Final Project Report

By Team D

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Abstract

In the medical field, one of the biggest challenges for a pharmacist is to provide a safe and effective treatment for his/her patients in order to cure, treat or prevent diseases and a variety of conditions. To increase the effectiveness of a treatment, the patient must have the capability to take a prescribed medication, the desire to be treated and the knowledge about the medication taken.

Our team decided to address two of these factors that affect treatment effectiveness by making a mobile application for seniors that will remind and warn them to take their medicine on time using notifications and that will educate them about the medications taken.

The following report elaborates on our mission, our strategy and timeline to achieve them, our design, our testing results, the ethical dimensions of our product, and our product source code.

Table of Contents

List of Tables

List of Figures

Mission Statement

Product Description

This application is used to remind and make sure seniors take their medicine on time, it includes setting a schedule for elders to take their medicine, sending a notification to remind them and sending a message to their caregiver(s) if they do not take their medicine after a user-defined reminder time following the initially scheduled time. The notification stops when the medication box is opened.

Benefit Proposition

It will benefit the caregivers since this app offers an easy way to monitor the intake of medicine of the seniors for whom they care for. It will also benefit the seniors who may forget to take their medication due to their old age by sending a reminder to their device, thus keeping them in good health.

Key business goals (goals for cost, price)

Each medicine box will hold three A3144 Hall Effect sensors, an Arduino Nano microcontroller, an HC-05 Bluetooth module and a 6AA battery holder. Each sensor costs around $0.50, the microcontroller costs $5.00, the bluetooth module costs $10.00 and the battery holder costs $5.00. The box itself will cost $10.00. Therefore, the total cost of the product is $31.50. However, this cost is a very conservative figure and future development will allow the cost to be halved. Since we are focused on helping seniors, we will sell this product for $35.00 per unit and a possibility of a discount for high volume orders. The app and sensor development will take 300 hours at $50/hour, and its total cost will be $15,000. To break even, we need to sell 4,300 units, and we are confident that we can achieve this goal.

Target Market

This mobile application will target the elderly and their caregiver(s) (medical personnel or relatives). Seniors and caregivers are the most likely groups of people who will use and buy the product. Since the mobile application will be made easy to use for these targeted groups, it will be more likely to spread by word of mouth to other elders and caregivers who needs such a service. Large organizations like hospitals will also be able to take advantage of this application.

Assumptions and Constraints

There are three major assumptions made about this application:
1) The majority of our target users possesses a smartphone;
2) The Hall effect sensor is safe to use and will not affect the medicine's chemical composition.
3) All hospitals allow the use of cellphones in most of their care departments.

There are four major constraints for the app:
1) The mobile application must be completed by mid-April 2018;
2) The mobile application is only designed for Android;
3) The mobile application is developed by university students who are not professionals;
4) The cost of the product is $31.50.

Stakeholders

The stakeholders of this mobile applications:

1) The seniors, they are direct users of this mobile application, they are likely to be one of our major customers. They are our most important stakeholders and we need to tailor the development of our mobile application to their needs and to better serve them.

2) The caregivers, they are direct users of this mobile application, they are most likely one of our major customers since they are the ones often reminding their care receivers to take their medicine. Caregivers include, but are not limited to, relatives, medical personnel and volunteer caregivers. We must value their work and strive to make their life easier with our mobile application. The mobile application must then be able to fulfill their needs.

3) The hospitals, they are potential customers who can help spread more efficiently the use of the mobile application since hospitals often host many people who needs to take medicine on a regular basis. The mobile application will thus account for the environment and the needs of hospitals.

4) Pharmacists, they are potential customers who can help distribute and encourage people to use the mobile application. Since they are the ones providing the medicine, they have a substantial knowledge about medicinal pills and other health products. We thus need to take their input into account when developing the application.

5) Google Play Services, they are our main distributor in the sense that we are using an Android platform, thus, the best way to sell our application will be through Google Play Services. The sensor can be provided by an in-app purchase. We thus need to ensure the compatibility of our mobile application with Google Play Services.

6) Investors, they are people or organizations who are willing to invest financially into this project. The mobile application will not have high margins as our main goal is to help people, but it is still profitable and its prospects are great enough to attract investors. Investors will help us get to the market quickly and get a lead over any potential competitors.

7) Development team, they are the ones developing the mobile application, team D. It is important to consider this stakeholder's need because it will have a direct impact on the development of the application. Therefore, regular team meetings and discussion should occur to make sure that the project runs smoothly and that deliverables can be provided on a regular basis.

Final Product Backlog

Story ID	Story Title	Card	Story Points	Sprint	Status	Conversation	Confirmation
BK-1	sensor and microcontroller	*As a senior person, I want the medication box to be able to detect when I open the pill box, so that I can be reminded to take the medication*	8	Sprint 1	Completed	1. The sensors used are hall sensors 2. There will be an Arduino Uno 3. There will be two sensors	1. The sensors can detect a magnetic field 2. The microcontroller can take data from the sensors 3. The sensors are in sync
BK-2	skeleton	*As a senior, i want to be able to log into the Medication Taking Reminder app, check the information about my medication, allow my nurse to set the medication intake schedule, and input guardian contact information, so that I may reduce any possibility of missing my medication intake.*	13	Sprint 1	Completed	1. It is a prototype of our application. 2. it should have several button for those functions.	1. Does it have a login button? 2. Does it have a check schedule button? 3. Does it have a set medicaction schedule interface? 4.Does it have set guardian information button? 5.Does each button take the user to a different page?
BK-3	open box detection	*As a senior person, I want the medication box to be able to detect when I open the pill box, so that I can get a notification when I miss the time to take my medicine.*	8	Sprint 2	Completed	1. Hall sensors are used in the detection 2. A magnet will be used for sensing 3. The box is a common pill box 4. The miss rate for detection needs to be less than 5%	1. Does the sensor successfully detect the "open box" action? 2. Is the miss rate less than 5%?
BK-4	bluetooth connection	*As a user of the application, I want the medication box to be connect to my smart device so that I can have real-time updates on my device*	5	Sprint 2	Completed	1. There will be a Bluetooth slave chip on the sensor module 2. The version is Bluetooth 4.0 3. Sensor data sent via Bluetooth	1. The Bluetooth chip connects to the phone 2. The sensor data is successively transmitted to the phone
BK-5	Login page	*As a user, i want the application to be secure, so that no other person using my phone will be able to change the information of this application by accident.*	5	Sprint 2	Completed	This page require the user name and password.	Access the application by inputting the correct user name and password
BK-6	schedule setting	*As a nurse, I want the application to allow me to set a reminder schedule on my patient's cellphone for medication intake, so that I don't need to remind them personally every time for pills.*	8	Sprint 2	Completed	1. There will be a schedule planner 2. The guardian will be in charge of schedule planning	1. The schedule can be set within 5 minutes 2. Schedule setting is not ambiguous 3. The schedule can be reset 4. The schedule can be updated
BK-7	message notification	*As a senior person, I want the application to send me an alert when I don't open the medication box on time, so that I will not miss the chance to take medicine in proper time.*	8	Sprint 3	Completed	1. The notification is a message 2. The notification is a sound 3. The notification can be set to have different sounds 4. The user can set the notification frequency and time	1. The notification message needs to include the time to intake, the time of intake, the medication to take and the quantity 2. It is possible to change the notification frequency and times
BK-8	taskbar notification	*As a senior person, I want the notification to also appear in the taskbars that I can be sure not to miss it*	8	Sprint 3	Completed	Having this feature will eliminate some of the risks that the notification will not be heard	1. Is the users information only obtainable by specific individuals? (i.e Nurse, Doctor, Guardian, User)
BK-9	Existing Reminder modification	*As a use, i want the application allows me to modify the existing Reminder, so that i can organize my schedule easier.*	5	Sprint 3	Completed	This functionallity will allow the user to edit and delete the existing Reminder	1. The exist Reminder can be modified 2. The Reminders can be deleted
BK-10	Sensor to Box Integration	*As a senior person, I want to be able to use the box with all the components integrate inside so that I can easily transport it and not be bothered with exposed wires and electronic components*	8	Sprint 3	Completed	1. The components will be mounted on protoboards 2. The controller used is going to be Arduino Nano 3. The magnet is going to be fixed on the top cover	1. Check if the wires are too loose 2. Check if the components are well fixed 3. Check if the magnet can touch the flat part of the sensors when in closed position

