹. The reasoning behind this was to obtain user feedback on user experience aspects of the application as well as on graphical themes and components. More specifically we wanted to test the “flow” of the app (figure 2), i.e. whether the sequence of choices and screens of the app would be perceived as intuitive by the participants and if the progression would feel natural. One good thing about the Figma software is that, by connecting an iPhone to a computer running the application, one is able to run the prototype directly on the phone, which was the utilized method for the test. The prototype was evaluated by 8 people who all got to test the prototype and then answer a survey composed of questions regarding whether they felt that they were provided with enough information in all stages of the progression as well as about the overall design and color themes. The results of the evaluation influenced the design of the application going forward.

4.3 Designing Halfway

The app is made using the Swift programming language¹⁰ with the SwiftUI framework¹¹ handling the styling and visual interface. Further, the Mapkit library is used for navigation and map functionality. Firebase’s Firestore database¹² is used for the backend, making the app able to update the users’ locations and display them to the counterpart in real time. Firebase is also utilized to store larger data types such as the profile images.

⁹ <https://www.figma.com>

¹⁰ <https://developer.apple.com/swift/>

¹¹ <https://developer.apple.com/xcode/swiftui/>

¹² <https://firebase.google.com>

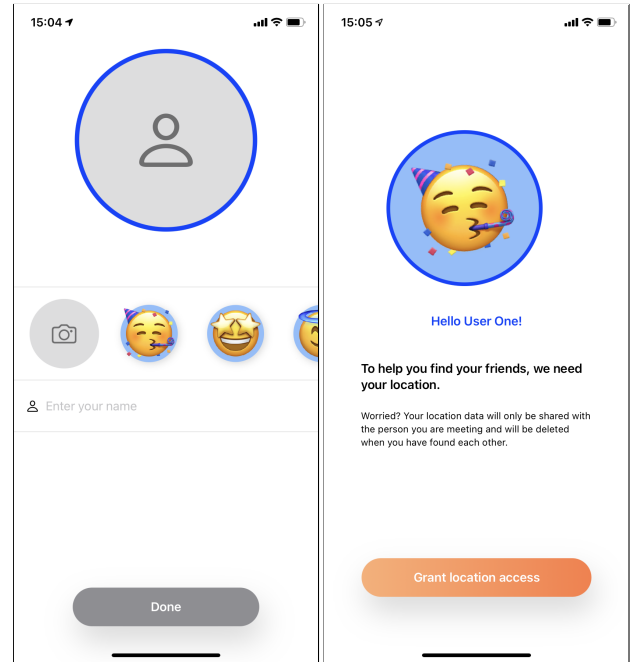


Figure 3. The on-boarding process of Halfway. To the left, setting up a profile and to the right, granting access to location data.

As navigation apps are steadily becoming more common in this day in age, there are a lot of strong concepts [14] tied to these, such as moving the map by swiping or zooming by “pinching”, which provided a useful foundation in the interaction design work of Halfway. On top of this, Apple has a rather strict policy¹³ on how apps may look and function if they hope to be allowed on the App store, so their human interface guidelines [15] provided valuable guidance in for example button location and appearance as well as transitions between screens and pop-ups. Furthermore, the SwiftUI framework is tailored to make apps behave and look according to these guidelines, using features such as a set screen border and preset dynamic text fonts, colors and sizes.

The iOS-app “Meet in town” by Pintumo UG [12] has been an inspiration, both regarding function and design, during the development of Halfway. Meet in town has the same core idea, as Halfway, of finding a halfway point between users and displaying the route to that point for each user. Although similar in some ways, there is however one distinctive main difference between Meet in town and Halfway. Meet in town acts more as a planning tool, used by one person, where they type in each person’s starting location instead of fetching them from the users’ GPS-data. This makes for a tool focused on planning ahead, while Halfway focuses mainly on meeting someone in the moment, during the initial use of the app.

