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Personal Assistant App

Submitted By

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CMPE 297 – Special Topics
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Contents

1. Project Description

1.1. Abstract

Personal Assistant is an application built, specifically to target ease and comfortability of its users. The application consists of multiple features to assist its users in performing day to day activities and keeping record of them. The users can now make personal notes, check their daily health data, locate nearby places on maps, recognize objects they are not sure of as well as notify their close ones in case of an emergency caused due to fall.

Personal Assistant is a user-friendly application which requires users to simply create their accounts, and log in to the application in order to access their information and personal data. The application focuses on user's personal information security and thus implements the fingerprint scanner, in order to access the personal diary of the user. Application users can thus create their personal notes in their personal diary.

When it comes to locating nearby places, the application makes sure that the users retrieve the information about the places that they search for. Apart from this, the fall detection feature enabled in the application makes sure that the user is safe and in a right healthy condition.

1.2. Project Goals and Objectives

With this project, the idea was to achieve an application which acts as an all in one feature app for the users. The user has the power of iOS features in this one single application. The objectives were to implement the following kits in the application development.

1- Map Kit

To implement the detection of current location of the user as well as to help the user search for any nearby places based on their choice of interest.

2- NS File Manager

To save the personal notes that the user might add to his/her personal diary. These files were not saved just as .txt files, rather archived and saved to the local directory of the user's iPhone. Also, the objective was to make the personal diary as secure as possible, hence the fingerprint authorization was implemented. This, in turn made the personal diary available only the personal user of the iPhone.

3- ML Kit and Core ML

The implementation of image recognition was achievable with the help of the implementation of ML Kit. The use of Machine Learning Model, helps the users in identifying any item they are not sure about.

4- Core Motion

Core Motion was implemented to enable fall detection of a user. This feature acts as a security alert for the user to make sure that the person who has fallen is fine.

Core Motion was also implemented to construct the health dashboard of the user. This displays the number of steps a person has walked each day and shows a history of his trekked steps.

These goals were achieved with the implementation of the main features if iOS application development.

1.3. Background, Problems and Motivation

The application is constructed keeping in mind, the feasibility of an end user. The user- friendly Interface consists of simple and elegant clickable list items. The major features of the application are listed on the main dashboard of the user. Every functionality is a click away from the user.

The application provides its users, an easy assistance for day to day activities. The users would not need to access different applications for their tasks to be done. Instead, they can achieve all their goals through this single task.

Initially, the problems faced by the team were to implement the trained Machine learning model in order to give accurate results for images captured. But Apple provides efficient trained models, some feasibly lesser in size and easily interactable. Thus, we used a similar ML model and the results were accurate.

The motivation of this project was to create a solution for every iOS device user which was efficient as well as simple to use at the same time. The results were satisfactory.

1.4. Project Application and Impact

The project can be applied for multiple uses. Users can access the application if they would like to make any personal notes and keep them private. Not only this, but the personal diary can also be used to keep notes as a reminder and make different lists that need to be accessed every now and then.

Similarly, the user can access iOS Maps through Personal Assistant application. Alongside accessing the current user location, whatever place or feature the user would like to search, they can type in the search bar and search related locations would be place-marked on the map for the ease of locating for the user.

If the user would like to keep track of the steps walked, or the floors ascended/ descended every day, he/she can easily access that information. It is displayed to the user in a very systematic manner.

The project is applicable in conditions where the users are old-aged and need to be kept track of. The fall detection feature helps in being notified if a fall is detected. This feature can be enabled as well as disabled by the user anytime.

Lastly, there are situations when a person does not recognize what an item is. Instead of doing a google search every time, a personal assistant user just needs to click a picture of the item, and the application displays the result, recognizing the item. The item name is spoken out loud by the application and it makes sure to let the user know how much confident the application is, about its result.

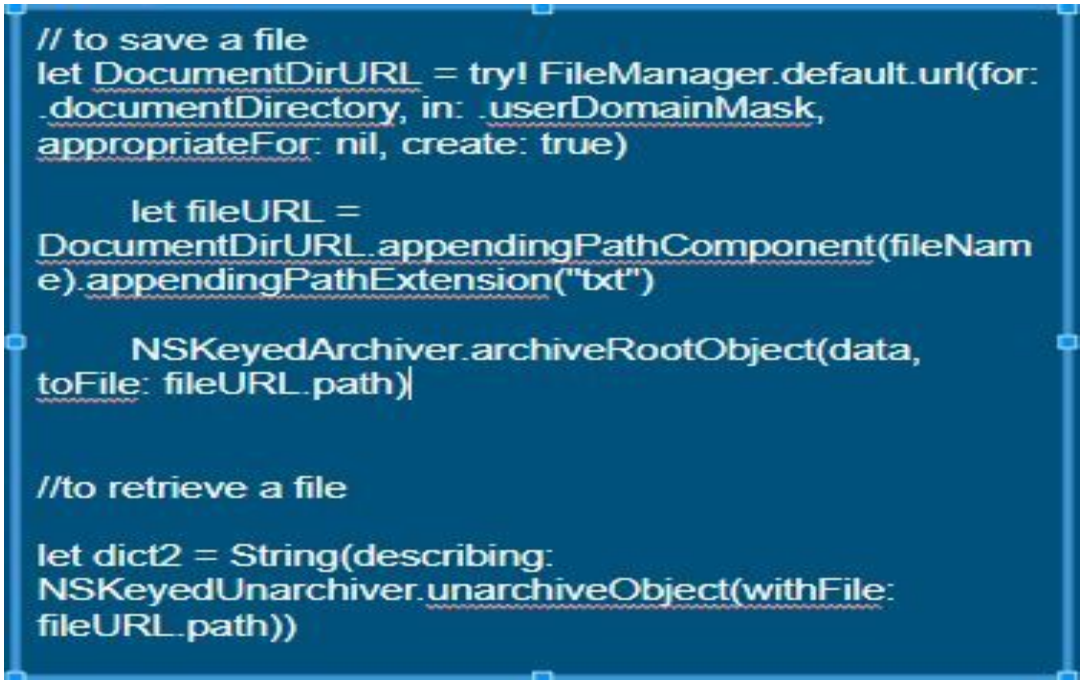
These are small day to day activities that a person goes through and if they are all available to the user in a single application, it leaves a significant impact in their lives.