BK-11	notification for guardian	*As a guardian, I want the application be able to inform me if my senior does not take their medicine a period time pass the schedule, so that I can contact them and get more detail of why they miss the right time to take pills.*	13	Future	Not in sprint	1. What is the period be we send the notification to the guardian, if the senior does not take their medicine? 2. How can we store the information of guardian? 3. How can the application automatically send the notification to the guardian phone when the senior does not take the pill pass a period of time?	1. Does the notification send when the sensor does not detect a action passing a certain of time? 2. Does the notification sucessfully send to a particular phone?
BK-12	educative interface	*As a senior person, I want to be able to have access to information concerning the medication I take so that I know the benefits, dosage and secondary effects of the medication I'm intaking.*	20	Future	Not in sprint	Having this feature will allow the user to be better informed on the benefits, dosage and secondary effects of the medication, thus allowing him/her to make better choices and to encourage him/her to take the medication	1. Can the user understand clearly the information provided? 2. Is the information up-to-date with current research and development? 3. Is the information stated in a way which invites the user to read and does not bore them?
BK-13	privacy protection	*As a senior, I want to be able to have protected access to the application so that I can preserve my confidentiality*	13	Future	Not in sprint	1. What technology are we using to complete this function? 2. Who can access the data?	1. Is the users information only obtainable by specific individuals? (i.e Nurse, Doctor, Guardian, User)
BK-14	multi-box interface	*As a senior, I want to be able to monitor my activity when I have more than one medication box so that I do no mix up and can be more organized*	20	Future	Not in sprint	1. There will be a page to add, drop and modify box and box content 2. There will be buttons to access these pages on the main page	1. Check if add/drop/modify takes less than 5 minutes to do 2. Check if the buttons get to the different section within 3 clicks
BK-15	multi-sensor detection	*As a senior, I want to have a redundant system using multiple sensors to detect my medication activities so that I can be sure I took the medication*	40	Future	Not in sprint	1. The suggested sensors are motion sensors, contact sensors, vibration sensors 2. The sensors will complement each other	1. Check sensor data output 2. Check if the controller can handle all the data 3. Check how sensors can complement one another
BK-16	user database	*As a guardian, I want to have access to the information concerning the senior from my own mobile device so that I can monitor their activity from any location*	20	Future	Not in sprint	1. There will be a database that can be updated through servers 2. The database will hold using information 3. Authorized user can access assigned database	1. Check if updating database is simple 2. Check if authorized users can access theirs but not others 3. Check if servers can process data quickly
BK-17	battery life extension	As a senior, I want to be able to use the sensor device for an extensive amount of time without having to change the battery so that I do not have to spend a lot of money on batteries	20	Future	Not in sprint	1. The overall power usage of the system is reduced 2. Research into lower power controllers and Bluetooth technology to be done 3. Optimization of the circuit	1. Check if the battery can last for at least two months without replacement
BK-18	battery replacement	As a senior, I want to know when I need to replace the batteries in the device so that I can avoid not receiving signal because the battery needs to be replaced	13	Future	Not in sprint	1. There will be a warning notification when the battery goes below a certain voltage level 2. There will be a mechanism to check for battery voltage	1. Check if the mechanism takes less than 0.1% of the total power usage 2. Check if the warning notification is clear
BK-19	bracelet notification	As a senior (with hearing impairment), I want to receive small vibrations on a bracelet when a alarm goes on	8	Future	Not in sprint	1. Small vibrations will pulse on the bra	1. Check if alarm is triggered 2. Trigger vibration on bracelet
BK-20	data log	As a user, I want to be able to verify when I did and when I did not take my medication on time, so that I can have a better idea of how consistently I am taking my medication	13	Future	Not in sprint	1. The log will store all the open and close	1. Check if the log is accessible

| Sprint 1 Goal(s): | 1. Build sensors and microcontroller circuit and collect data |
| | 2. Build the skeleton of the application |

Story ID	Task ID	Task Title	Task Description	Ideal Hours	Status	Comments
BK-1	1,1	**Brainstorming**				
	1.1.1	**Brainstorming I**	Research about possible sensors that could be possibly used in this application	3 hours	Completed	Motion sensor, vibration sensor, contact sensor, potentiometer, hall effect sensor
	1.1.2	**Brainstorming II**	Discuss the complexity of implementation associated with the sensor	3 hours	Completed	We finally decided to use the hall effect sensor
	1.1.3	**Brainstorming III**	Discuss the connectivity to be used between the devices	2 hours	Completed	Bluetooth 4.0 connection
	1,2	**Sensor Position**	Find out the best position for the sensor	3 hours	Completed	3 at most on the front of the box
	1,3	**Obtaining sensors**	Research information about different kind of sensors, decide which one is needed, find where the sensors are sold and buy them	2 hours	Completed	Bought them from ABRA electronics, 2 for the moment
	1,4	**Circuit design**	Design the circuit that will connect the sensors to the microcontroller and allow interfacing with them	4 hours	Completed	A circuit was found on a hobbyist website and it was modified to fit our needs
	1,5	**Arduino code**	Write the Arduino code that will allow retrieval of data from the sensors	3 hours	Completed	A simple code was written to turn on an led and display closed when the Hall sensor senses a magnet
	1,6	**Build/interface sensors**	Build the circuit and use the Arduino code to collect data from the sensors	4 hours	Completed	The circuit was built on a bread board and was successfully interfaced with
BK-2	2,1	**Login Page**	Creation of a login page and links to its related activities	5 hours	Completed	
	2,2	**User profile Activity**	user can input their name, guardian's name and guardian's phone number.	5 hours	Completed	
	2,3	**Main Page**	This activity contains two buttons, which are "EDIT PROFILE" and "MANAGE MY REMIDERS". Also, the user's information will shows on the top of this page.	5 hours	Completed	
	2,3	**Schedule Activity**				
	2.3.1	schedule checking activity	Creation of the reading mode of this activity	5 hours	Completed	only allow to read the schedule
	2.3.2	schedule setting activity	Creation of the edit mode of this activity	5 hours	Completed	enables the edition of information
	2,4	**User information edit Activity**	An activity allows user to change their information.	5 hours	Completed	
	2,5	Action bar	An action bar for those two Schedule activity and edit Activity	5 hours	Completed	
	2,6	**Testing**				
	2.6.1	Buttons	Test and check that each button in the application meet their respective requirements	5 hours	Completed	
	2.6.2	Schedule Activity	Test and check the schedule activity working well	5 hours	Completed	
	2.6.3	User information edit Activity	Test and check the component in this activity working well	5 hours	Completed	
	2,7	**Integration testing**	Test the entire application	5 hours	Completed	Involves unit and component testings
	2,8	**Defect correction**	This is reserved for solving any error that may arise due to task/feature malfunction	5 hours	Completed	
		Documentation		6 hours	Completed	
		Product Backlog groom		5 hours	Completed	

				Ideal Hours	Status	
Sprint 2 Goal(s):		1. Successfully detect the "open" action and missing rate should less than 5%. 2. Establish a bluetooth connection between the hardware and the application 3. A notification is sent at a specific time 4. The medicine schedule allows to set, save, and check				

