Remember Me

Team Members: Ahmdullah Samady, Ekramul Sawrid

The City College of New York

Our partners

Facility Advisor and Mentor: Professor Zhigang Zhu

Facility Instructors: *Gerardo A Blumenkrantz,*
Katherine Olives

Contents

Abstract

According to the World Health Organization, approximately 5-8% of the American population suffer from dementia, of which Alzheimer's disease is the most common cause of. Alzheimer's disease is a progressive brain disease which causes the affected persons to experience memory loss as well as other brain related symptoms. Because of the nature of the disease, those affected by it may have trouble remembering loved ones with whom they were very close with in life and may need to constantly be reminded of who a loved one is. Remember Me is our attempt at solving this specific problem.

Remember Me is an app on mobile devices which will allow the user to save a profile of each of a person's loved ones, along with any information that may help the affected person remember their loved one in the future. Through the use of Facial Recognition Technology, the user will be able to take a picture of someone's face and have that individual's profile loaded and presented to the user, in the hopes that it may help the affected person re-recognize the person in front of them. Remember Me was built from the ground up to be as simple and intuitive as possible to ensure that it can be used by both caregivers and patients themselves. Through the repeated use of Remember Me, we believe those affected by Alzheimer's disease will be able to recognize their loved ones more easily and hopefully speed up the otherwise unfortunate process of reminding a patient of their loved ones.

Background

Dementia is a chronic disorder of the mental processes caused by brain disease and marked by memory disorders, personality changes, and impaired reasoning. According to the World Health Organization around 50 million people around the world are suffering from dementia. Alzheimer's disease is the most common type of dementia, with Alzheimer's disease accounting for 60-80% of dementia cases. The exact cause of the disease is unknown, and currently no cure is available. An estimated 6 million Americans aged 65 and older are living with Alzheimer's dementia today.

Due to the nature of the disease, a large portion of those affected by Alzheimer's dementia live in nursing homes because of the requirement of a full-time caregiver. More than 50 percent of residents in assisted living and nursing homes have some sort of dementia or cognitive impairment, including Alzheimer's. Because of the progressive nature of the disease, some of those living with Alzheimer's are much better off mentally relative to others, with some only experiencing mild symptoms of memory loss, while others requiring constant care.

Statement of the Problem

One of the most common symptoms of Alzheimer's disease is memory loss. An unfortunate reality of the disease is that many of those who suffer from it are often not able to recognize their closest loved ones. In cases where the disease has not progressed too far, the individuals affected may have to be reminded of who exactly the person in front of them is, regardless of how close they may have been in life. Due to the nature of the disease, this heartbreaking process of reminding the afflicted person may have to be repeated several times.

While there are many apps and technologies meant to assist the lives of those affected by the disease, such as Alarms, Trackers, memory games, etc.., there are currently are no tools which are aimed at tackling the specific problem and burden of having to constantly remind those who suffer from Alzheimer's of who their closest loved ones are. Our app, Remember Me, is our attempt at easing this burden. Our solution is intended to help users both in the short and long term.

Rationale of Solutions

For those afflicted by the disease who are able to be reminded of a certain person through the help of others, in their mind there must be a “spark,” something which triggers the memories of the loved one to return to them in order for them to finally recognize the person in front of them. The goal of our app is to have these “sparks” recorded and saved in a person’s profile, so that they can be loaded and presented to the patient in the future, in the hopes that it might help them the next time they are forgetful. The user will be able to store a profile for each of the afflicted loved ones, as well as any memories or information which may help remind them of the person in the future. Whenever the patient is having trouble remembering someone, the profile of that person will be loaded up along with their own most prominent memories of that person and the information will be presented to them, in the hopes that it may once again help them remember. By using this tool, we believe we can cut down on the time required to repeatedly remind the victim of their loved ones, and hopefully ease the burden of the tragic situation.

The flagship feature of our app is facial recognition technology. Along with manually looking through and finding the specific profile of the loved one in question, the app includes a facial recognition feature, which will allow the user to take a picture of the person in front of them, and if the face of said person is present in one of the stored profiles, then that profile will automatically be loaded up and have its information presented to the user. This feature increases the accessibility and ease of use of our app, while also potentially instilling a sense of

security in the afflicted, as it will be a third party and their own memories which will help remind them of the person in front of them.

