

Criterion C: Development

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1. Techniques Used

Multi-user environment	File reading	Connection with Apple Map	Database recording
Notification system	Mail integration	Nested loops	Two-dimensional arrays
Hierarchical data structure	UserNotifications, UIKit, PDFKit, MapKit (API).	Loops	

2. The Structure of the Application

MeDaily Reminder is a medicine reminder application for elderly people who often forget to take medicines. The name of the application is the combination of “Me”, “Daily” and “MeD” which is the abbreviation for medicine. The background colour of the application is chosen carefully as navy blue (#12185A) for a better user experience. According to research¹, it is the favourite blue tone for the elderly that creates a calming and confident atmosphere that effectively fits the purpose of the application.

Declaration types:

- **@IBOutlet² var**; declares that the Interface Kit can identify the property and synchronize with the display.
- **override func viewDidLoad**; is used for loading the view of these variables.
- **@IBAction func**; declares actions.
- **let³**; declares constant variables.
- **guard let⁴**; is used for exiting the function/condition.

When the user scrolls down the screen, she can go back to the previous screen.

¹ Eldertech, “*Designing Technology for Seniors - Color in User Interfaces for Elderly People.*”, 22 Apr. 2017.

² Apple Inc., “*Concepts in Objective-C Programming.*” *Outlets*, 9 Jan. 2012.

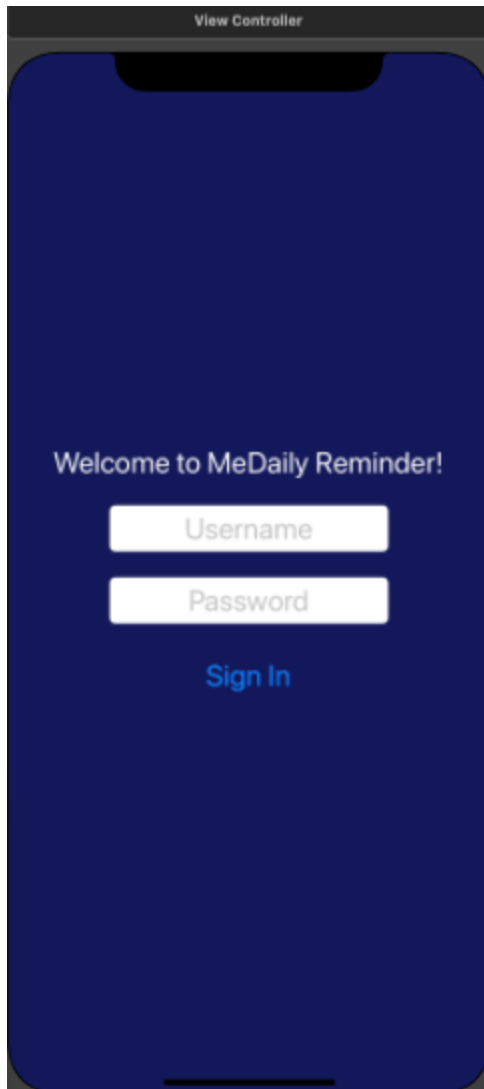
³ Agoi Abel, “*The ‘Let’ Keyword in Swift.*”, Medium, 8 Jan. 2018.

⁴ Paul Hudson, “*When to Use Guard Let Rather than If Let.*” Hacking with Swift, 5 June 2020.

2.1. Launch Screen

The user enters the Username and Password. It creates a multi-user environment. As the client is just Ms G for now, no authentication is required to keep data safe, but in the next versions of the application, Google Firebase Authentication will be used.