Story ID	Task ID	Task Title	Task Description	Ideal Hours	Status	Comments
BK-3	3,1	**Obtaining the box**	Find or purchase a suitable box, ideally a commercially available pill box, as our prototype	1 hour	Completed	The box was bought at Staples.
	3,2	**Box opening action (definition)**	Define what is considered as opened and what is considered as closed, this subtask is done by brainstorming	2 hours	Completed	The box is considered as closed if the magnet touches the Hall sensor and opened if the magnet is not touching the hall sensor
	3,3	**Data collection**	Collect data from the sensors for opening and closing the box	2 hours	Completed	Data has been collected from all the sensors. Since the sensors are digital, we are getting true/false value where a high voltage value represents opened and a low voltage value represents closed
	3,4	**Missing rate**	Detemine the miss rate from the data collected	2 hours	Completed	The miss rate was found to be 1 iin 100 which is due to mispositioning of the magnet
	3,5	**Reducing the missing rate**	if the missing rate is greater than 5%, adjust the sensor to a better position, and calculate the missing rate	5 hours	Completed	To reduce the miss rate we need to align the magnet and the flat part of the sensor perfectly, we are also using triple redundancy and majority voting to reduce the miss rate
BK-4	4,1	**Pill box and smartphone connection**				
	4.1.1	**Bluetooth integration**	Integrate a Bluetooth Chip with the microcontroller system	3 hours	Completed	Succesfully paired the phone with the bluetooth chip
	4.1.2	**Wireless sensor system**	Use a battery (9V) to power the sensor/microcontroller system to make the system independent of the computer's usb port	3 hours	Completed	The system is can be fully independent from the computer since the code has been uploaded to the microcontroller and the battery is well connected to the board
	4.1.3	**Bluetooth connection**	Write the code that will enable the application to receive Bluetooth signals	4 hours	Completed	
	4.1.4	**System testing**	Test the connection at different distances and in different rooms to verify the connectivity and obtain data	5 hours	Completed	Strength of connectivity has been measured by going into different rooms and using an app to measure the strength in dBm. The signal could work anywhere in a radius of at least 10 meters in different rooms
	4,2	**Sensor interfacing**	Write the code that will enable the application to use the sensor data received from the sensor module	5 hours	Completed	
BK-5	5,1	**Login layout**	Implement a unique layout	6 hours	Completed	Background, text field, round button, logo
	5,2	**Input Type**	Brainstorm and decide what input type the username and password would be	2 hours	Completed	Username is made of alphabetical only and Password is numeric only (characters)
	5,3	**Input Length**	Code implementation to set the maximum length of characters which each input field could have	3 hours	Completed	Username is 5 characters long and Password is 4 characters long
	5,4	**Security check**	Test if the entered credentials are correct	6 hours	Completed	Check when the each/both input field(s) is/are empty, check if the the user entered the correct credentials then grants access, and display toast messges for those.
BK-6	6,1	**Schedule time setting**	allow the user to set up the alarm time	5 hours	Completed	
	6,2	**Schedule date setting**	allow the user to set up the alarm date	4 hours	Completed	
	6,3	**Schedule repeat setting**				
	6.3.1	**Switch**	a switch that allow the user to set the event repeat or not	3 hours	Completed	
	6.3.2	**Repeat period setting**	allow the use to set the period they need	4 hours	Completed	
	6.3.3	**Repeat period Textview**	it will shows the period which the user set up	3 hours	Completed	

Sprint 3 Goal(s):		1. Create message and taskbar notifications 2. Create existing reminder modifier 3. Add ability to edit/remove existing reminders				
Story ID	Task ID	Task Title	Task Description	Ideal Hours	Status	Comments
BK-7	7,1	**Message notification**	Create a notification message that contains time of intake, time to intake, medicine to take and quantity	5 hours	Completed	
	7,2	**set notification sending**				
	7.2.2	get setting time	A function which will set the alarm time	5 hours	Completed	
	7.2.3	compare function 1	A function for comparing the real time and the setting time	3 hours	Completed	
	7.2.4	check "open" action	A boolean function to check if the pillbox is opened or not	5 hours	Completed	
	7.2.5	date check	it will compare the date of the system and the date we set	5 hours	Completed	
	7.2.6	repeat alarm	it will allow the user to set the period they want to repeat the notification	3 hours	Completed	
BK-8	8,1	**Taskbar notification**	when the alarm is on, the will be a notification show up on the taskbar	4 hours	Completed	
	8,2	**Taskbar notification clickable**	when click the notification on the taskbar, it will lead to new activity	5 hours	Completed	
	8,3	**notification send**	If the pill box does not open, the notification will send. Otherwise, the notification will not send.	3 hours	Completed	
	8,4	**notification resend**	if the pill box does not open 15 mins after the first notification was sent, send the notification again	5 hours	Completed	
	8,5	notification repeat	it will base on the repeat period which set by the user, and repeat the notification	5 hours	Completed	
BK-9	9,1	**Existing Reminder modify**	Allow user the change the information of the exisiting Reminder	5 hours	Completed	
	9,2	**Existing Reminder Delete**				
	9.2.1	**Reminder remove from SQLite table**	The existing Reminder will be delete from the SQLite table	4 hours	Completed	
	9.3.2	**Reminder remove from application**	The existing Reminder will be delete from the application	4 hours	Completed	

Table 1: Product Backlog

Design Document

Android Application Wireframe

The wireframe shown in Figure 1 is the skeleton of the application. It best interests the needs of seniors since they will occupy the majority of the user base. The user interface will have many big buttons and easy to read text. The creation interfaces only have up to 6 types of data, that way the user is not overwhelmed with unnecessary options. Also, the user will be able to navigate to any page within two button presses (except for the first launch when the user will be sent to the creation page automatically), this way the user will be able to navigate back to the splash screen with ease. Expect the final application to have similar features to those shown in figure 1.
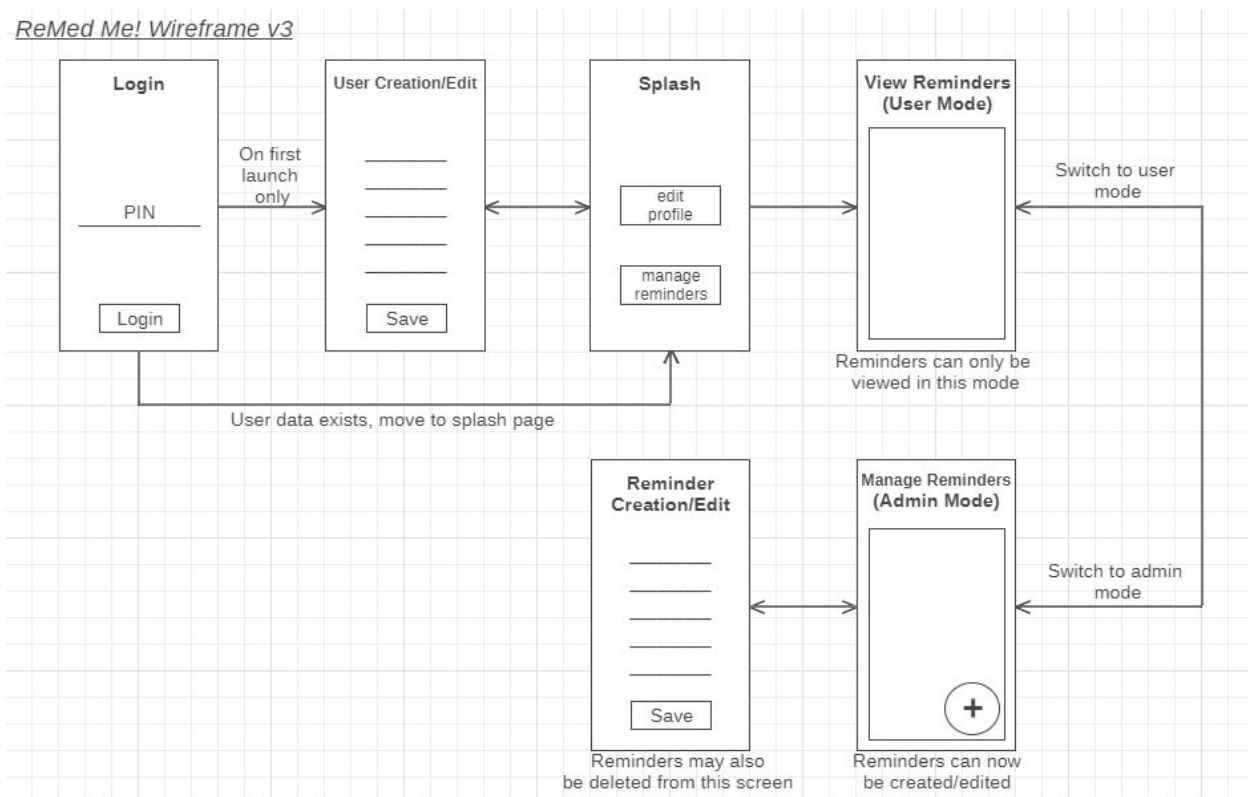
Figure 1: Application Wireframe v3