As previously mentioned, Alzheimer's disease is a progressive disease, with some of those afflicted only suffering minor symptoms. Some of those affected by the disease who are in its earliest stages can be quite self-sufficient and be capable of operating and handling smartphones. For this reason, we have designed Remember Me to be as simple, accessible, and easy to use as possible, so that if a patient is capable of using a smartphone, they should have no problem operating our app. With this in mind, we have made every aspect of Remember Me as intuitive as we can, and we believe it can be used by anyone who can handle a smart phone. While we do expect the majority of our users to be caregivers who are using the application on behalf of others, we have focused on simplicity from the get-go, so as to not alienate any potential users who suffer from the disease.

Design and Development of Systems

The design of Remember Me is quite simple, which is a fundamental goal of our app. We came up with 3 interfaces: profile list, profile page, and the camera screen. In the mock-up of your interfaces as seen in Figure 3, all the interfaces were simple. The triangle style navigation, as seen on Figure 2, is simple and intuitive. We would work on this basic idea. Later, we needed to implement an Add Profile page to add profiles or else the app would be of no use. Although this Add Profile page is essential, we anticipate our user will only use this page when adding a new profile, which will not happen often. This is why we don't consider it an branding interface. Ofcourse, in later sections of this report, we have improved our interfaces greatly.

The contents of our app is the information and user of each profile. Our system stores the user data in a json file with a defined schema. The image of the profile is named according to the user information. The json file and also the images are stored in the phone storage as well. However, the images are stored in a designated app folder named "RememberMeApp", which can be accessed by the user on their phone using an app like File Manager on Android. When an image needs to be displayed, the Remember Me goes into the designated folder to retrieve the image. Since the data and image are stored locally or internally on the user's phone, no internet connection is needed to use the app for viewing profiles.

Now that we had a solid plan and a strong foundation, we need to develop our app. To develop and implement the app we used the Flutter and Dart software development technologies, which is developed by Google. We have employed defensive programming to

make sure the user can not mishandle or break the app. Below you can see a flow diagram of our app and how it can be navigated through