2. Requirements

Functional Requirements

Personal Diary

A user can save the content on the phone using this functionality
It allows only authorized users through fingerprint authentication
The main logic of personal diary is presented in below screenshot:



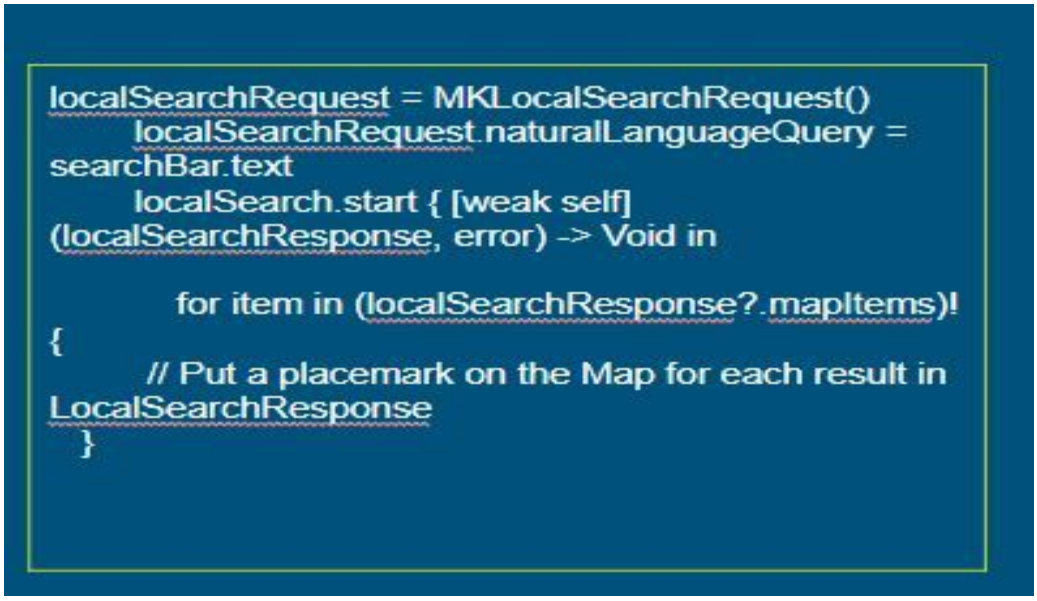
```
// to save a file
let DocumentDirURL = try! FileManager.default.url(for:
.documentDirectory, in: .userDomainMask,
appropriateFor: nil, create: true)

        let fileURL =
DocumentDirURL.appendingPathComponent(fileNam
e).appendingPathExtension("txt")

        NSKeyedArchiver.archiveRootObject(data,
toFile: fileURL.path)


//to retrieve a file

let dict2 = String(describing:
NSKeyedUnarchiver.unarchiveObject(withFile:
fileURL.path))
```

Nearby Location

User can search nearby places using this functionality

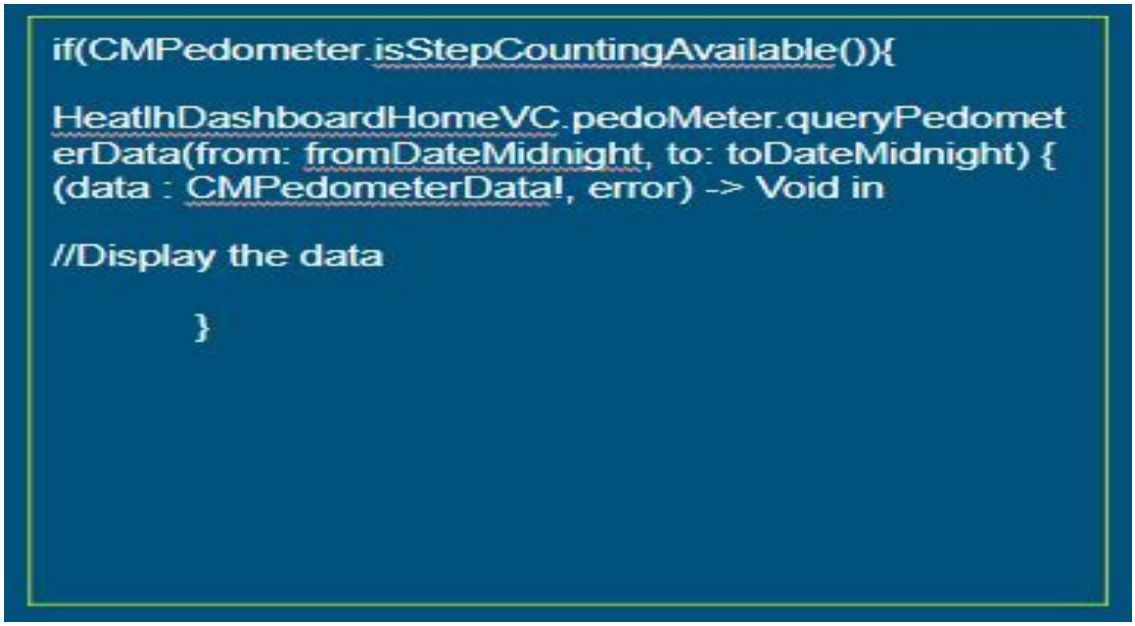
We are using Core location and map kit to achieve this feature