System Architecture

This system architecture will be as shown in figure 2. The hall effect sensors will receive an input from the user and send a signal to the microcontroller which will then send a signal via bluetooth to the device. Once the signal is received, the device will process the signal and shut off the alarm if the correct signal is received. Optionally, the device can send a text message to a guardian if the notification has yet to be disabled for *X* amount of time. Reminders will be held in a local database via SQLite tables.
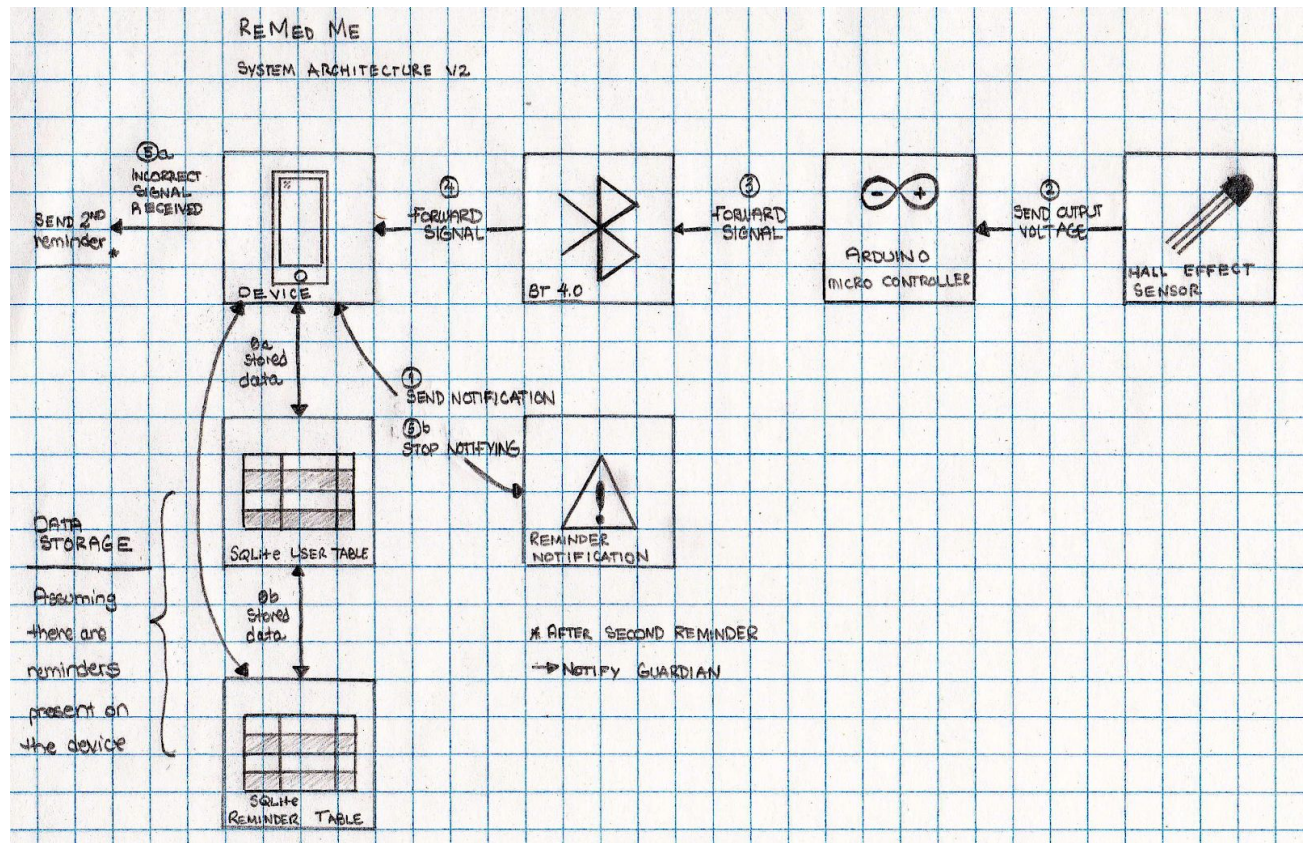
Figure 2: System Architecture v2

Hardware Architecture

The system will be using three hall effect sensors within the box on the edges of the dividers. There will magnet tape on the underside of the lid. The sensors and magnets will line up when the box is closed. Hall effect sensors are used for proximity switching. When the box is closed, the sensor will be next to the magnet, the sensor will respond to the magnetic field and output a certain voltage. Opening the box will move the sensors away from the magnets, thus changing the output voltage. The two different output voltages will be classified as the box being either opened or closed. When a reminder initiates on the device, it will search for an open signal from the microcontroller, when the lid is opened and the signal is received, the application will cease to notify the user of the reminder.

Software Architecture

The software contains 5 activities. The main activity is the user login, this will be the screen the user sees when they initially launch the app, they will be required to enter a PIN to continue further into the application. From the login screen, the user may proceed into the main functionality of the application once the correct PIN has been entered, there will be null credentials for first time login, thus the user will be required to enter their credentials immediately. The create user activity currently has five credentials to fill out, username, date of birth, address, emergency contact name, and emergency contact phone number. When the create/done button is pressed, the credentials will be stored in the shared preference, and the SQLite table for the reminders will be initialized. After the user data is entered on first launch, or after a successful login on any other login, the splash page will appear with 2 options, manage reminders and edit profile. The manage reminders activity provides the user with a listview of all existing reminders in the database. By default the user may only view reminders, there is an option to enter admin mode which will allow the user to create, edit, and delete reminders. The user may switch back and forth between user and admin modes, a password for the admin mode will be added in the future. Pressing the add button or tapping an existing reminder will bring the user to the create/edit reminder activity. This activity has 6 types of data to input, medication name, date, time, repeat, repeat type (monthly, weekly, daily…) and repeat length. Empty data forms will not be accepted. Once the save button is pressed, the reminder is added/updated to/in the database. The user may also chose to delete an existing reminder within the edit reminder activity, a confirmation message will appear incase the button was pressed by mistake. The edit user activity functions very similarly to the create user activity but will instead update the credentials over creating a new row.

Use Cases and Sequence Diagrams

Use Case 1: Creating/Editing & Viewing Reminders (figure 3)

Starting from the main activity, the user select activity, tapping on user_btn (User 1, 2, 3…) sends the user to the splash page activity. Tapping on create_reminder_btn (Create Reminder) sends the user to the create reminder activity. In this activity there are up to 6 credentials to input, a String for the medication name, a Date for the day, a Time for the time, a boolean for repeat, a String for repeat type, and an integer for repeat length. There will be future support for a BufferedImage for an image of the medication. When add_reminder_btn (Create) is tapped, the information is stored in the SQLite table with INSERT INTO reminder_table. Alternatively, from the splash page activity, tapping view_reminder_btn (View Reminders) sends the user to the view reminders activity. In this activity, the contents of reminder_table are displayed in ListView format. Tapping a one of the TextViews will prompt the user to edit or delete the reminder. Deleting the reminder calls DELETE FROM reminder_table and removes the specified row from the database. Editing the reminder sends the user to the same page as it would for creating the reminder but instead of inserting into the table, the table is updated with UPDATE reminder_table.
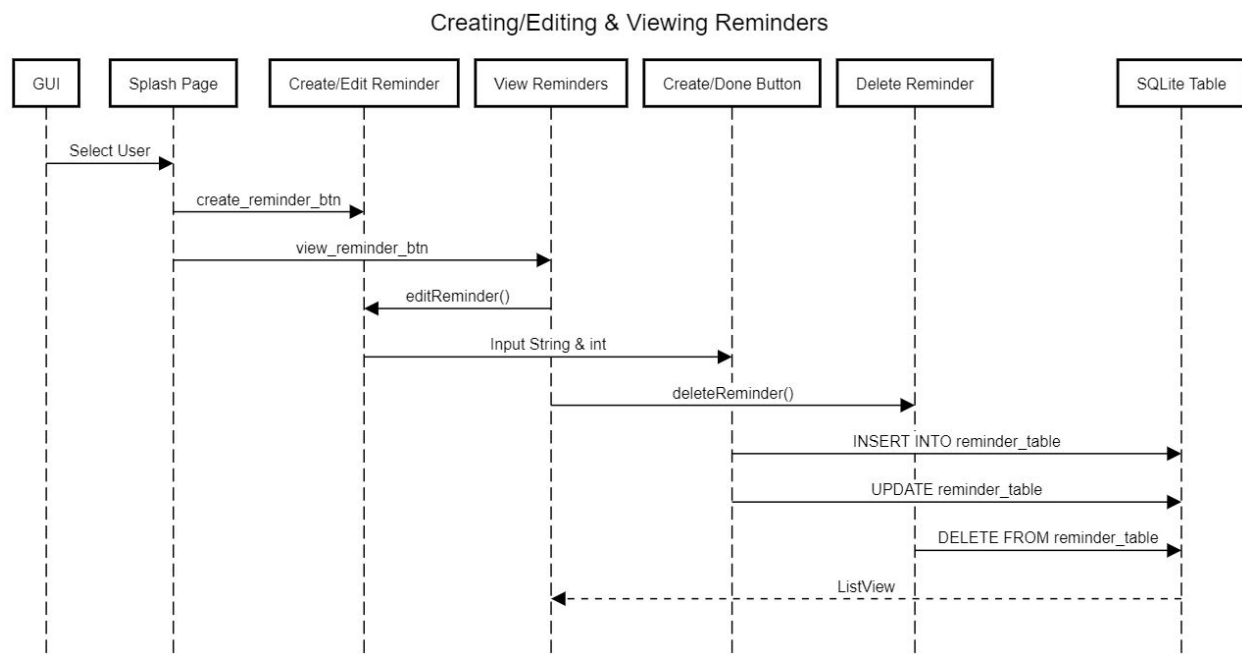