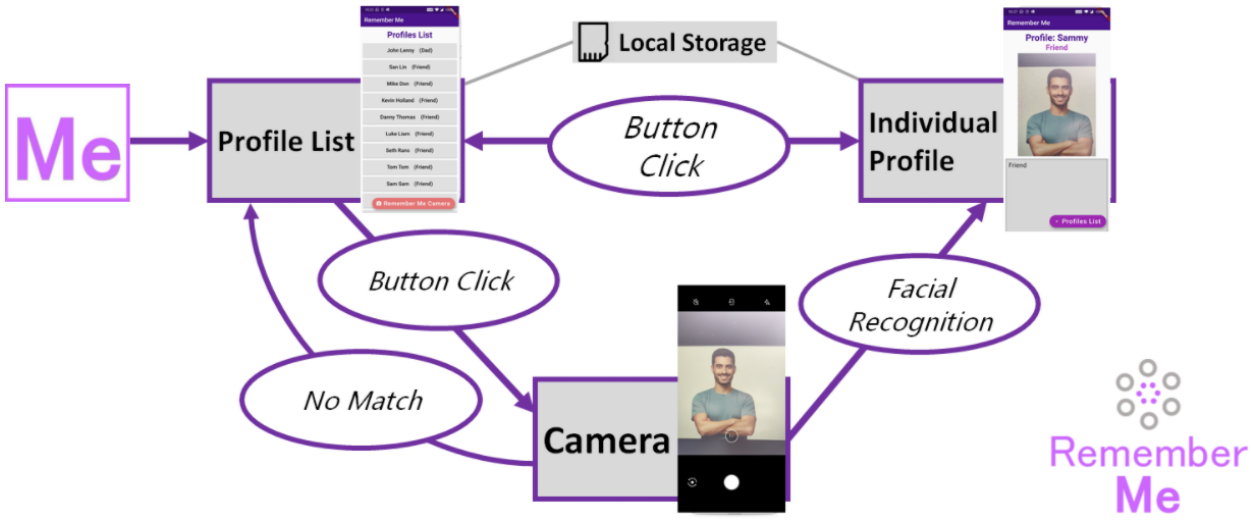

Figure 2-Flow diagram of navigation through Remember Me

Upon opening the app, the user will be presented with the profile list, from which they can choose to either open an individual profile manually, or instead choose to open the Remember Me camera, from which they can use the facial recognition feature to automatically load a profile. The user is also able to add new profiles and include any information that may help remind the user in the future. All data input into the app is stored locally, with only the metadata of each individual face being stored in Kairos's cloud.

To implement the Facial recognition feature of our app needed a facial recognition API, for which we chose Kairos.

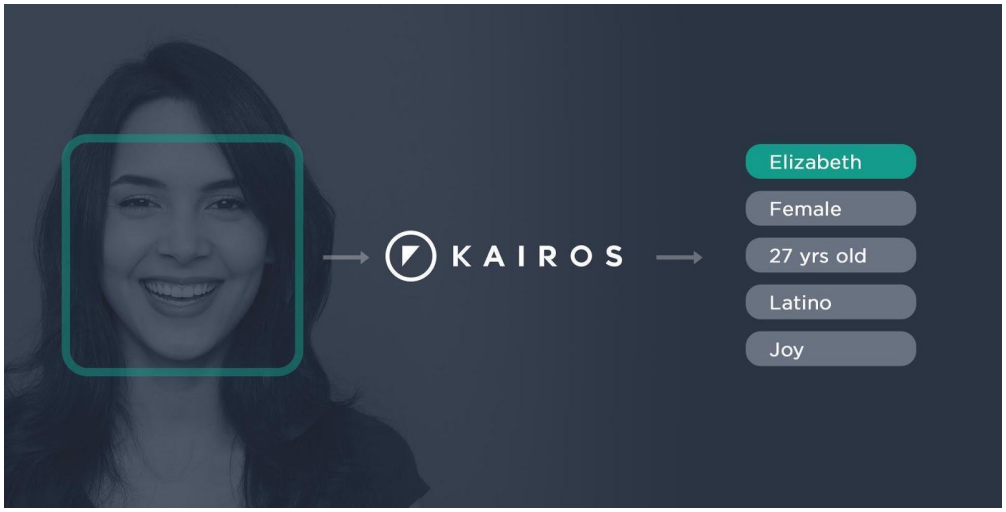

Figure 1-Facial Recognition API used in Remember Me. Picture Source: kairos.com.

Kairos is a well-respected facial recognition API which offers several features and services that we found to be very valuable when implementing our app. In order to make use of Kairos's facial recognition features we implemented three main API calls, Enroll, Detect, and Recognize.

The Enroll API call would be used when initially creating a new profile and storing a person's face within Kairos's cloud. We did this by converting the image of a person's face to base 64 and sending that data to Kairos, from which Kairos saves the metadata of that person's face for use in the future. The Detect API call is used to detect whether or not a person's face is visible in a given image. This is to ensure that a person's face is present in an image that is taken through the app. The final main API call we use is Recognize, with which we send the information of a person's face to Kairos, and if Kairos recognized the face as one of those already stored, then it returns a json which includes the name of the recognized persons face, with which we can load the persons profile and information and present it to the user.

Evaluation with Users and Partners

Over the course of developing Remember Me, we have conducted several surveys and user tests from which we have gained valuable feedback. From this feedback we have made very meaningful changes to our app ranging from our brand to the addition of new features to make the app more accessible.