The main logic of Nearby location is presented in below screenshot



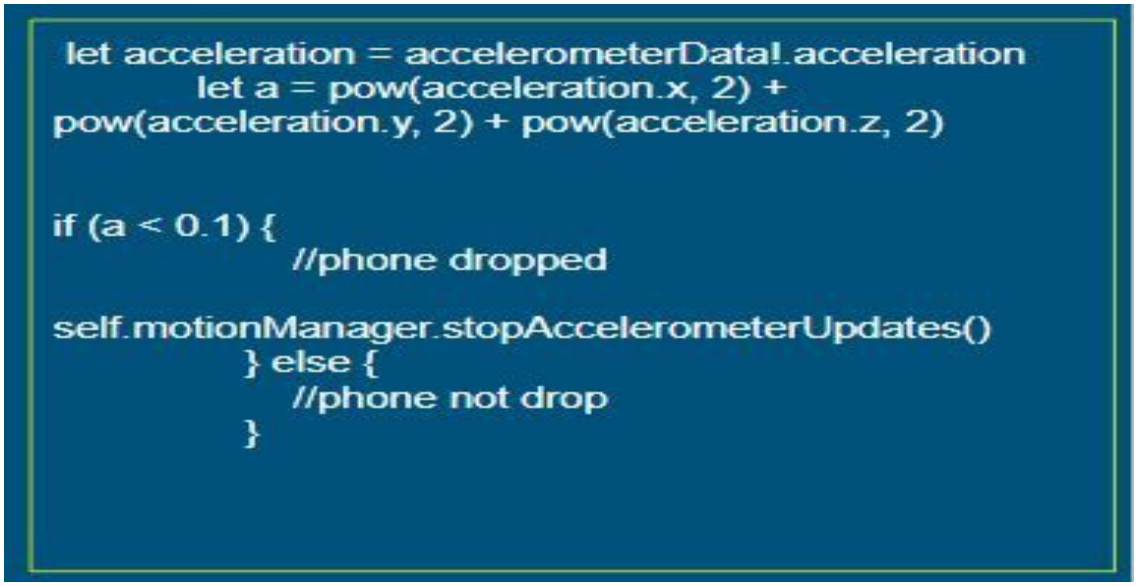
Step Count

The number of steps a person has done in a day is shown using this functionality
Daily activity of a person can also be tracked with this feature
The main logic of this feature is included in the below screenshot



Fall Detection

The fall of a person can be detected using this functionality
Using coreMotion we have detected the fall of a person
when ever accelerometer goes less than 0.1 the fall occurs.based on this logic we have implemented the feature
The main logic of Fall detection is included in below screenshot



```
let acceleration = accelerometerData!.acceleration
        let a = pow(acceleration.x, 2) +
pow(acceleration.y, 2) + pow(acceleration.z, 2)


if (a < 0.1) {
                //phone dropped

self.motionManager.stopAccelerometerUpdates()
            } else {
                //phone not drop
            }
```

Image recognition

Image recognition functionality is implemented using Squeeze Net model

For invoking audio and camera they are using AV Foundation

The main logic of Image recognition functionality is included in below screenshot

```
do {
            let model = try VNCoreMLModel(for:
SqueezeNet().model)
            let request = VNCoreMLRequest(model:
model, completionHandler: resultsMethod)
            let handler =
VNImageRequestHandler(data: photoData!)
            try handler.perform([request])
        } catch {
            debugPrint(error)
        }
```

3. iOS UI Design Principles

We have followed the standard principles of IOS UI designs keeping it simple and user friendly. To make sure that the app developed can be used in any device, we have also included constraints on the storyboard to maintain the frame throughout the devices. The design principles used are as follows -

3.1 Consistency and Clarity

The entire application has a consistent font size, font color without any drastic color contrasts. The most important features are highlighted and represented in the form of pictures for clarity.

3.2 Aesthetic Integrity

The Personal Assistance app maintains a clear UI by representing the core main functionalities such as Personal diary, Fall detection, Health rate step count, Nearby location and Image recognition with the necessary pictures to guide the user. The app is simple enough for the users to understand and use.

3.3 User permissions and control

The app asks the user for permission to enable location in the device hence giving the control to the user. The app also helps the user to secure the data in the app such as Personal Diary, by enabling Touch ID. The data written in the Personal diary is additionally archived.

3.4 Feedback

Throughout the app the user receives the necessary feedback required. When a fall is detected by the user, the user receives an alert that they have fallen. The image recognition has an in built voice to assist the user further.