Figure 3: Reminders Sequence Diagram

Use Case 2: Creating/Editing User Profile (figure 4) [LEGACY]

Note: this use case is no longer supported as the application is now suited for a single user profile.Starting from the main activity, the user select activity, tapping on create_user_btn (Create New User) sends the user to the create user activity. In this activity there are three credentials to input, a String for the users name, a String for the guardian name, and a String for the guardian phone number. When add_user_btn (Create) is tapped, the information is stored in the SQLite table with INSERT INTO user_table. Alternatively, from the user select activity, the user can select a profile to move the the splash page activity. When edit_user_btn is tapped, the user is sent to the edit user activity which is the same as the create user activity but instead of inserting into the table, the table is updated with UPDATE user_table.
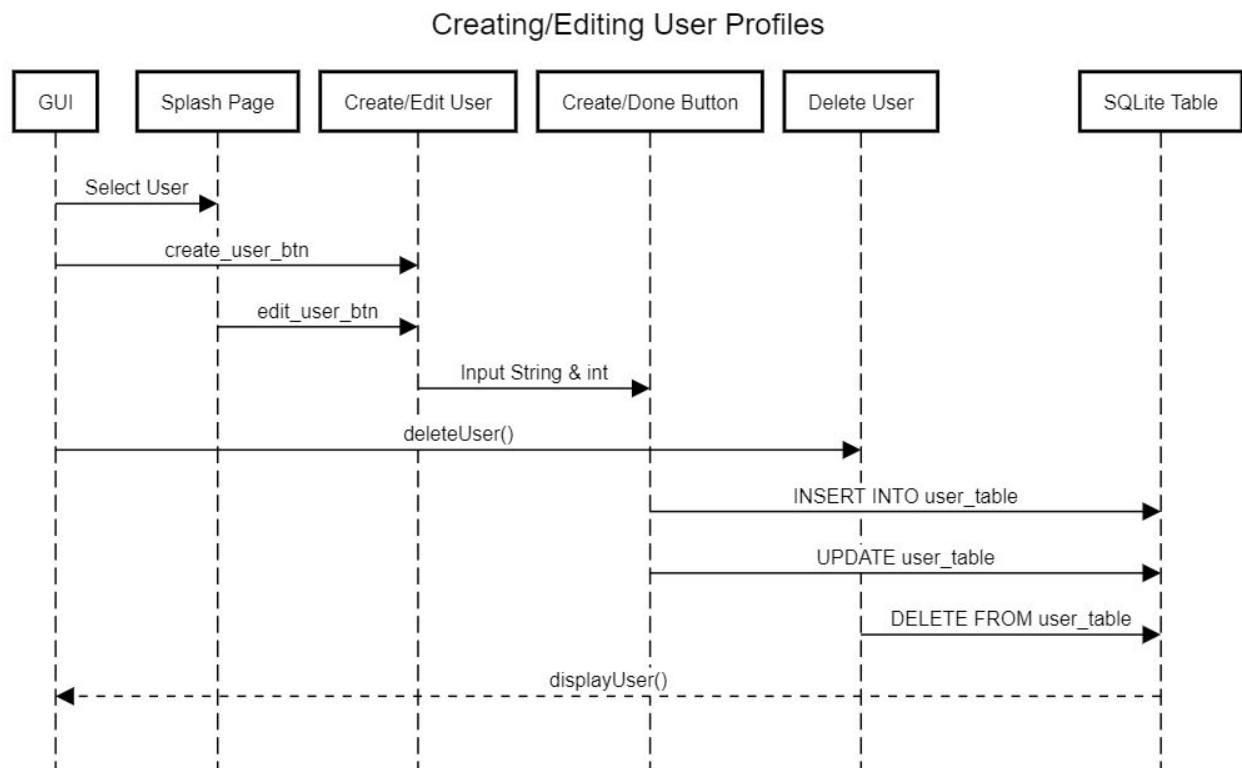

Figure 4: User Profile Sequence Diagram

Changelog (Sprint 2)

The user interface of the application was overhauled with a much nicer design. There is a new login page with support for only one user currently, currently there is a username and password authentication (defaulted to admin & 1234 respectively). If no user profile exists, the user is redirected to the edit profile page instead of the splash page. The user profile now has a date of birth and an address parameter. The reminder creation now has a date selection via calendar and time selection via clock, as well as an option to set the reminder to repeat every X day(s). The splash page now displays the users name, date of birth, and address.

The design of the box has changed slightly. The sensors will now reside inside the box, with the magnets on the bottom side of the lid. The microcontroller and circuit will be stored inside one of the compartments of the smaller compartments of the box.

Changelog (Sprint 3)

Support for multiple users has been removed, to identify different users reminders, the name of the reminder can include the name of the user that must intake the medication. This will allow a much simpler user experience and much less information to add.

The view reminders and create/edit reminders activities have been merged into a single activity, but still exist separately. The new activity is called manage reminders. Upon pressing the button to enter the activity, the activity will be in user mode which will only allow for viewing of existing reminders. Upon pressing the admin button in the drop down options menu on the action bar, the activity will switch to admin mode which will allow the user to add new reminders or edit/delete existing reminders.

The design of the box has changed slightly. An extra sensor has been added in the middle of the box divider. This will add an extra check to the box being closed and thus allowing for more accurate measurements of whether or not the box is open.

Updated the wireframe to accommodate changes.