¹³ <https://developer.apple.com/app-store/review/guidelines/>

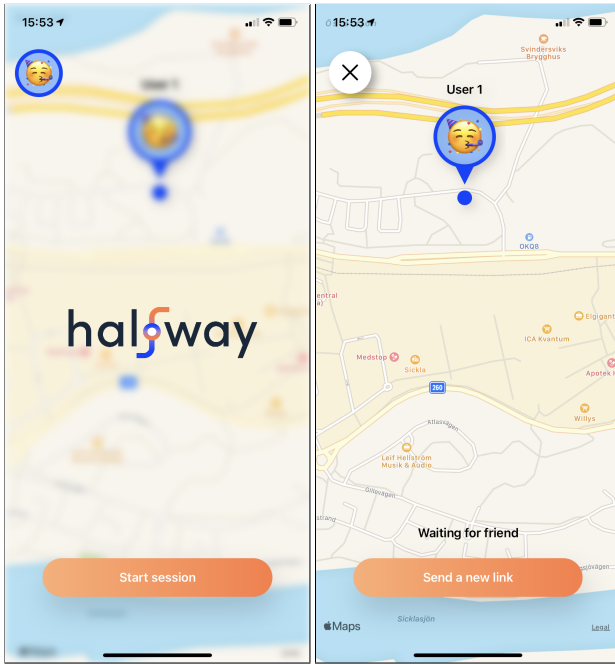


Figure 4. The main screen to the left and the session screen to the right.

4.3.1 Application Progression

Halfway is, in its current state, designed to help the user do one thing, get directions to the halfway-point between themselves and another user. To accomplish this the app is divided into two parts, setting up the user’s profile and connecting with other users in what is called a “session”. At initial launch, the user is guided through the profile setup as well as prompted to share their location (Figure 3). During the profile setup, the user needs to choose a name and a profile image, which can be an image from their own photos library or a preset emoji-avatar, in order to continue. The same is true regarding granting location access, as this is a core setting needed for the app to function, the user can not move on to the main part of the app without accepting location sharing. After setting up a profile and accepting location access, the home screen is shown (Figure 4). Here the user is prompted with two options (buttons), “Start session” and change profile, placed on a background showing the user’s image and name as a pin on a non-interactive map, together with the Halfway logo. Choosing “Start session” enables the map, making it interactive, the “Start session” button is changed to “Send invite link” and a button ending the session replaces the profile button in the top left corner (Figure 4). In this mode, the primary intended flow is to send a unique link to a friend via any messaging app (Figure 5), wait for that person to click it and then use the dynamically updated pathway shown as directions to find the halfway point (Figure 6). In this mode the users can see the location of each other in real time as well as each user’s estimated time to the halfway-point. When the two

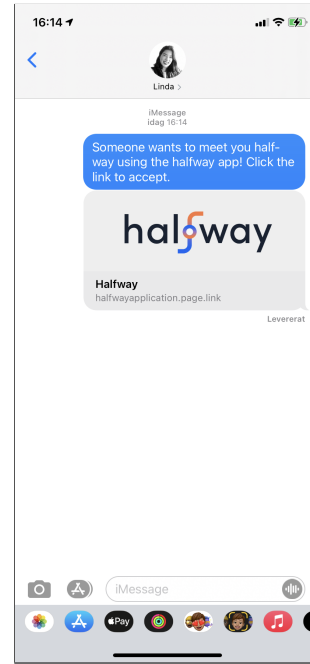


Figure 5. An example of sending the session invitation via the user’s preferred messaging app.

users are approximately 10 meters away from each other a pop-up sheet with a looping animation of the user’s avatars doing a “high five” is played, along with the option to end the session (Figure 6). Ending the session sends the user back to the home screen as well as removes all user data from the database, initialized at the start of the session.

4.3.2 Location and Security

Security and transparency has been a ubiquitous topic throughout the design process of Halfway with the aim to explicitly inform users of the data usage and storage. On the screen where users are asked to share their location (Figure 3), the following disclaimer is presented : “Worried? Your location data will only be shared with the person you are meeting and will be deleted when you have found each other”, explaining what the obtained data is used for and that it will be deleted once the session is terminated. Another planned, but not yet added, security aspect is the implementation of logging in via “Sign in with Apple”¹⁴.

4.3.3 Appealing Design

For users to want to keep utilizing the application, it not only has to be efficient and well designed from a usability point of view, it also has to be fun and rewarding to use. Therefore, each interaction with the app does not only have to make sense, it also has to be joyful, hopefully leaving the users with a smile on their face. This sense of joy was a central aspect throughout the design process and the aim was to utilize this in as many ways as possible.