Screenshot 1: Launch Screen



Screenshot 2: Launch Screen Code (ViewController⁵)

```

8  import UIKit
9
10 class ViewController: UIViewController {
11
12     @IBOutlet var welcomeLabel: UILabel!
13     @IBOutlet var usernameField: UITextField!
14     @IBOutlet var passwordField: UITextField!
15     @IBOutlet var signInButton: UIButton!
16
17
18     override func viewDidLoad() {
19         super.viewDidLoad()
20
21     }
22
23     @IBAction func signInGo(_ sender: UIButton) {
24
25     }
26 }

```

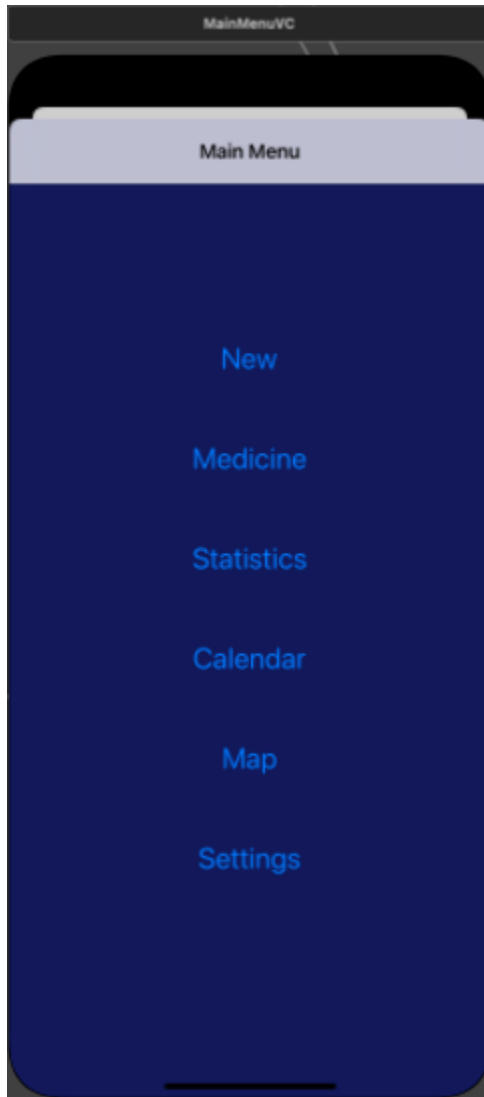
In order to bind the UI to the code, UIKit as an API frame is imported. Between 12-15, variables are identified to show the launch screen. Line 23 represents the sign-in button as a function: When the user presses Sign In, the function works as showing the Main Menu screen.

⁵ See Appendix “Variable Tables” [Table 1].

2.2. Main Menu Screen

It consists of 6 submenus: New, Medicine, Statistics, Calendar, Map and Settings.

Screenshot 3: Main Menu Screen



Screenshot 4: Main Menu Code (MainMenuVC⁶)

```

27
28 class MainMenuVC: UIViewController {
29     ...
30     ...
31     @IBOutlet var newButton: UIButton!
32     @IBOutlet var medicineButton: UIButton!
33     @IBOutlet var statisticsButton: UIButton!
34     @IBOutlet var calendarButton: UIButton!
35     @IBOutlet var settingsButton: UIButton!
36     ...
37     ...
38     override func viewDidLoad() {
39         super.viewDidLoad()
40         ...
41         ...
42     }
43
44 }
45

```

Between 31-35, the variables are identified. The user can switch between the other view controllers, so this screen has the most connections to the other screens.

⁶ See Appendix “Variable Tables” [Table 2].

2.3. New Medicine Entry Screen

When the user presses the “New” button on the main screen, some specific parameters are shown.

Screenshot 5: New Medicine Entry Screen

```

107
108 class NewEntryVC: UIViewController {
109     ...
110     @IBOutlet var nameField: UITextField!
111     @IBOutlet var typeField: UITextField!
112     @IBOutlet var amountPerDoseField: UITextField!
113     @IBOutlet var frequencyField: UITextField!
114     @IBOutlet var strengthField: UITextField!
115     @IBOutlet var mealField: UITextField!
116     @IBOutlet var morningNextButton: UIButton!
117     ...
118     override func viewDidLoad() {
119         super.viewDidLoad()
120         ...
121     }
122     ...
123 }
124

```

Screenshot 6: New Medicine EntryCode (NewEntryVC⁷)