Future Design Concept

The future of the application can offer many improvements. A connection to the cloud would be more secure and more reliable, reminders would be programed via external devices such as android, iOS or even personal computers. The notification system can be shifted to a simple board instead of an all in one android device. Such software can be implemented on a raspberry pi as an example. The box would be powered by DC in as an always-on model. This will remove the dependencies of batteries, backup power from the batteries would activate in the case of power loss. A screen within the box would display the image of the medication that must be taken, and a speaker on the outside of the box would play a tone or a song until the box has been opened.
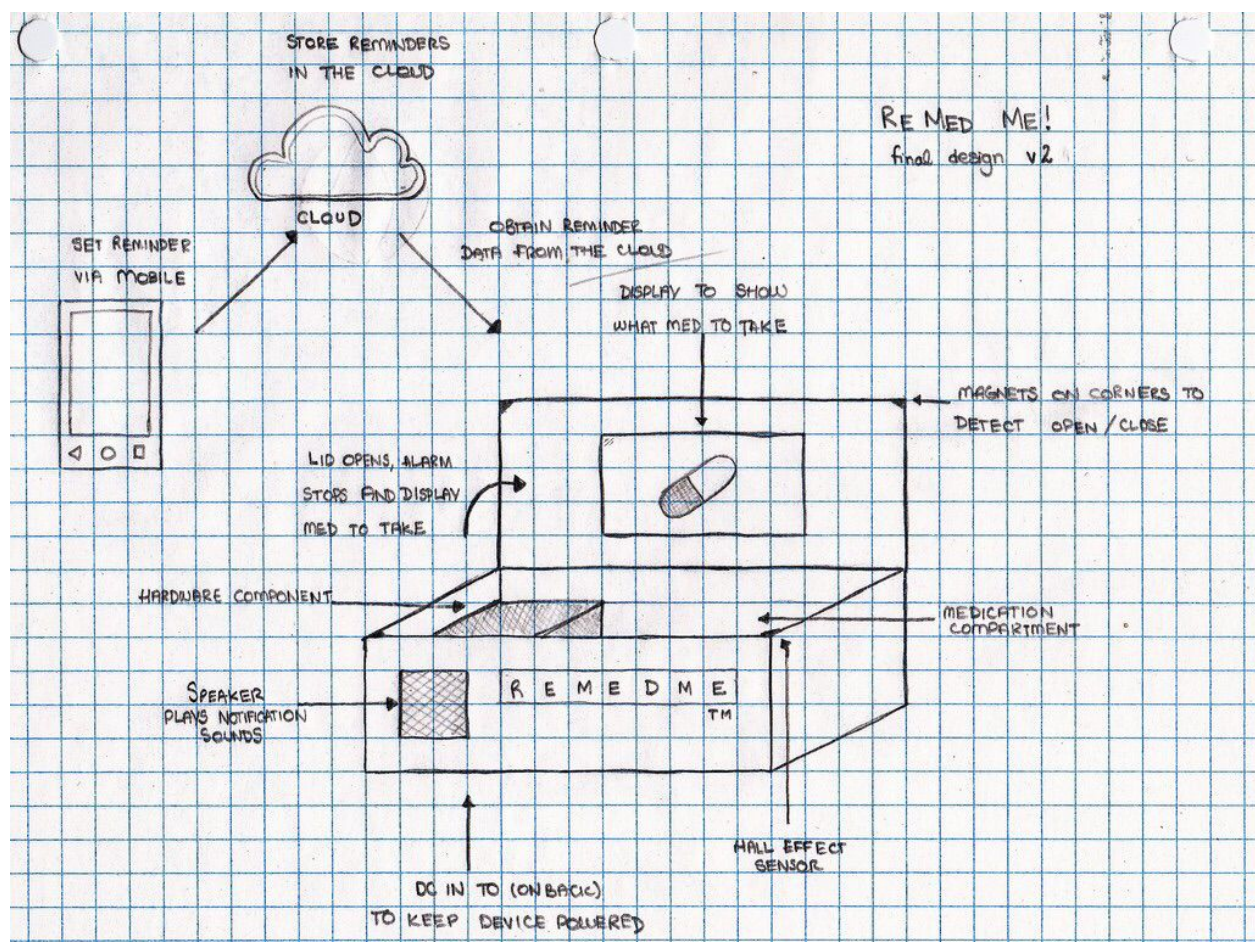

Figure 5: Future design concept v2

Definition of Done

Definition of Done criteria

After discussing the important criterias that are related to our project, here is the checklist that we decided to use for the validation of each PBI :

- ✓ Produced artifact (code/document) for the PBI
- ✓ Requirements mentioned in PBI are satisfied
- ✓ Acceptance criteria(s) for PBI are satisfied
- ✓ Unit tests performed and passed
- ✓ Integration tests performed and passed
- ✓ Project builds without errors
- ✓ Design Document updated
- ✓ Test Document updated

Definition of Done validation

Story ID: BK-1	
User Story: Sensor and Microcontroller *As a senior person, I want the medication box to be able to detect when I open the pill box, so that I can be reminded to take the medication*	
DoD checklist for this PBI:	**Status** **Completed**
✓ Produced artifact (code/document) for the PBI ✓ Requirements mentioned in PBI are satisfied ✓ Acceptance criteria(s) for PBI are satisfied ✓ Unit tests performed and passed ✓ Integration tests performed and passed ✓ Project builds without errors ✓ Design Document updated ✓ Test Document updated	Done Done Done Done Done Done Done Done

Story ID: *BK-2*

User Story: Skeleton

As a senior, i want to be able to log into the Medication Taking Reminder app, check the information about my medication, allow my nurse to set the medication intake schedule, and input guardian contact information, so that I may reduce any possibility of missing my medication intake.

DoD checklist for this PBI:	Status Completed
✓ Produced artifact (code/document) for the PBI	Done
✓ Requirements mentioned in PBI are satisfied	Done
✓ Acceptance criteria(s) for PBI are satisfied	Done
✓ Unit tests performed and passed	Done
✓ Integration tests performed and passed	Done
✓ Project builds without errors	Done
✓ Design Document updated	Done
✓ Test Document updated	Done

Story ID: *BK-3*

User Story: Open Box Detection

As a senior person, I want the medication box to be able to detect when I open the pill box, so that I can get a notification when I miss the time to take my medicine.

DoD checklist for this PBI:	Status Completed
✓ Produced artifact (code/document) for the PBI	Done
✓ Requirements mentioned in PBI are satisfied	Done
✓ Acceptance criteria(s) for PBI are satisfied	Done
✓ Unit tests performed and passed	Done
✓ Integration tests performed and passed	Done
✓ Project builds without errors	Done
✓ Design Document updated	Done
✓ Test Document updated	Done

Story ID: *BK-4*

User Story: Bluetooth Connection

As a user of the application, I want the medication box to be connect to my smart device so that I can have real-time updates on my device

DoD checklist for this PBI:	Status Completed
✓ Produced artifact (code/document) for the PBI	Done
✓ Requirements mentioned in PBI are satisfied	Done
✓ Acceptance criteria(s) for PBI are satisfied	Done
✓ Unit tests performed and passed	Done
✓ Integration tests performed and passed	Done
✓ Project builds without errors	Done
✓ Design Document updated	Done
✓ Test Document updated	Done

Story ID: *BK-5*

User Story: Login Page

As a user, i want the application has a login page, so that I or other person use my phone will not change the information of this application by accident.

DoD checklist for this PBI:	Status
	Completed
✓ *Produced artifact (code/document) for the PBI*	*Done*
✓ *Requirements mentioned in PBI are satisfied*	*Done*
✓ *Acceptance criteria(s) for PBI are satisfied*	*Done*
✓ *Unit tests performed and passed*	*Done*
✓ *Integration tests performed and passed*	*Done*
✓ *Project builds without errors*	*Done*
✓ *Design Document updated*	*Done*
✓ *Test Document updated*	*Done*

Story ID: *BK-6*

User Story: Schedule Setting

As a nurse, I want the application to allow me to set a reminder schedule on my patient's cellphone for medication intake, so that I don't need to remind them personally every time for pills.

DoD checklist for this PBI:	Status
	Completed
✓ *Produced artifact (code/document) for the PBI*	*Done*
✓ *Requirements mentioned in PBI are satisfied*	*Done*
✓ *Acceptance criteria(s) for PBI are satisfied*	*Done*
✓ *Unit tests performed and passed*	*Done*
✓ *Integration tests performed and passed*	*Done*
✓ *Project builds without errors*	*Done*
✓ *Design Document updated*	*Done*
✓ *Test Document updated*	*Done*

Story ID: *BK-7*

User Story: Message Notifications

As a senior person, I want the application to send me an alert when I don't open the medication box on time, so that I will not miss the chance to take medicine in proper time.