¹⁴ <https://developer.apple.com/sign-in-with-apple/>

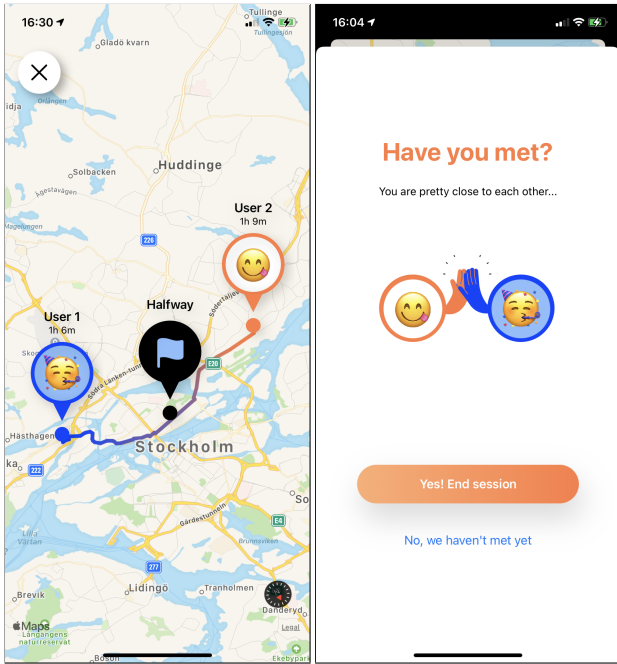


Figure 6. The navigation functionality to the left and a still image of the animation showed when users meet, to the right.

Loading screens are typically not appreciated when using mobile applications and steps were taken to remedy this. After sending an invite in Halfway one needs to wait for the other party to accept the invitation. The waiting screen was designed with a map in the background so one could explore it and nearby locations while waiting, hopefully making the wait less dull and better incorporate the waiting period as an active part of using the app. To further prevent inactive waiting, the ability to receive a notification when the user's friend accepted the invitation, was planned. This would let the user close the app while waiting, however this feature was not implemented in the evaluated version due to time constraints.

Another vital aspect in the development of Halfway, which also adds to the joy-factor of using the app, was to promote a sense of togetherness, or copresence. Seeing the representation of each other, in the form of avatars (profile image or emoji) on screen, increases the perception of togetherness [16]. Furthermore, by being able to track the movement of each other's avatars in real-time, a connection is made between the two parties as they get constant feedback of the other's involvement.

4.3.4 Visual Design

As the application is focused around one simple task, the visual design followed the same path by using minimalistic and simple elements. The main part of Halfway where users spend most of their time is the "Session-page"(Figure 6), which is highly focused on following directions on a map (Figure 6). The color choices of the graphical inter-



Figure 7. A first draft of a logotype (left). The final logotype of halfway (right)

face and logo (Figure 7 were inspired by other navigation applications where colors like blue, green, orange and yellow are quite common. For the graphical representation of the route, a gradient between the two main colors, orange and blue, was chosen to symbolize uniting - of two becoming one - as the two users in the session unite at the halfway point.

Animations were also utilized to enhance the visual experience as well as to provide guidance. For example, the "high five" animation shown when the users meet (Figure 6) was added partly to communicate to the user that the session is over and can be closed, but also to leave them with positive feedback. The same being true for an animation used where the user's image is wobbling back and forth, shown on the screen where location access is granted (figure 3). This was implemented partly to acknowledge that their profile was set correctly in the previous page, but also to spark joy.

4.4 Testing the Final Prototype

User tests of a fully functional prototype were conducted by two test leaders in December 2020 using 6 participants. Each participant was handed either an iPhone 12 mini, iPhone 11 or iPhone 7 with the Halfway app pre-installed. Each participant was briefly informed about how the test was going to be performed and was then instructed to start the app, set up a user profile and wait to receive an invitation for a Halfway-session. The invitation was sent by a test leader approximately one kilometre away and when the participant accepted the meeting, a halfway point was calculated and a session began. The participants were tasked with navigating to the generated destination and meeting up with the test leader as well as encouraged to think aloud during. At this distance, in city surroundings, the test took roughly five minutes to finish on average. When the study participant and test leader had met another session was conducted, but this time with the participant starting the session, i.e. sending the invitation link. This session was of similar length and environment but using another route. After the two sessions, the participants were asked to answer a survey about their experience using the application and after this, also asked if s/he would like to add or comment on anything verbally, which was recorded by the test

leader.