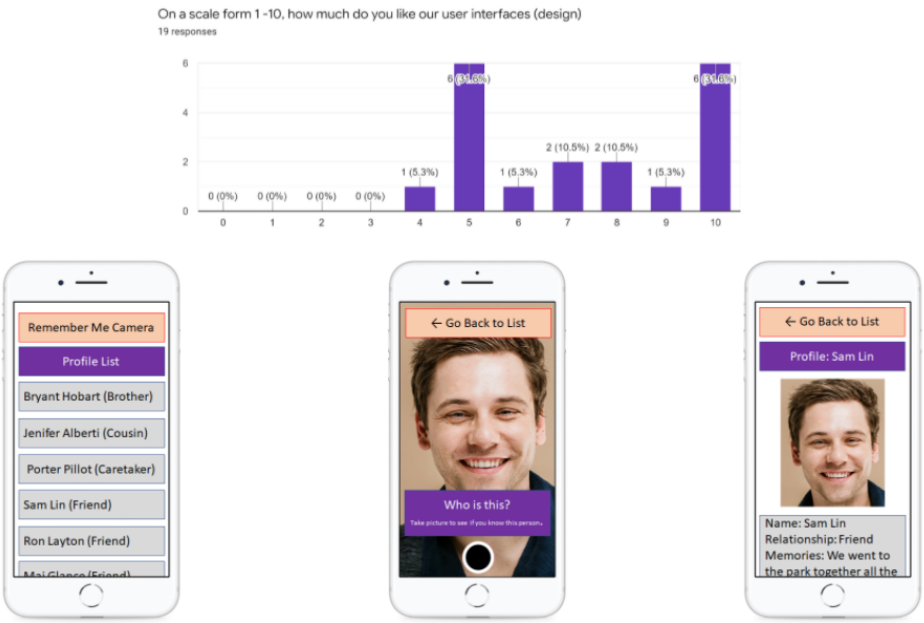

Figure 3-Survey conducted on Mock User interface

Shown above is one of the first surveys we did, where we asked for feedback on our mock interface. From the results of that survey, we saw that the reception wasn't as positive as we wanted it to be, so we made major changes until we arrived at our finished product which has surveyed much better.

We have also received feedback from our evaluators, some of which were very familiar with our intended users. Although we were the team that scored the highest out of all the team

on average, we got valuable feedback which we incorporated. For example, we have also added a text-to-speech feature for the profile page. The text-to-speech feature, which activates when the orange button is clicked, says all the information about the user in such a structured way that the user can comfortably understand. The text-to-speech feature was also requested from our surveys. We also got other feedback like implemented videos and speech-to-text.

Another major change we have made as a result of feedback was to our logo, from which we created our current logo, which we are very happy with. From our presentation to evaluators, we also received a request to implement a text-to-speech feature, in order to improve accessibility. We agreed that this feature was necessary given our design goals, and immediately got to work implementing it into our app. The changes we've made based on the feedback we've gotten are numerous, and we are thankful to all those who have provided us feedback through our surveys and hands-on tests. Unfortunately, due to the pandemic, we were not able to go out to nursing homes and test our app with the patients directly, however we have reached out to several providers and are on track to meet with them once the pandemic is over.

For our user test, we decided to test the phone app on our family since the pandemic posed a serious risk to people in nursing homes. We observed their behavior and how the app was used. Before letting them use the app, we briefly told them what the app was about in 3-4 sentences. We noticed that the profile list, profile, and camera were intuitive to use. However, when the user got to the Add Profile page, we spent a lot of time, which was no surprise to us. A speech-to-text feature on this page would have been really useful in terms of user accessibility and ease of use. Also from this test, we concluded that the text needed to be

bigger as one of my older family members had trouble reading what was on the screen. All the intended features of the Remember App, including the Add Profile page, facial recognition feature, and text-to-speech, were working properly. We anticipate that in real life testing that our features will work properly.

Discussions of Potential Markets and Future Work

As stated previously, over 50 percent of residents living in nursing homes suffer from dementia. Given the large concentration of our given demographic, our goals are to work with nursing homes to initially test our application with real users, and then to eventually partner with them. Given the subscription nature of the facial recognition API, we do not believe a fixed costs model would work in delivering our app on an individual basis. Assuming we have 1,000 customers and a use rate of 50 Kairos requests per day per person, the cost to operate our app is 2 dollars per person per month. If we have 100,000 customers, the cost to operate our app is 1.51 dollars per person per month. This is the minimum cost we can have. However, nursing homes are willing to pay more than we are offering, although we aren't charging much. We believe a monthly charge is our best option. By partnering with nursing homes, we will be able to not only gather information about our app usage, and get more accurate cost estimates, but we will also become more established in the market. Using our experience and name brand we can then potentially seek out a sponsor who will be able to allow us to publish our app into the market for free.