4. Storyboard and Wireframes

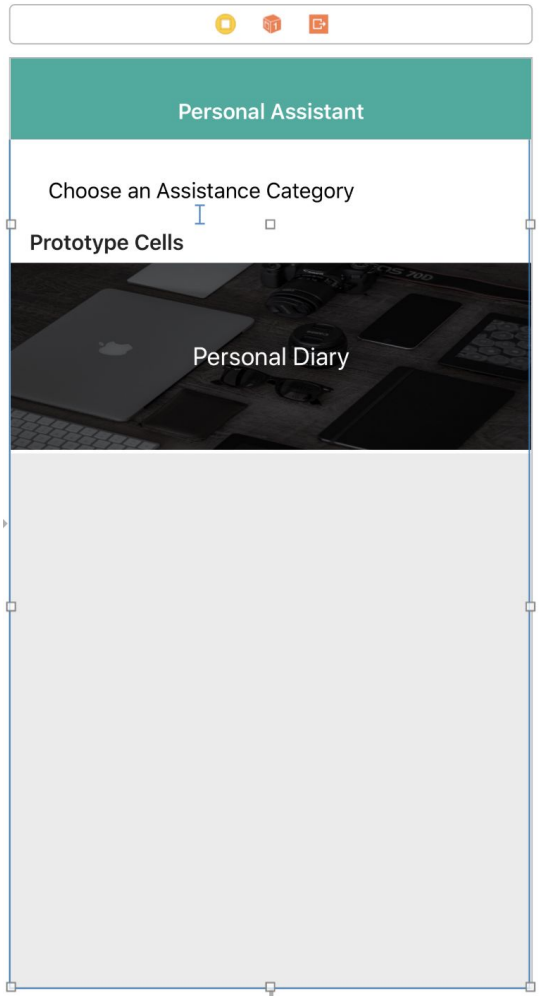


Fig: Home page storyboard

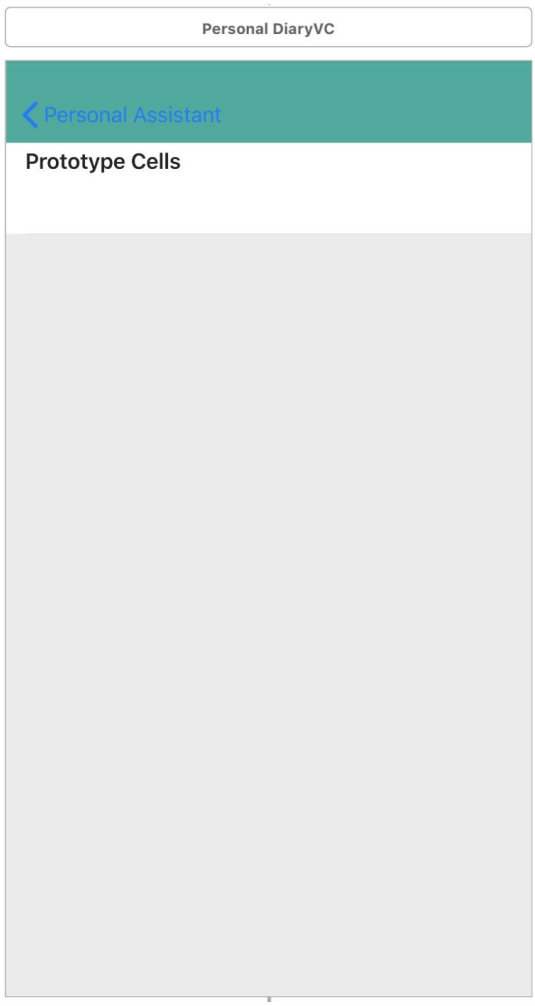


Fig: Personal diary Storyboard

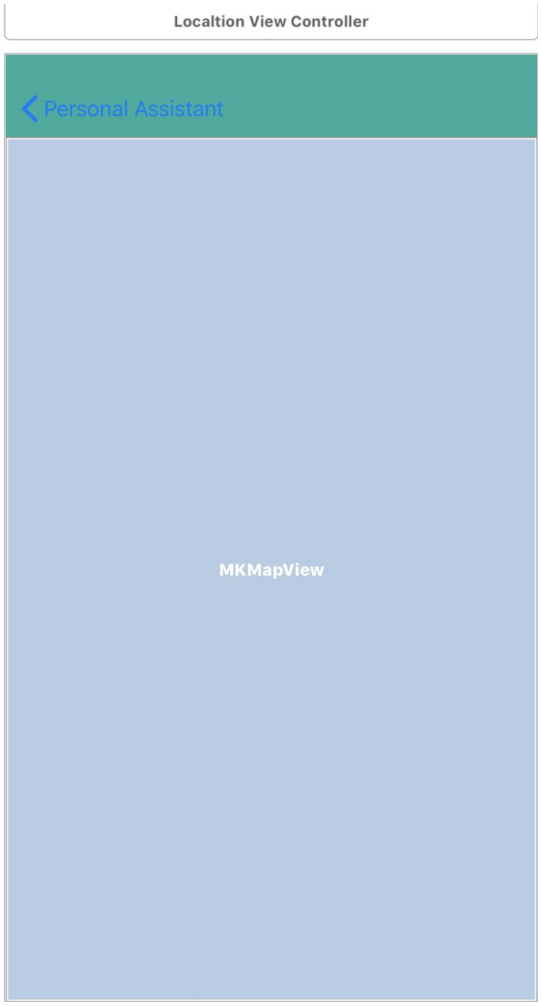


Fig: Nearby Location Storyboard

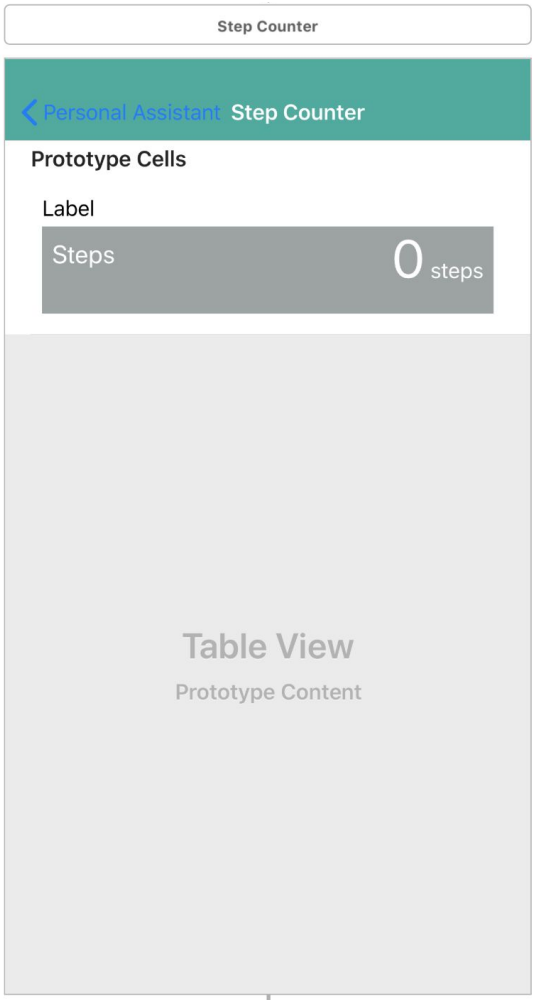


Fig: Step count storyboard

Fig: Fall detection story board

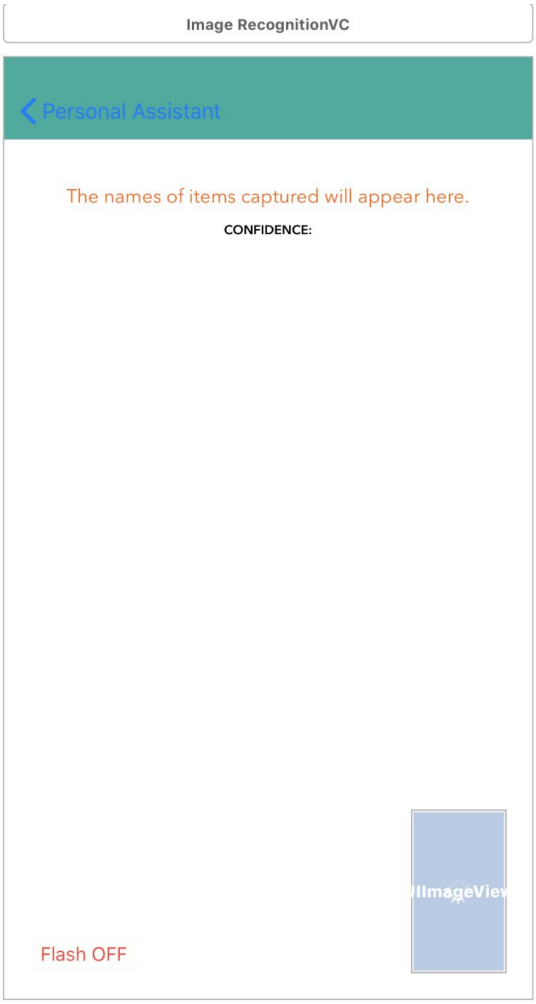


Fig: Image Recognition Storyboard

5. High Level Architecture

The high level architecture is as follows:

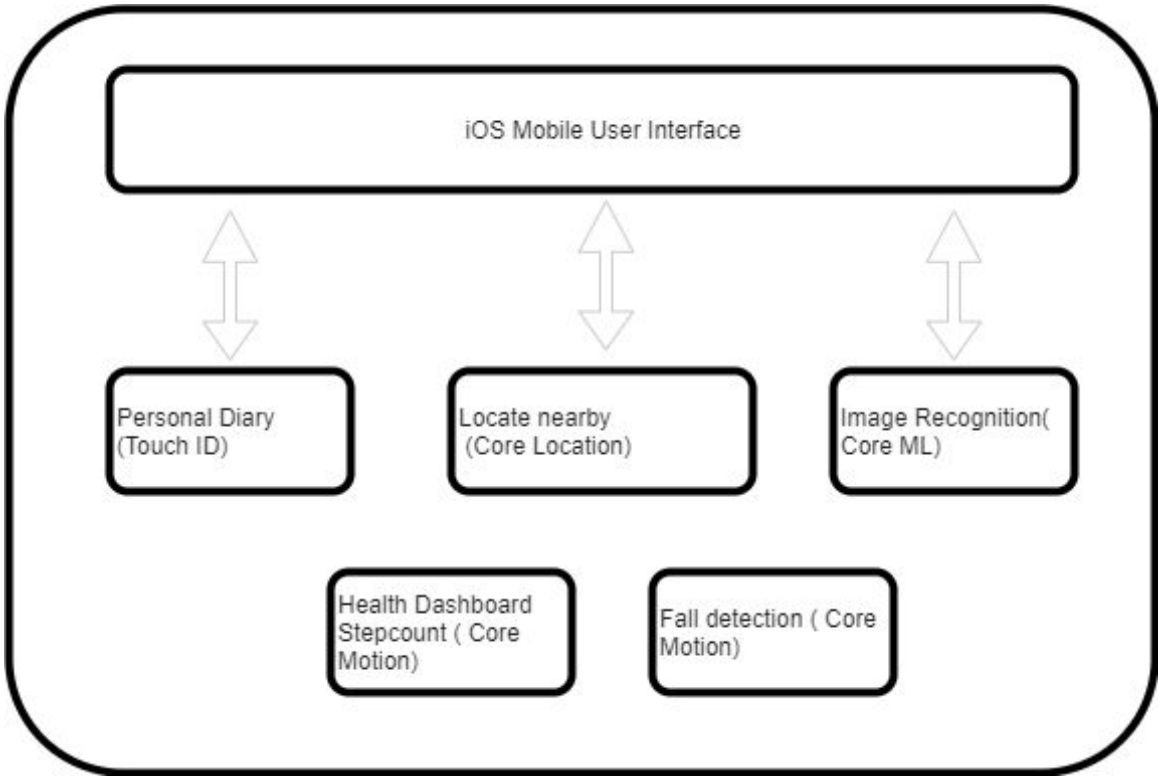


Figure: High Level Architecture

6. Component Level Design

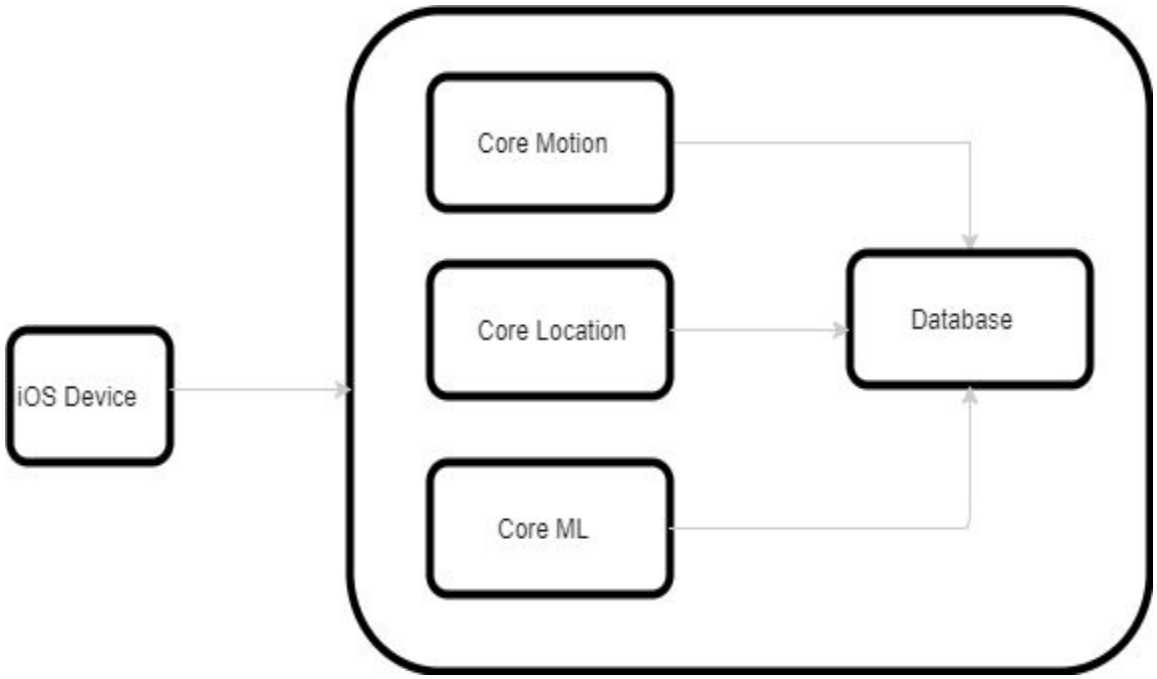


Figure: Component Level Design

iOS Device:

The user is required to own an iOS device to install and use the app. The iOS app installed comprises of many iOS kits as follows.

Core Motion:

The app utilises Core motion to get accelerometer, magnetometer and pedometer data. The Core Motion further utilizes