5. RESULTS

In this section the results of the initial survey regarding navigation application usage and security, the clickable prototype evaluation as well as the results from the user tests of the final prototype is presented.

5.1 User Research Evaluation

The user research survey provided valuable insight in how and when navigation apps are used, how people usually go about meeting each other as well as respondents' thoughts on security issues. The most commonly used apps when meeting up were direct messaging services such as SMS, Facebook Messenger¹⁵ and WhatsApp¹⁶ as well as map and navigation applications which were used by a fair amount. Regarding the map and navigation apps, 17% claimed they used these daily, 70% chose the alternative "A few times a week" and concerning which of these apps are the most popular, Google Maps had an overwhelming lead. When asked in which situations this kind of app is used, most answers were task based and in line with "When I don't know where to go" and "When trying to find out the shortest route to somewhere". These results were, of course, largely expected but some of the answers did bring some insight. One respondent said he/she used these apps "Every time I'm heading somewhere slightly unfamiliar, even though I might know the way". This is interesting as it indicates that the threshold for using these kinds of applications is really low for some people. Other respondents pointed out the aspect of finding out how long it would take to get to a location, which further cemented our decision to display the ETA of both parties in a session.

One question on the form concerned participants' readiness to share their location with others. A clear majority of the respondents stated they would allow the sharing of their location, but the lion's share of these said they would only do so with friends and during controlled sessions. About 20% chose the alternative "no, never". These results consolidated the viability of our initial stance, to use time limited user controlled sessions in which users' positions are visible.

In regards to what types of locations people most often choose to meet-up at, restaurants, bars, parks and close to public transportation were the most popular choices. The participants stated that proximity is the single most important factor when deciding where to meet, while cost and type of location were also major factors. Only two people chose social distancing as being an important factor which is interesting as it, contrary to our initial thoughts, indicates that this aspect does not seem to be that big of

an issue. The last question in the form concerned whether people think that existing map and navigation apps make it easy and convenient to meet up. Approximately half of the test group answered that existing map and navigation apps make it "very easy" to meet up, while 30% chose the alternative "somewhat easy". The fact that people generally have little problems with existing apps presents us with a difficult design challenge: how do we design for what people need when they are already content with existing technology?

5.2 Clickable Prototype Evaluation

The evaluation of the clickable prototype showed that, by testing the app, people got a relatively good idea of what the app was supposed to do and how they should use it. It did however also reveal a few problems and that some areas of the progression should be explained more clearly. When asked if they at any point using the app were confused, did not know what to do or where to click, two of the 8 participants expressed that they experienced this when prompted to send an invitation link to a friend. One of them requested more information in this stage of the progression, expressing that the "send invitation"- button was not self-explanatory and should be explained in some way. In the final design, steps were taken to redress this such as having the user start a session before sending the invitation as well as changing the button-text to "Send invitation link". Another person requested feedback at various stages, pointing out the lack of introduction as well as explanation of what your button-presses and choices led to. This resulted in the adding of a splash screen, loading screens and informational texts such as "waiting for friend" in the final prototype.

Regarding the visual design and color themes of the app, the evaluation did not reveal as many issues. People expressed that they generally liked the layout and colors, with many people commenting that they appreciated the way the colors fade into each other at the "half-way point". A few negative comments touched on the typography and, as mentioned before, the button-texts.

5.3 Final Prototype Evaluation

The evaluation of the prototype was evaluated on one participant for the pilot test and six participants for the final evaluation.

5.3.1 Pilot test

A pilot test was conducted with one participant and revealed several issues, in the form of software bugs, that significantly affected the usability of the application. These issues had a substantial impact on the user experience of the application as main functions of the app were not properly working. The most significant bug was that the locations of the users were not updating properly. Only the

¹⁵ <https://www.messenger.com>

¹⁶ <https://www.whatsapp.com>

users own location was updated in real time as the user moved, while the other user's location was always in the same position. Besides this, there were some complications in the sending and receiving of invites as well as issues with the users receiving multiple routes or different halfway points. These problems were reflected in the user's survey results and especially in the question of the bad aspects of the application design where the participant expressed complaints of the application not working as expected. These bugs were remedied before the main test.