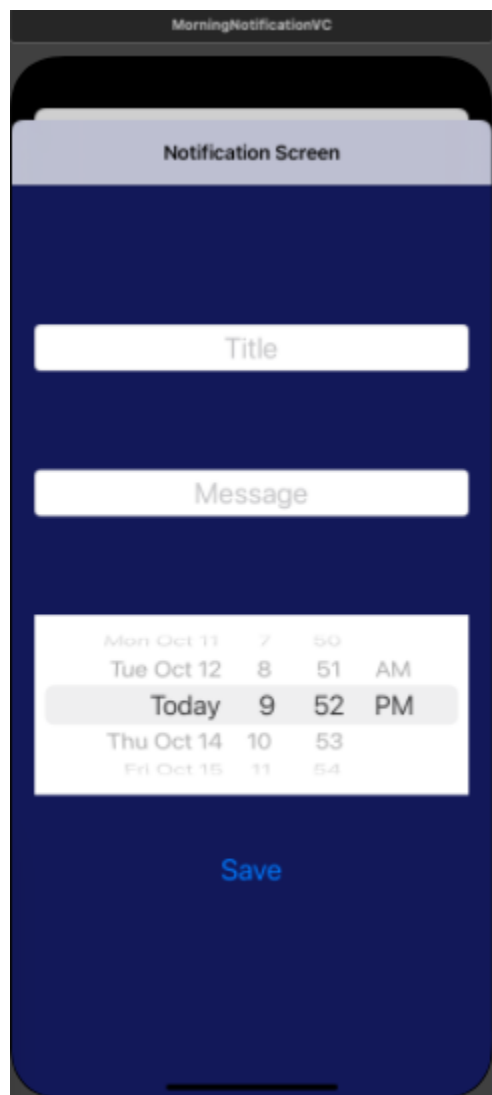
Between 110-116, all the variables for this screen are identified. After filling in the parameters, the client presses the Next button, and the information she has filled in is saved to the medicine database⁸.

⁷ See Appendix “Variable Tables” [Table 3].

⁸ See Appendix “Medicine Database JSON File”.

2.4. Notification Editing Screen

Screenshot 7: Notification Editing Screen (morningNotificationsVC⁹)



The client freely changes the title and the message of the notification and chooses the time for medicine.

To access the notification centre, `UserNotifications` as an API is imported to the code. The names of the variables start with morning because at the beginning, I planned to create three notification pages for different times of day, but I thought that this feature wouldn't be useful for the elderly. Between 137-145, there is a connection to Apple device settings that the application asks the user to receive notifications. If the user doesn't allow notifications, the permission will be denied, so the user should allow the notifications. Between 148-205, `morningSaveAction` as a function is declared. When the time the user chooses to get a reminder notification comes, the application triggers the notification center to send it to the user's screen. In this situation, when the user presses on the reminder notification, she opens the application, so she confirms that she takes her medication. In the first situation, if she doesn't press the reminder notification, the algorithm understands that Ms G didn't take her medicine. So, the

application decides to send another reminder notification. Likewise, in the first situation, if the user doesn't press the reminder notification, this time, the application won't trigger the notification center. So, the application sends a reminder email to the companion. Between 207-214, a function is declared for indicating the format of the banner when the user saves the notification.

⁹ See Appendix "Variable Tables" [Table 4].

Screenshot 8: Notification Editing Code

```

125
126 import UserNotifications
127
128 class morningNotificationsVC: UIViewController {
129     @IBOutlet var morningNotificationTitleField: UITextField!
130     @IBOutlet var morningNotificationMessageField: UITextField!
131     @IBOutlet var morningNotificationDatePicker: UIDatePicker!
132
133     let notificationCenter = UNUserNotificationCenter.current()
134
135     override func viewDidLoad() {
136         super.viewDidLoad()
137         notificationCenter.requestAuthorization(options: [.alert, .sound]) {
138             (permissionGranted, error) in
139             if(!permissionGranted){
140                 print("Permission denied.")
141             }
142         }
143     }
144
145     @IBAction func morningSaveAction(_ sender: Any) {
146         notificationCenter.getNotificationSettings { (settings) in
147             DispatchQueue.main.async {
148                 let title = self.morningNotificationTitleField.text!
149                 let message = self.morningNotificationMessageField.text!
150                 let date = self.morningNotificationDatePicker.date
151                 if(settings.authorizationStatus == .authorized) {
152                     let content = UNMutableNotificationContent()
153                     content.title = title
154                     content.body = message
155
156                     let dateComp =
157                         Calendar.current.dateComponents([.year, .month, .day, .hour, .minute],
158                                                         from: date)
159                     let trigger = UNCalendarNotificationTrigger(dateMatching: dateComp,
160                                                                 repeats: false)
161                     let request = UNNotificationRequest(identifier: UUID().uuidString,
162                                                         content: content, trigger: trigger)
163
164                     self.notificationCenter.add(request) { (error) in
165                         if(error != nil) {
166                             print("Error " + error.debugDescription)
167                             return
168                         }
169                     }
170                 }
171             }
172         }
173     }
174 }