CMMotionManager, CMPedometer and CMMotionActivityManager classes to get the data required.

Core Location:

The application makes use of Core Location. Core location in turn uses CLLocationManager which provides a search bar for the user to search for nearby places. Core Location provides the services that allows the application to determine the location, latitude, longitude, orientation and position of the device.

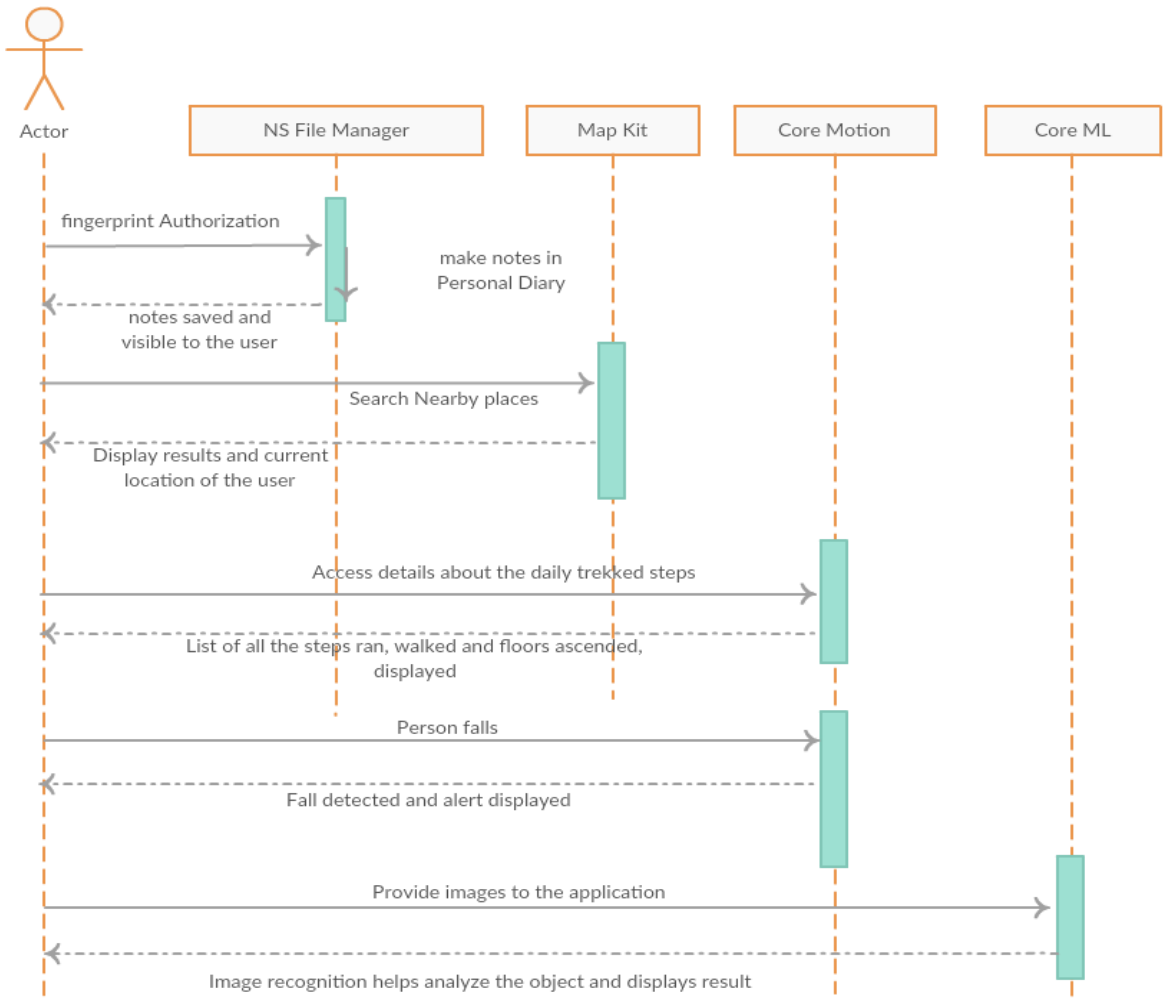
Core ML:

The application uses Core ML to integrate trained models into the iOS device. Squeezenet Machine learning model is the trained model that has been used for Image recognition in the application. Additionally, the app uses AV Foundation class for audio and camera features.

Database:

The data obtained from the device by CoreML, Core Location and Core Motion is stored in the database for further analysis.

7. Sequence Diagram



8. iOS Technologies Used

The following are the technologies used in the app.

- NSFileManager
- LocalAuthentication
- CoreLocation
- MapKit
- CoreMotion
- CoreML

9. Testing

In order to perform testing, we have used manual testing. We have tested the app after each feature. Also we have tested the app on emulator and iphone 6s as well. The app was tested after each step of integration of code.

10. User Interface - Screens

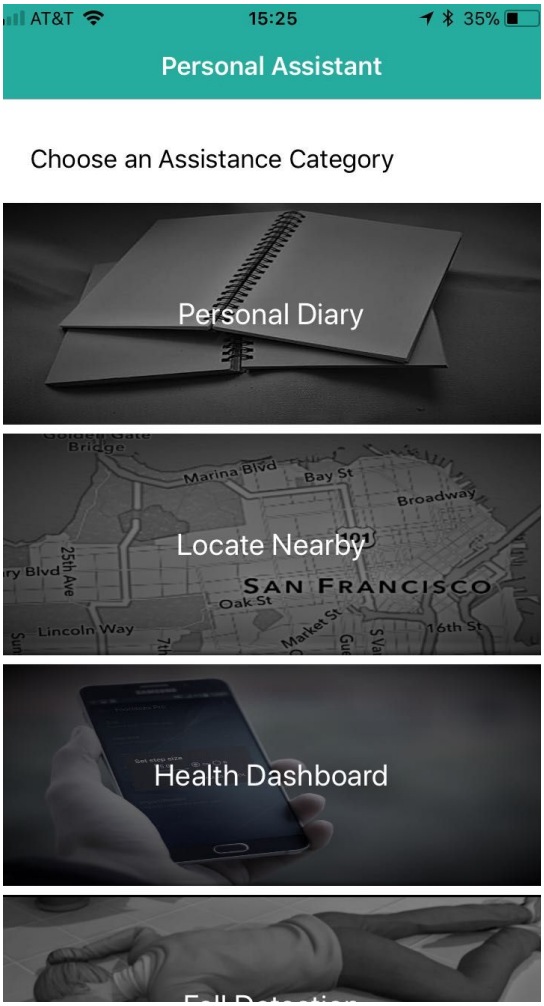


Fig: Home Page

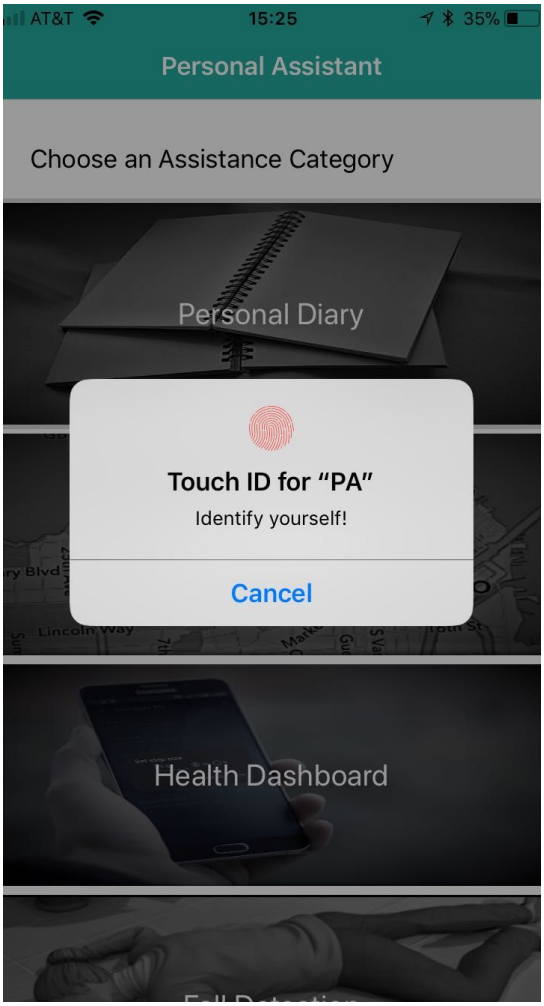


Fig: Local Authentication

Fig: Fall detection

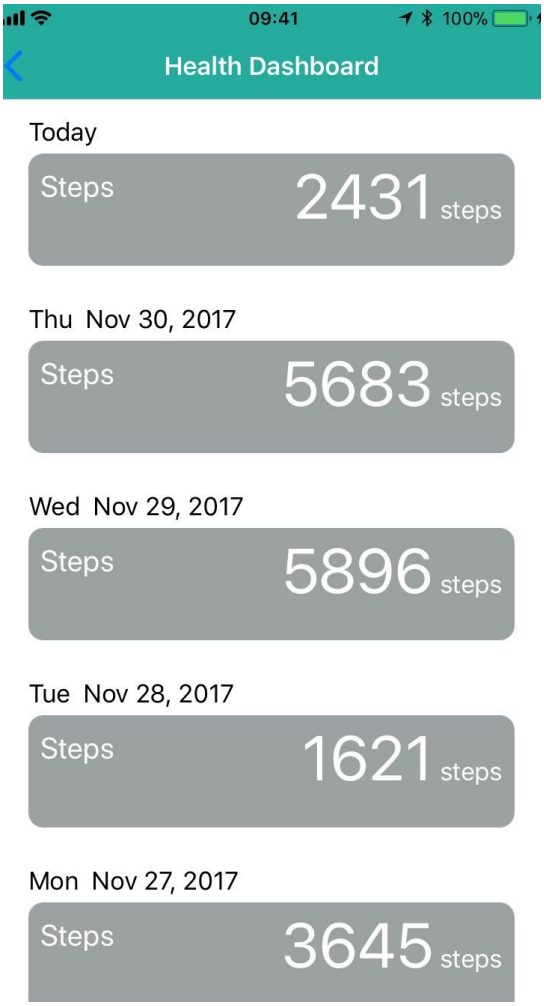


Fig: Step count

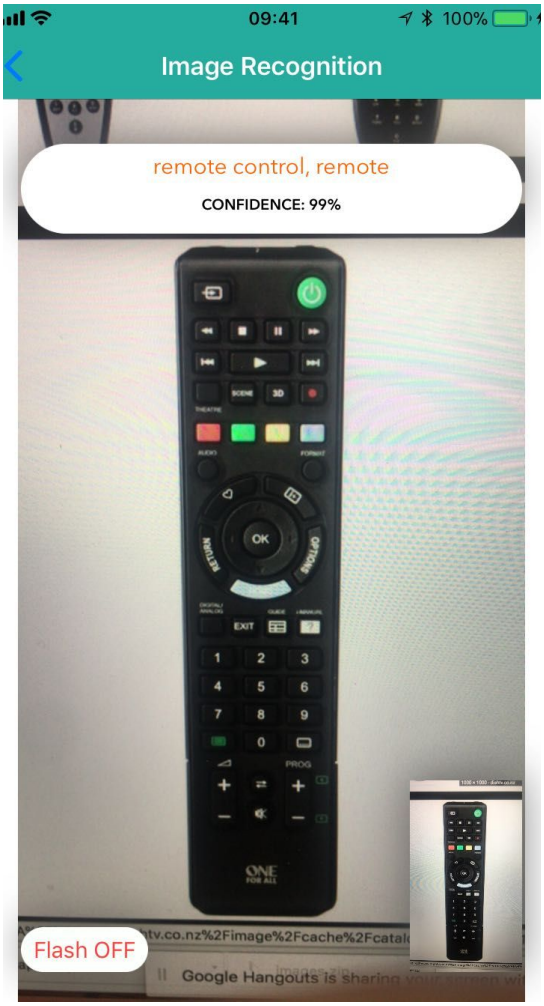


Fig: Image Regconition