5.3.2 Usability

All of the six participants described themselves as very familiar with navigation applications as five of them selected the highest alternative on the five-point Likert-Scale varying from "Not Familiar"(1) to "Very Familiar"(5). The remaining participant chose a 4.

Regarding the usability of the application, the participants were asked whether they experienced any confusion or disorientation while using Halfway. While five of the participants answered "No" on the question, one participant answered "Yes" and further explained their answer with: "I was a tiny bit unsure how to meet up with someone when I got to that screen. I didn't know whether there would be an in-app friends list or if someone would automatically appear. The send invite link could conceivably have been an invite to just become a member or whatever, not necessarily an invite to the specific session. But we're talking about a millisecond of hesitation here, so I don't know..." This correlates with the previously received feedback from the Prototype Evaluation where a larger part of participants also experienced confusion regarding the same aspect of the application.

5.3.3 Perception of joy

Regarding the question about if Halfway was a fun application to use, the entire test group answered "Yes". The participants commended the concept of the application and used words like "Useful", "Convenient" and "Rewarding" while expressing their opinions about Halfway as a whole. They further commented on the animations, describing them as "Fun", "Cute" and as increasing the sensation of reward when meeting their friend.

5.3.4 Usage in everyday life

Four out of six participants expressed that they would use this kind of app in their everyday life while the remaining two participants said they would not. One of those participants expressed: "I don't think I would use it everyday. But for travel it would be nice.". While the other participant expressed: "I do not meet up people in unknown destinations every day" These answers however point to a misconception of the question by the participants, which will be further covered in the discussion.

5.3.5 Design Aspects

When asked about their opinions about the visual design of the application, the participants used words like "Clean", "Simple", "Not Overwhelming". Further, opinions expressed about the logotype and animations were that they were perceived as appealing. Critique received about the design was that text sometimes was rendered invisible in front of graphic elements with the same color. This was due to some elements not being optimized for the "dark mode"-theme of iOS.

5.3.6 Data sharing

Regarding the sharing of one's data - in this case location data and images - four participants expressed that they would be comfortable with sharing this type of data in their everyday life with the application. The remaining two participants, who answered "no", expressed hesitation due to lack of information about how the data was going to be used. A worry they had was whether the data would be sold to other companies or if it would be stored for longer periods of time.

6. DISCUSSION

Our aim with this project was to facilitate communication and promote an easy way of meeting up in physical space through the development of the iOS-app, Halfway. Our studies and previous research indicate that a simple application with a clear and limited purpose is best suited for this specific implementation. Our studies also show that an important aspect to ensure that people actually use the app is a natural progression or "flow" through the application as well as to provide clear and positive feedback in the form of text, illustrations and animations. The animations were particularly well received and generated a lot of joy in the participants during the tests. To experience the act of meeting up as something that is undertaken and accomplished as a team is something that people found especially rewarding. This could be tied to the perception of copresence [7] through mutual attention and emotion. Regarding whether there is a need for this type of feature, our studies and user tests would indicate that there is. Most participants responded that they would use this app in their everyday life and most were also positive to the straight forward nature of the application.

As shown in the results, two people expressed that they would not use Halfway in their everyday life. However, from their elaborated responses one can gather that the participants use the words "Every day" instead of "Everyday life" which suggests a misunderstanding of the question. The question is not specifically asked whether they would use Halfway each and every day but whether they would use it from time to time in their everyday life. Other phrasings, such as "regularly" could have been used instead to

avoid the misunderstanding. Yet another phrasing, or an additional question, that would have been interesting to inquire about is *to what extent* people would use this feature or this specific application. The concept of guidance [5] was applied in most stages during this project to enforce efficiency when needed, while at the same time letting the user grasp and process necessary information without feeling stressed. This decision was made to avoid confusion and to make the progression as clear and comprehensible as possible. As our user studies show that these types of apps are mainly used to accomplish one specific task, careful thought was put into limiting the application so as to focus on one primary task and doing that one well instead of designing an all round navigation app. Thus, chat functionality was also ruled out.