In the immediate future we will continue improving our app and adding features to aid with accessibility, such as speech-to-text. The speech-to-text will eliminate the need for the user to type on the phone screen. With the success of our text-to-speech feature, we believe the speech-to-text will also be very successful. Once we are able to get real user feedback, we can begin working on the necessary changes and work towards a full launch. To eliminate all

recurring costs, which will net us an extremely high margin, we can develop our own facial recognition software. Therefore, we might also work on our own facial recognition feature.

Branding

When the idea of Remember Me first came up, we were not sure what to call it. But we stuck to something that is simple, to the point, and perfect: Remember Me. From the very beginning we had a mission for our app to remember people in forms of profiles and help users remember, whether it be by the facial recognition feature or manually looking at profiles, those people in the profiles. We think it's a simple but powerful application. When thinking about our brand and what we want to represent us, we had three main themes in mind: calmness, simplicity, and the color purple. The reason why we wanted the color purple in our brand is because purple is the color of Alzheimer's awareness, which is something we want associated with us. With these criteria in mind we developed our current logo.

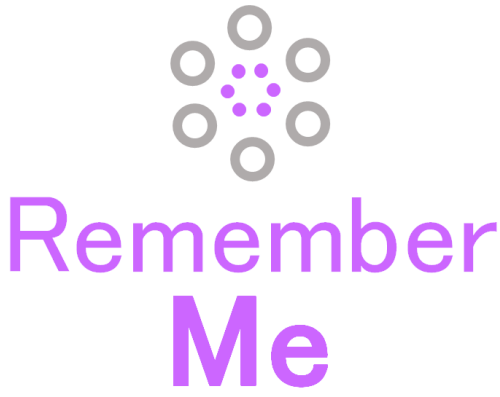

Figure 4-Remember Me Logo

We believe this logo does an excellent job of both presenting and representing who we are. We surveyed other logos and eventually came to choose this one, as we think it fits us best. In a similar vein, we developed our mobile app icon, shown below, which is used to launch our app.

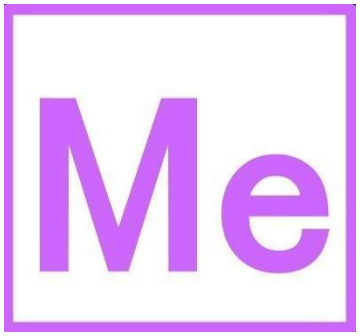

Figure 5-Remember Me app Icon

We believe this app icon does a good job of representing our app, and we think it is very easily recognizable as the app launcher for Remember Me. It is important for our users to locate our app. The purple-bordered white box with a big “Me” inside it does a great job of not only being cognizable but is also intuitive and gives an idea of what the app might be about.

Figure 6-Previous candidate Remember Me logo.

We did have previous Remember Me logos. Like the one just above, is a head with a light build in the middle. The light bulb has a pattern like a puzzle would have. We thought that this logo represented our app and intention very well. The light build and the puzzle pattern meant

that a person would suddenly or slowly recognize or remember someone, which is what our app is intended to do. However, this logo might seem too detailed and cluttered. Also in our survey, around 75% of our survey takers thought the current Remember Me logo was better. For these reasons, we decided to change to what is now our current logo, which represents a more technological side.

We have made several design changes to our app UI after receiving feedback. Changes include increasing the visibility, decreasing the clutter, as well as other small changes such as increasing the font to increase accessibility. We have arrived at a place that we are happy with and think our current UI is strides better then the initial UI we showed previously. If you would like to see our full UI, please watch our video.

Video Link- https://youtu.be/yKrc12HErPc

Acknowledgements

“The work in this project is our own. Any outside sources have been properly cited. The project is supported by the CCNY CEN Course Innovation Grant.”