DoD checklist for this PBI:	Status
	Completed
✓ *Produced artifact (code/document) for the PBI*	*Done*
✓ *Requirements mentioned in PBI are satisfied*	*Done*
✓ *Acceptance criteria(s) for PBI are satisfied*	*Done*
✓ *Unit tests performed and passed*	*Done*
✓ *Integration tests performed and passed*	*Done*
✓ *Project builds without errors*	*Done*
✓ *Design Document updated*	*Done*
✓ *Test Document updated*	*Done*

Story ID: BK-8

User Story: Taskbar Notifications

As a senior person, I want the notification to also appear in the taskbars that I can be sure not to miss it

DoD checklist for this PBI:	Status Completed
✓ Produced artifact (code/document) for the PBI	Done
✓ Requirements mentioned in PBI are satisfied	Done
✓ Acceptance criteria(s) for PBI are satisfied	Done
✓ Unit tests performed and passed	Done
✓ Integration tests performed and passed	Done
✓ Project builds without errors	Done
✓ Design Document updated	Done
✓ Test Document updated	Done

Story ID: BK-9

User Story: Existing Reminder Modification

As a use, i want the application allows me to modify the existing Reminder, so that i can organize my schedule easier.

DoD checklist for this PBI:	Status Completed
✓ Produced artifact (code/document) for the PBI	Done
✓ Requirements mentioned in PBI are satisfied	Done
✓ Acceptance criteria(s) for PBI are satisfied	Done
✓ Unit tests performed and passed	Done
✓ Integration tests performed and passed	Done
✓ Project builds without errors	Done
✓ Design Document updated	Done
✓ Test Document updated	Done

Story ID: BK-10

User Story: Sensor to Box

As a senior person, I want to be able to use the box with all the components integrate inside so that I can easily transport it and not be bothered with exposed wires and electronic components

DoD checklist for this PBI:	Status Completed
✓ Produced artifact (code/document) for the PBI	Done
✓ Requirements mentioned in PBI are satisfied	Done
✓ Acceptance criteria(s) for PBI are satisfied	Done
✓ Unit tests performed and passed	Done
✓ Integration tests performed and passed	Done
✓ Project builds without errors	Done
✓ Design Document updated	Done
✓ Test Document updated	Done

Summary of Testing

Single Sensor Miss Rate Test

The test was performed by repeatedly approaching a magnet towards the Hall effect sensor. A single error occurred after a hundred trials. However, this single error may solely be blamed on an incorrect approach and a displacement of the sensor. If well fixed in the box, the sensor should be able to have a miss rate of less than 0.0001%. Since, three sensors are used, a majority voting, single-error correction code can be implemented. We can thus determine the probability of error from the following equation.

$$P_{error} = \sum_{k=2}^{3} \binom{3}{k} (0.000001)^k (1 - 0.000001)^{3-k}$$

Thus, we can find that the probability of error is about 3×10^{-12} which is negligible.

Test Document

Test Plan 1: Crash Test

Summary: BK-2, BK-5

We are trying to see whether the app will crash while switching activities in quick succession for a moderate period of time. If we are constantly switching activities, the application could potentially crash from too many actions happening in a short period of time. We are trying to see whether the app will crash if we keep adding items to the reminder table. If we add too many reminders to the database, the application may not be able to hold all of them and throw an error or crash.

Test Case 1.1: Stress Test		
Pre-Condition: BK-2: We need a working skeleton to be able to switch between activities		
Steps	**Expected Results**	**Actual Result**
1. Switch to a different activity	Proper switch through activities	Proper switch through activities
2. Speed up the rate of switching in an attempt to crash the application	Application crashes due to too many actions	Application did not crash
Pass/Fail:		
👍		

Test Case 1.2: Overflow Test		
Pre-Condition: BK-2, BK-5: We need a working skeleton and working reminder creation to store reminders		
Steps	**Expected Results**	**Actual Result**
1. Navigate to create reminder activity.	Proper switch to correct activity	Proper switch to correct activity
2. Add a reminder to database	Reminder is added to database	Reminder is added to database
3. Continue adding many reminders to the database to crash or generate an error	Error is generated or crash due to too many insertions to the database	Error is generated or crash due to too many insertions to the database
Pass/Fail:		

Test plan 2: Skeleton Reliability

Summary: BK-2

   We are going to test the performance of our app. Firstly, we are going to test the Login Page. The login page require user to input correct PIN, so they can access the app. Secondly, we are going to test the main page. There are two buttons on this page, which are "EDIT PROFILE" and "MANAGE MY REMINDERS", and user's information shows on the top of this page. By clicking on those buttons, it will lead the user to different Activity. Thirdly, we are going to test the User Profile Activity. In this Activity, the user can fill in their personal information, which are user's name, birthday and address, and the guardian's information which are guardian's name and phone number. Finally, for Manage my Reminder Activity, there are two model, "User Privileges" and "Admin Privileges".

Test Case 2.1: Login page		
Pre-Condition: Have the application running on a device		
Steps	**Expected Results**	**Actual Result**
1.Input an incorrect PIN and click "Login"	A message show and tell incorrect PIN	A message show and tell incorrect PIN
2. Input a correct PIN and click "Login"	Go to main page	Go to main page
Pass/Fail:		
👍		

Test Case 2.2: Main Page		
Pre-Condition: Pass the Login Page		
Steps	**Expected Results**	**Actual Result**
1.If it is the first time to use this app.	Go to User Profile Activity	Go to User profile Activity
2. If NOT the first time	User information show on the top of this page, and contains "EDIT PROFILE" and "MANAGE MY REMINDES" buttons.	User information show on the top of this page, and contains "EDIT PROFILE" and "MANAGE MY REMINDES" buttons.

3. Click "EDIT PROFILE" button	Go to User Profile Activity	Go to User Profile Activity
4. Click "MANAGE MY REMINDERS"	Go to Manage my Reminder Activity	Go to Manage my Reminder Activity
Pass/Fail:		
👍		

Test Case 2.3: User's Profile Activity		
Pre-Condition: Access this Activity by clicking the "EDIT PROFILE" button on Main Page or first time use this app		
Steps	**Expected Results**	**Actual Result**
1. Access this Activity	An information list show and hints for each input items	An information list show and hints for each input items
2. Type in user's name	Keyboard show up, and allows input characters	Keyboard show up, and allows input characters
3. Type in user's birthday	Keyboard show up, and allows input number and symbol "/"	Keyboard show up, and allows input number and symbol "/"
4. Type in user's address	Keyboard show up, and allows input characters and number	Keyboard show up, and allows input characters and number
5. Type Emergency name (guardian's name)	Keyboard show up, and allows input characters	Keyboard show up, and allows input characters
6. Type Emergency phone (guardian's phone)	Keyboard show up, and allows input number	Keyboard show up, and allows number
7. Click "SAVE" button	Back to Main Page and information saved and show.	Back to Main Page and information saved and show.
8. Access this Activity again	User information shows	User information shows
9. Modify information	Information will be modified in this Activity	Information will be modified in this Activity
10. Click the backward icon on toolbar	Back to Main Page and information NOT save	Back to Main Page and information NOT save
Pass/Fail:		
👍		

Test Case 2.4: Manage my Reminder Activity		
Pre-Condition: Access this Activity by clicking "MANAGE MY REMINDERS" button on Main Page		
Steps	**Expected Results**	**Actual Result**
1. Access this Activity	An SQlite list shows, and if no reminder exist then empty	An SQlite list shows, and if no reminder exist then empty.
2. Click the three dot icon on the right of the toolbar.	Two model can be chosen, which are "User Privileges" and "Admin Privileges" and "User Privileges" model is default.	Two model can be chosen, which are "User Privileges" and "Admin Privileges" and "User Privileges" model is default.
3. Click the "Admin Privileges"	An "+" icon shows up on the bottom right of the screen	An "+" icon shows up on the bottom right of the screen
4. Click "+" icon	Go to Reminder Setting Activity	A message shows and return to User's Profile Activity
Pass/Fail:		
👍		

Test plan 3: Adding/Editing/Removing Reminders

Summary: BK-6, BK-9

      We are going to test the output of adding a reminder to the database. Firstly, we are going to set a reminder for 1 minute from the current time. Upon pressing the name, we should be able to edit the name of the medication, we should also be able to set a date and a time. Flicking the switch should enable an editText for number of days repeating. Pressing the create reminder should set an alarm.