In neither of the three evaluation studies could the test group be said to be an accurate representation of the entire population. Regarding the fact that few survey respondents expressed social distancing as an important factor when deciding on where to meet up, one may assume that the composition of the test group might have provided somewhat skewed results, since all participants were relatively young and neither of them belonged to Covid-19 risk groups. Furthermore, with the small number of participants testing the final prototype, one would not be able to achieve the breadth of opinion, education level or different technology habits one might desire. For example, the six people participating in the study were all master students of Interactive Media Technology at the Royal Institute of Technology in Stockholm, Sweden, and all of the participants described themselves as “very familiar” or “familiar” with navigation applications. A test group including people less versed in interaction design or less used to using these types of apps might have produced other results or insights. Due to the ongoing pandemic, Covid-19, a large set of participants was however not possible to obtain. That being said, these results do give an indication of the validity and possible need for this application.

6.1 Security

Questions of security were present all through the design process. A point of discussion was whether to force users to login or not. One opinion being that people would feel safer knowing that the one they are meeting indeed are who they say they are, and that signing in using functionality such as “Sign in with Apple” would add that extra layer of security. An opposing opinion however, was that this scenario would never come into play as people would only use the application with people they already know. The fact that initialization of a Halfway-session is only possible via the sending of an invite link would void this security issue, as receivers would always know who is sending the link. Further they claimed that no extra layer of security would compel people to share their position with a stranger. This

statement might well be true, but due to the risk that minors would be able to use the application and share their position with strangers, we however decided that using “Sign in with Apple” would be the best way to go. The Apple-ID that is required to login has an age restriction of 13 years old which will at least hypothetically provide security for this age group. Time restrictions did however not permit this implementation in the evaluated iteration of the application but is something scheduled for a later installment.

The results of the final prototype evaluation showed that several participants felt unsure of how their data was stored and used. A reason why users still experienced a lack of transparency despite being presented with the disclaimer regarding how their data was handled, is possibly that the text of the disclaimer had a relatively small font. The page (figure 3) was purposely designed this way as the disclaimer was not intended to be the main focus of the screen, however it may have led to some users skipping to the next screen instead of taking the time to read the conditions.

The design choice of having emoji avatars as an alternative to profile images was also done in regards to peoples’ perception of security. Many people are reluctant to upload their personal images to the internet. Having a representation of the counterpart is however an important aspect in producing copresence as it describes the person they will meet up with, facilitating mutual attention and emotion. The option of choosing between different emoji-avatars was therefore added as these emojis can be thought to represent a user’s state of mind or personality.

6.2 Future Development

As designing and developing an iOS app is a time consuming task, quite a few planned features had to be pushed to a later version of the app. As previously mentioned, given the time frame we did not have time to implement a “Sign in with Apple”-feature. Another planned and significant feature is to enable more than two users per session, allowing calculation of half-way points between three or more users simultaneously. In the evaluated version, the application calculates the closest meeting point by way of walking only. Further development of the application would allow for calculating the closest meeting point by using other ways of transport like bicycle, car or public transportation as well as implementing filtering on specific types of meeting points, such as providing the fastest route to a café or park for example. Furthermore, a useful feature would be to be able to move the half-way point by dragging and dropping if the calculated spot is not suitable for some reason, something that was not possible in the evaluated version.

Another important feature is the navigation view. In the evaluated version, the navigation screen is set to a top-down map-view mode. Our initial idea was to, in addition to this, give users the option of entering a first person

navigation view, similar to that of Google Maps or Apple Maps, after the half-way point has been set. A challenge when adding these additional features mentioned above is to keep the simplicity and the straight-forwardness of the app, as this is imperative for good user experience. Our concept is to not add any new stand-alone features, only to add functionalities to the already existing core feature of meeting each other half-way.

Further, changes to the graphical interface and screens/pages could be made to distinguish them from each other. For example the start screen and the session screens (figure 4) have a similar layout and appearance which increases the risk of confusion. The elements that currently exist to differentiate the screens - the text "Waiting for friend" for example - could be emphasised or replaced by appropriate icons or animations. While the results from the final prototype evaluation show that changing the buttons text from "Send invitation" to "Start Session" and "Send Invite Link" made it more clear to the users what the result of pressing the button would lead to. The text was, however, not descriptive enough for all the participants to completely understand it, which shows room for improvement.