```

```

172 .....let ac = UIAlertController(title: "Notification Scheduled", message:
173 .....    "At " + self.formattedDate(date: date), preferredStyle: .alert)~
174 .....ac.addAction(UIAlertAction(title: "OK", style: .default, handler: {
175 .....    (_, in) ~
176 .....}) ~
177 .....self.present(ac, animated: true)~
178 .....} ~
179 .....} ~
180 .....let ac = UIAlertController(title: "Enable Notifications?", message:
181 .....    "To use this feature you must enable notifications in settings.",
182 .....    preferredStyle: .alert)~
183 .....let goToSettings = UIAlertAction(title: "Settings", style: .default) {
184 .....    (_, in) ~
185 .....    guard let settingsURL = URL(string:
186 .....        UIApplication.openSettingsURLString) ~
187 .....    if(UIApplication.shared.canOpenURL(settingsURL)) ~
188 .....    {
189 .....        UIApplication.shared.open(settingsURL) { (_, in) ~
190 .....        } ~
191 .....    } ~
192 .....    } ~
193 .....    } ~
194 .....    } ~
195 .....    } ~
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209 .....    } ~
210 .....    } ~
211 .....    } ~
212 .....    } ~
213 .....    } ~
214 .....    } ~
215 .....    } ~

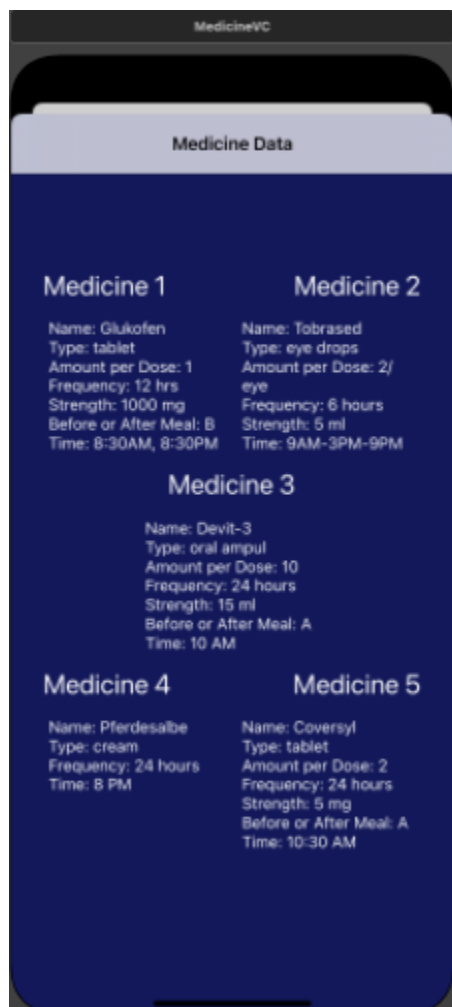
```

2.5. Medicine Data Screen

It shows the medicines that the client has filled before. In the application, Ms G uses only 5 different medicines, so there are only 5 areas for her to see their information.