Over the course of the past two semesters, we have gained a vast amount of knowledge that has culminated in Remember Me, an app we think has the potential to do some real good and help the unfortunate victims of Alzheimer’s Dementia. However, none of this would have been possible without the help of dozens of people such as Evaluators, survey respondents, and testers, who all gave us valuable feedback and allowed us to make meaningful positive changes to our project. We would also like to specifically Thank Professor Zhigang Zhu, for providing us a structured path to app completion, as well as constant feedback which led to significant changes that have resulted in a much better final product. Without the help of all those mentioned, we would not have been able to make an app half as good as what we have, and for that, we thank you.

We acknowledge and thank individuals: Professor Zhigang Zhu, Garardo A Blumenkrantz, Katherine Olives.

We acknowledge and thank our partners: The City College of New York, Goodwill NYNJ, Moxie Foundation, CCNY Campus Network, Rutgers University, and Lighthouse Guild.

We acknowledge and thank groups of people: evaluators, survey-takers, and test users.

Individual Contributions

Ahmdullah Samady

- Created current logo design and color scheme. Co-collaborated on past Remember Me logos. Has been in charge of the branding.
- Idea and Design:
    - Collaborated on refining idea and designs in the past year.
- Collaborated with partner on research and project proposal.
- System
    - Backend:
        - Fully responsible for functions for facial recognition technology (Kairos) features, including implementation and testing phases. This includes enroll, recognize and detect functions in system. This also includes setting up account.
        - Collaboration with partner on text-to-speech feature.
        - Collaborated with partner on camera features.
        - Collaboration with partner on testing of backend features.
        - Peer-checked some backend code. This included help on debugging.
        - Wrote other backend code, sections, and functions.
- Collaborated with partner on surveys and user testing.
- Collaborated with partner on Wiki, logs, and presentation.
- Collaborated with partner on writing this final report.

Ekramul Sawrid

- Created mobile icon image. Collaborated on past Remember Me logos.
- Idea and design:
    - Came up with the idea and initial design.
    - Collaborated on refining idea and designs in the past year.
- Collaborated with partner on research and project proposal.
- System
    - Frontend:
        - All frontend interfaces, elements, and components: Profile List, Profile, and Add Profile. This includes fonts, boxes, placement, and shapes.
        - Linked frontend components like buttons to code and created functions for receiving content.
        - Tested all frontend elements and components.
    - Backend:
        - Set up initial code of the app to which we write code and build the necessary features on.
        - Implementation of local storage (creating, storing, and receiving) on the phone, including folder creation on phone storage. This includes json file (and the schema) storage.
        - Implementation of navigation and screen changes of app, including data passing.
        - Collaborated with partner on text-to-speech feature.

        - Collaborated with partner on camera features.
        - Co-collaboration with partner on testing of backend features.
        - Peer-check backend code. This included help on debugging.
        - Wrote other backend code, sections, and functions.
- Co-collaborated with partner on surveys and user testing.
- Co-collaborated with partner on Wiki, logs, and presentation.
- Co-collaborated with partner on writing this final report.
- Created final video.

References

[1] Naqvi, Erum. “Alzheimer's Disease Statistics.” *Alzheimer's News Today*, 30 June 2017, alzheimersnewstoday.com/alzheimers-disease-statistics/.

[2] Duthey, B. (2013, February 20). *Background Paper 6.11 Alzheimer Disease and other Dementias* (Rep.). doi:https://www.who.int/medicines/areas/priority_medicines/BP6_11Alzheimer.pdf

[3] “Mobile OS Market Share 2019.” *Statista*, 17 Aug. 2020, www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/.

[4] Lindsay, Christopher. “Ten Apps (and Other Activities) For People With Dementia and Alzheimer's.” *Estate Planning & Elder Law Services, P.C.*, 26 Feb. 2020, www.formyplan.com/elder-law/alzheimers-dementia/2020/02/26/ten-apps-and-other-activities-for-people-with-dementia-and-alzheimers/.

[5] Sauer, Alissa. “7 Technological Innovations for Those With Dementia.” *Alzheimers.net*, 22 July 2019, www.alzheimers.net/9-22-14-technology-for-dementia.

[6] Giscle, Giscle. “Facial Recognition Use-Cases in All the Industries.” *Medium*, Giscle, 8 Apr. 2019, medium.com/giscle/facial-recognition-use-cases-in-all-the-industries-8c960aaf91fd.