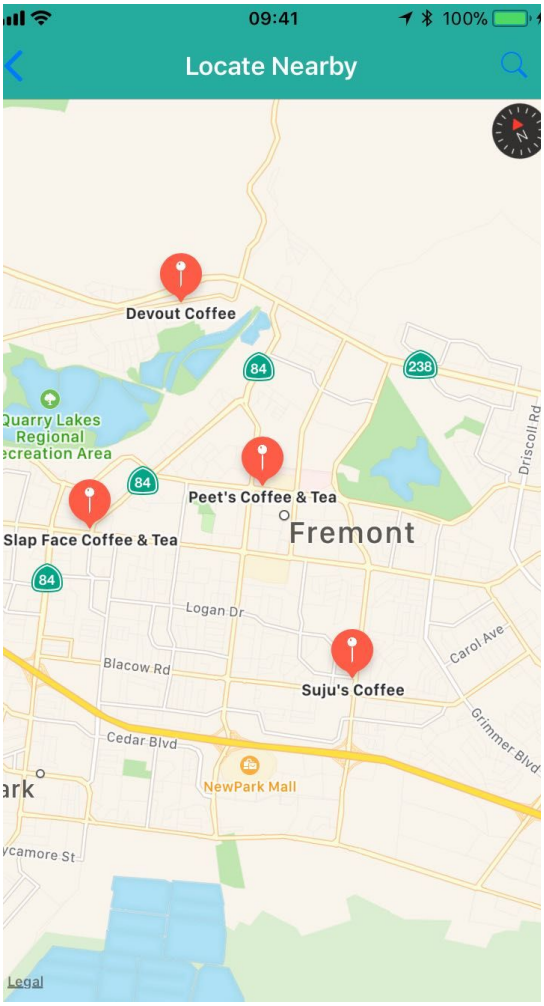


Fig: Nearby Location

11. Conclusion

Personal Assistant is an all in one application that focuses on fulfilling basic requirements of the users. The use cases were implemented keeping in mind, the daily-use scenarios of iOS users. Also, the application interface was designed keeping in mind the interface that would visually speak about the functionalities.
The application provides its users with the personal diary, location detection, image recognition, fall detection and health dashboard.

12. Future Scope

This app is extensible. Many more features can be added to app. Addition of HomeKit, Sirikit, Arkit makes the app powerful and gives the user the power of iphone in one app.

13. References

https://developer.apple.com/machine-learning/
https://developer.apple.com/design/
https://developer.apple.com/develop/
https://developer.apple.com/swift/

14. Presentation

14.1 Presentation link

https://drive.google.com/open?id=1-3t_3qJoby3Il9CUTOxvufSLs65W3PCZLXEgGQNfYd8

14.2 Code Link

https://github.com/mohamadkhan19/CMPE297_SpecialTopics_FinalProject_PersonalAssistant/tree/final-version