Screenshot 9: Medicine Data Screen

Screenshot 10: Medicine Data Code(MedicineVC¹⁰)



```

89
90 class MedicineVC: UIViewController {
91     @IBOutlet var med1Label: UILabel!
92     @IBOutlet var med2Label: UILabel!
93     @IBOutlet var med3Label: UILabel!
94     @IBOutlet var med4Label: UILabel!
95     @IBOutlet var med5Label: UILabel!
96     @IBOutlet var med1Text: UITextView!
97     @IBOutlet var med2Text: UITextView!
98     @IBOutlet var med3Text: UITextView!
99     @IBOutlet var med4Text: UITextView!
100    @IBOutlet var med5Text: UITextView!
101    override func viewDidLoad() {
102        super.viewDidLoad()
103    }
104    }
105
106 }

```

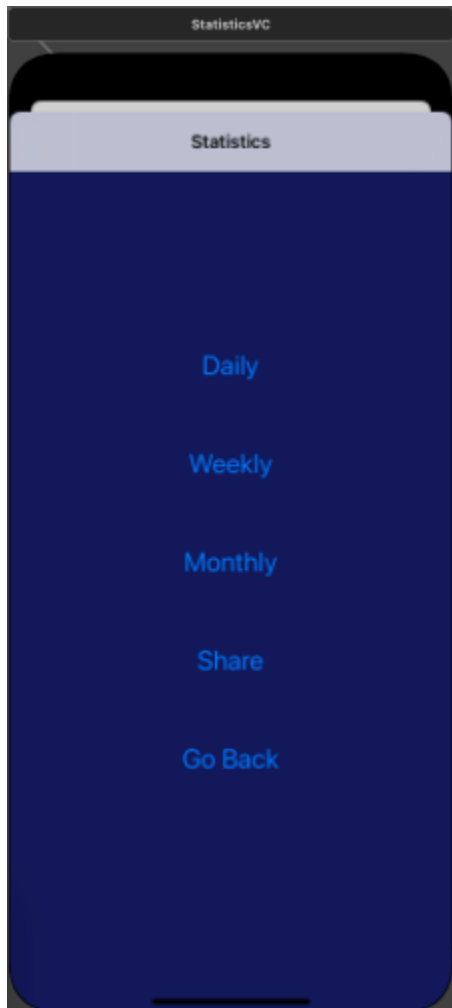
The client's previously filled medicines are in the database. Between 91-100, the variables are identified. The medicine information filled in New screen is saved to the database. So, Medicine Data screen is the visual appearance of the medicines.

¹⁰ See Appendix "Variable Tables" [Table 5].

2.6. Statistics Screen

It is used to looking at daily, weekly and monthly reports for the medicine.

Screenshot 11a: Statistics Screen



Screenshot 11b: Daily Report Screen

Name of the Medication	When to Take	Time Taken	Errors
Glukofen	8:30 AM 8:30 PM	8:35 AM 8:30 PM	Not pressed the first notification button. Pressed the second notification button.
Tobrased	9 AM 3 PM 9 PM	9 AM 3 PM 9 PM	Successfully taken.
Devit-3	10 AM	10 AM	Successfully taken.
Pferdesalbe	8 PM	8 PM	Successfully taken.
Coversyl	10:30 AM	10:45 AM	Not pressed the notification button the first and second time. Email is sent to the companion

```

74 class StatisticsVC: UIViewController {
75     ...
76     @IBOutlet var dailyButton: UIButton!
77     @IBOutlet var weeklyButton: UIButton!
78     @IBOutlet var monthlyButton: UIButton!
79     @IBOutlet var shareButton: UIButton!
80     @IBOutlet var goBackStatisticsButton: UIButton!
81     ...
82     ...
83     override func viewDidLoad() {
84         super.viewDidLoad()
85     }
86 }
87
88 }

```

Screenshot 12a: Statistics Code (StatisticsVC¹¹)

The variables are identified between lines 76-80.

¹¹ See Appendix “Variable Tables” [Table 6].

```

218  ↵
219  import PDFKit ↵
220  ↵
221  class DailyReportVC: UIViewController { ↵
222  ↵
223  ...let pdfView = PDFView() ↵
224  ↵
225  ...override func viewDidLoad() { ↵
226  ...super.viewDidLoad() ↵
227  ...view.addSubview(pdfView) ↵
228  ... ↵
229  ... ↵
230  ... ↵
231  ...guard let url = Bundle.main.url(forResource: "DMR", ↵
    withExtension: "pdf") else { ↵
232  ...return ↵
233  ...} ↵
234  ... ↵
235  ...guard let document = PDFDocument(url: url) else { ↵
236  ...return ↵
237  ...} ↵
238  ... ↵
239  ... ↵
240  ...pdfView.document = document ↵
241  ↵
242  ...} ↵
243  ... ↵
244  ...override func viewDidLoadLayoutSubviews() { ↵
245  ...super.viewDidLoadLayoutSubviews() ↵
246  ...pdfView.frame = view.bounds ↵
247  ... ↵
248  ... ↵
249  ... ↵
250  ...} ↵
251  ... ↵
252  ↵
253  } ↵
254