7. CONCLUSION

With the aim of developing functionality for easy on-the-fly physical outdoor meetings, the native iOS application Halfway, was created. Halfway lets users, in a swift and simple manner, calculate the half-way point between each other and then find one another via secure navigation-based sessions, using temporary location sharing. The need for this type of application was investigated along with an evaluation of the design and usability. Results from user testing indicate that the simplicity of the app, in terms of having only one single task represent the main functionality, as well as the level of joy felt while using the app, are vital aspects of applications in this category. The design choices made regarding usability and visual design proved to be justified from the final prototype evaluation. Furthermore, the study shows a need for the novel feature set provided by Halfway, largely due to socially distanced outdoor meetings being more and more desired by the general public, but also due to the absence of these features in similar applications.

8. REFERENCES

- [1] H. Kelly. (2020) The most maddening part about working from home: video conferences. [Online]. Available: <https://www.washingtonpost.com/technology/2020/03/16/remote-work-video-conference-coronavirus/>
- [2] M. Stel and R. Vonk, "Mimicry in social interaction: Benefits for mimickers, mimicees, and their interaction," *British Journal of Psychology*, vol. 101, no. 2, pp. 311–323, 2010. [Online]. Available: <https://bpspsychub.onlinelibrary.wiley.com/doi/abs/10.1348/000712609X465424>
- [3] S. de Bell, H. Graham, S. Jarvis, and P. White, "The importance of nature in mediating social and psychological benefits associated with visits to freshwater blue space," *Landscape and Urban Planning*, vol. 167, pp. 118 – 127, 2017. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S0169204617301391>
- [4] C. Montag and S. Diefenbach, "Towards homo digitalis: important research issues for psychology and the neurosciences at the dawn of the internet of things and the digital society," *Sustainability*, vol. 10, no. 2, p. 415, 2018.
- [5] A. Nurminen and A. Oulasvirta, "Designing interactions for navigation in 3d mobile maps," in *Map-based mobile services*. Springer, 2008, pp. 198–227.
- [6] A. Giddens, *Modernity and self-identity: Self and society in the late modern age*. Stanford university press, 1991.
- [7] C. Campos-Castillo and S. Hitlin, "Copresence: Revisiting a building block for social interaction theories," *Sociological Theory*, vol. 31, no. 2, pp. 168–192, 2013.
- [8] K. Höök and J. Löwgren, "Strong concepts: Intermediate-level knowledge in interaction design research," *ACM Trans. Comput.-Hum. Interact.*, vol. 19, no. 3, Oct. 2012. [Online]. Available: <https://doi.org/10.1145/2362364.2362371>
- [9] Apple, *Apple Style Guide*. Apple, 2020. [Online]. Available: <https://books.apple.com/dm/book/apple-style-guide/id1161855204>
- [10] —, *App development with Swift*. Apple Inc. - Education, 2019. [Online]. Available: <https://books.apple.com/us/book/app-development-with-swift/id1219117996>
- [11] T. Horbiński, "Progressive evolution of designing internet maps on the example of google maps," *Geodesy and Cartography*, vol. vol. 68, no. No 1, pp. 177–190, 2019.
- [12] P. UG. (2018) Meet in town. [Online]. Available: <http://meetin.town>
- [13] N. Kim and M. Moyers, "Meetup: a universally designed smartphone application to find another," 10 2012, pp. 279–280.

- [14] K. Höök and J. Löwgren, “Strong concepts: Intermediate-level knowledge in interaction design research,” *ACM Transactions on Computer-Human Interaction (TOCHI)*, vol. 19, no. 3, pp. 1–18, 2012.
- [15] Apple. Human interface guidelines. [Online]. Available: <https://developer.apple.com/design/human-interface-guidelines/>
- [16] A. L. Baylor and J. Ryu, “The effects of image and animation in enhancing pedagogical agent persona,” *Journal of Educational Computing Research*, vol. 28, no. 4, pp. 373–394, 2003.