```

Screenshot 12b: Daily Report Code (DailyReportVC¹²)

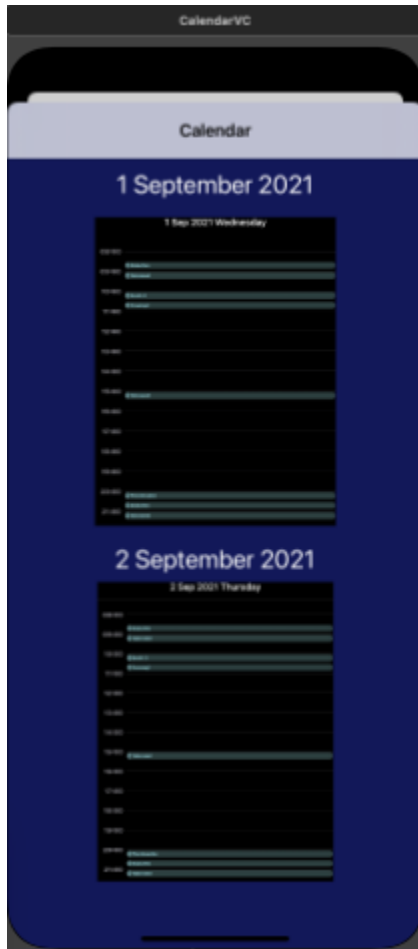
PDFKit as an API is imported to create a PDF view. Between 231-232, the source is identified as the PDF file's name and its type. If the user presses “Daily”, the pop-up comes out which shows the daily report.

¹² See Appendix “Variable Tables” [Table 10].

2.7. Calendar Screen

It shows a 2-days schedule for the medicines. The 2-days schedule contains today's and tomorrow's medicines. It is Ms G's idea because of her illnesses she couldn't go out to the pharmacy every day. So, 2 consecutive days are important to realize if the medicine runs out and buy a new one.

Screenshot 13: Calendar Screen



Screenshot 14: Calendar Code (CalendarVS¹³)

```

61  ~
62  class CalendarVC: UIViewController {
63      @IBOutlet var cal1Label: UILabel!
64      @IBOutlet var cal1View: UIImageView!
65      @IBOutlet var cal2Label: UILabel!
66      @IBOutlet var cal2View: UIImageView!
67      override func viewDidLoad() {
68          super.viewDidLoad()
69      }
70  }
71  ~
72  }
73  ~

```

Between 63-66, the variables are identified. When the user saves the medicine information in the New Screen, the data is saved to the database. In calendar screen, the data from the database are shown for the medicines and their times.

¹³ See Appendix “Variable Tables” [Table 7].

Screenshot 16: Map Code (MapVC¹⁴)

```

5 import UIKit
6 import MapKit
7
8 class MapVC: UIViewController {
9     ...
10    @IBOutlet var mapView: MKMapView!
11    override func viewDidLoad() {
12        super.viewDidLoad()
13        let pharmacy1 = MKPointAnnotation()
14        pharmacy1.coordinate = CLLocationCoordinate2D(latitude: 41.087853, longitude:
15            29.014096)
16        pharmacy1.title = "Omur Pharmacy"
17        pharmacy1.subtitle = "100 meters away"
18        mapView.addAnnotation(pharmacy1)
19        let pharmacy2 = MKPointAnnotation()
20        pharmacy2.coordinate = CLLocationCoordinate2D(latitude: 41.086059, longitude:
21            29.008232)
22        pharmacy2.title = "Emre Pharmacy"
23        pharmacy2.subtitle = "400 meters away"
24        mapView.addAnnotation(pharmacy2)
25        let pharmacy3 = MKPointAnnotation()
26        pharmacy3.coordinate = CLLocationCoordinate2D(latitude: 41.086854, longitude:
27            29.007683)
28        pharmacy3.title = "Arzu Pharmacy"
29        pharmacy3.subtitle = "450 meters away"
30        mapView.addAnnotation(pharmacy3)
31        let randomLocation = MKPointAnnotation()
32        randomLocation.coordinate = CLLocationCoordinate2D(latitude: 41.087338, longitude:
33            29.010724)
34        let yourLocation = MKPointAnnotation()
35        yourLocation.coordinate = CLLocationCoordinate2D(latitude: 41.088154, longitude:
36            29.015615)
37        yourLocation.title = "Your Location"
38        mapView.addAnnotation(yourLocation)
39        let region = MKCoordinateRegion(center: randomLocation.coordinate,
40            latitudinalMeters: 1000, longitudinalMeters: 1000)
41        mapView.setRegion(region, animated: true)
42    }
43 }

```

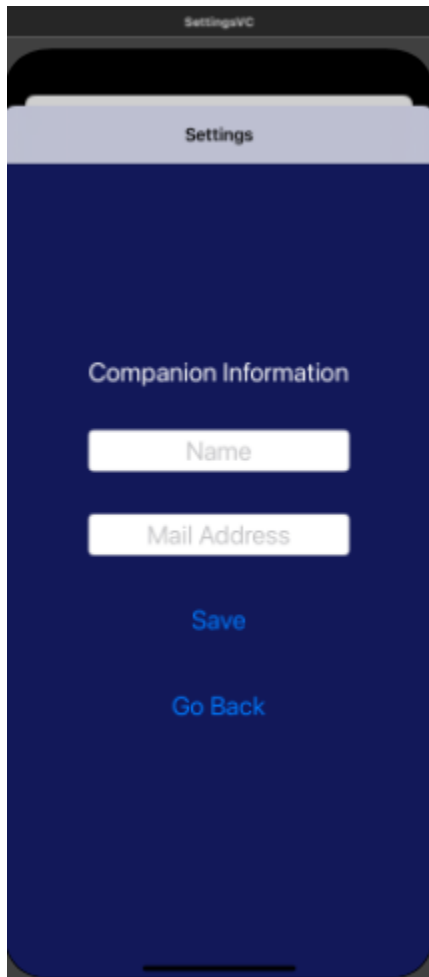
In order to access the current map view, MapKit as an API is imported to the code. As I know Ms G's location, I found her latitude and longitude. This process is also done for the pharmacies. To show a specific area, the diameter is arranged to 1000 meters. In this way, the user can see the pharmacies within a radius of 500 meters.

¹⁴ See Appendix "Variable Tables" [Table 8].

2.9. Settings Screen

It shows Companion Information where the client fills in Name and Mail Address.

Screenshot 17: Settings Screen



Screenshot 18: Settings Code (SettingsVC¹⁵)

```

45  ...
46  class SettingsVC: UIViewController {
47  ...
48  @IBOutlet var compInfoLabel: UILabel!
49  @IBOutlet var compUsernameField: UITextField!
50  @IBOutlet var compPasswordField: UITextField!
51  @IBOutlet var compSaveButton: UIButton!
52  @IBOutlet var goBackSettingsButton: UIButton!
53  ...
54  override func viewDidLoad() {
55  ...
56  super.viewDidLoad()
57  ...
58  }
59  ...
60  }

```

Between 48-52, the variables are identified. When the user fills in Companion Information, the data is saved to the Google Database. It is important for the user to save companion information because it is connected to the notification algorithm to break and send an email to the companion.

Word count: 980

¹⁵ See Appendix “Variable Tables” [Table 9].

Works Cited

- Abel, Agoi. “The ‘Let’ Keyword in Swift.” *Medium*, Medium, 8 Jan. 2018, <https://medium.com/@agoiabeladeyemi/the-let-keyword-in-swift-86b9e311da64#:~:text=In%20swift%2C%20we%20use%20the%20let%20keyword%20to%20declare%20a,value%20can%20not%20be%20changed>.
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