Test Case 3.1: Setting Parameters		
Pre-Condition: Select the Create Reminder button to move to Create Reminder Activity		
Steps	**Expected Results**	**Actual Result**
1. Tap the medication name	Keyboard appears to edit the medication name	Keyboard appears to edit the medication name
2. Tap the set date text	Calendar appears and text is updated depending on date selected	Calendar appears and text is updated depending on date selected

3. Tap the set time text	Clock appears and text is updated depending on time selected	Clock appears and text is updated depending on time selected
4. Tap repeat switch	Days to repeat editText appears	Days to repeat editText appears
5. Tap create button	Alarm is set for selected time	Alarm is set for selected time
Pass/Fail:		
👍		

Test Case 3.2: Viewing Existing Reminders		
Pre-Condition: Reminders already exist in DB and select view reminder button		
Steps	**Expected Results**	**Actual Result**
1. Move to view reminder activity	List of existing reminders appears	List of existing reminders appears (the list will show a message prompting the user to create a new reminder if the database is empty)
Pass/Fail:		
👍		

Test Case 3.3: Edit existing reminder		
Pre-Condition: Reminders already exist in DB and select view reminder button		
Steps	**Expected Results**	**Actual Result**
1. Tap on an existing reminder	Option to delete or edit reminder appears	Edit reminders page appears, option to delete reminder appears
2. Tap on edit reminder button	Move to edit reminder activity (should look like create reminder activity)	Edit reminder activity appears
3. Tap on done button	Alarm values are updated	Alarm values are updated
Pass/Fail:		

👍

Test Case 3.4: Delete existing reminder		
Pre-Condition: Reminders already exist in DB and select view reminder button		
Steps	**Expected Results**	**Actual Result**
1. Tap on an existing reminder	Option to delete or edit reminder appears	Edit reminders page appears, option to delete reminder appears
2. Tap on delete reminder button	Alarm is removed	Alarm removed from database
3. *Additional Check:* Wait for previously designated time to see if alarm fires	Alarm does not fire	Alarm does not fire at previously set time
Pass/Fail:		
👍		

Test plan 4: Notifications Validity

Summary: BK-7, BK-10, BK-11

We are going to ensure that notifications are received in the notification trigger activity. Once received, the notification will trigger when the corresponding alarm fires.

Test Case 4.1: Notification Trigger is successful		
Pre-Condition: Alarm must already exist in the system		
Steps	**Expected Results**	**Actual Result**
1. Wait for time/date of alarm	Alarm fires	Alarm fires +/- 30 seconds of set time
2. Check if notification appears	Notification appears when alarm is fired	Notification appears when alarm is fired
3. *Additional Check:* Does the notification contain the medication name?	Notification description contains medication name	Medication name appears in notification

Pass/Fail:
👍

Test Case 4.2: Notification for bluetooth connection error		
Pre-Condition: Alarm must already exist in system, Bluetooth must be disabled		
Steps	**Expected Results**	**Actual Result**
1. Wait for time/date of alarm	Alarm fires.	Alarm fires +/- 30 seconds of set time.
2. Check if notification appears	Notification appears when alarm is fired.	Notification appears when alarm is fired.
3. After 30s, new notification appears notifying that bluetooth is not connected	Error notification appears, loop until successful connection	Error notification appears, loops several times, stops looping once bluetooth is connected

Pass/Fail:
👍

Test Case 4.3: Secondary & Tertiary reminders		
Pre-Condition: Initial reminder must have already fired		
Steps	**Expected Results**	**Actual Result**
1. Wait X minutes for secondary reminder	Secondary reminder appears with warning message	Secondary reminder appears with warning message
2. Wait an additional X minutes for tertiary reminder	Tertiary reminder appears with emergency message	Tertiary reminder appears with emergency message
3.1. Send text message to emergency contact	Text message sends	*Hardware limitation: No SIM card provided*
3.2. Receive text message from ReMed Me! device	Text message is received	*Hardware limitation from previous step*

Pass/Fail:
👍	*Partial*

Test Case 4.4: Notification for successful opening/closing of box		
Pre-Condition: Initial reminder must have already fired		
Steps	Expected Results	Actual Result
1. Open the box before tertiary reminder	Notification appears notifying the user that the box has been opened	Notification appears
2. *Situational:* Leave the box open for X minutes	Notification appears notifying that the box has not been closed	Notification appears
3. *Situational (Requires Step 2):* Close the box	Notification appears thanking the user for closing the box	Notification appears
Pass/Fail:		
👍		

Test plan 5: Bluetooth Connection & Open/Close Validation

Summary: BK-3, BK-4, BK-10

We are going to test the validity of the bluetooth connection to the device as well as the validity of the open/close checks of the box.

Test Case 5.1: Bluetooth connection successfully established		
Pre-Condition: Initial reminder must fire on the device and BT device must be paired		
Steps	Expected Results	Actual Result
1. Wait for bluetooth connection to complete	Bluetooth connection is made (BT module LED will blink twice if connection is made)	Connection is made, BT module LED blinking twice
Pass/Fail:		
👍		

Test Case 5.2: Open/Close validation
Pre-Condition: arduino must be listening for feedback from sensors

Steps	Expected Results	Actual Result
1. Close the box	LED of arduino turns on (indicating successful close)	LED turns on
2. Open the box	LED of arduino turns off (indicating successful open)	LED turns off
Pass/Fail:		
👍		

Ethical Dimensions

For the development of our mobile application, there are two major ethical issues concerning our application that we found by interviewing stakeholders and by discussing among ourselves. The first ethical issue is the misuse of collected data for advertisement by pharmaceutical companies. The second ethical issue is the possibility from a relative to take advantage of the information contained in the application to either cause harm or control a senior or a patient using our application.

Our first ethical issue is that since we plan to collect data on our users, there are pharmaceutical companies that may use this data to advertise their products at the expense of our users. Furthermore, it is very likely that we are going to partner with pharmacists, in the future, to provide the an educative interface as well as monitor the dosage of the medication. Therefore, we may very well be tightly involved with pharmaceutical corporations. Since their vested interests are not always in the benefits of our clients, we need to make sure that we have clear policies with our partners. Since our main stakeholders are seniors and seniors can be gullible and more worried about their health than other stakeholders, they make easy prey for pharmaceutical companies. We do need to collect data on our users to help them improve habits and follow-up on their medication intake, but we must avoid that corporations uses this data to take advantage of our users. What kind of data should we collect? Who can access this data? How should we collected this data? Should the data collected be merely statistical over the entire population of users or tailored specifically to each individual? The latter may lead to more risk of misuse, but may be more helpful to our user. This ethical issue may arise when we will be seeking investors as our investors may be pharmaceutical companies or other related businesses that may have an agenda that is not in favor of our users. If we are in dire need of financial support, what should we value more? Our customers' privacy or our need for capital? In such a case, we need to keep in mind why we are doing such an application. We need to keep in mind our mission statement and that our main stakeholder is seniors and we are making this application to help them. Furthermore, we can implement different methods to protect our customers. Among these methods is encryption of user data which can only be accessed by a medical professional, the senior and his/her guardian.

Our second ethical issue concerns the potential abuse of the application to control or harm a senior or a patient. Indeed, during one of our interviews, the interviewee brought up the issue of confidentiality and gave the example of consent that is required for a parent, for example, to access their 13 years old or older child's information. Would anybody be able to access the patient's information? Who can see and who cannot? If it is absolutely necessary that someone else has access to

that information, but the consent is not granted, what would we do? Also, in the opposite case, how could we protect our user's confidentiality? Therefore, this ethical issue arises among around different users. Our primary users, the seniors, and our secondary users, medical staff and guardians. One way such an abuse can be done is that there will be most likely some sensitive information concerning the patient that he/she may not want to be known. Therefore, someone may use that information to humiliate or threaten our user. Also, some users feel ashamed or belittled by their medical conditions and would rather not have someone else know about it. This may lead to, in the case someone using our application get access to this information without consent, in some circumstances, to the information holder to tr and use this information to blackmail the user and thus control or abuse the user. Our solution is to use PIN access so that only the senior or their guardian can have access to the user data.

Product Application Source Code

The source code is located on the following GitHub link: **https://github.com/monnyy/CoenElec390**

Team Blog

Date (When)	Members (Who)	Activity (What)	Purpose (Why)	Output (Result)
Jan 26th 2018	All	Team meeting at Concordia (15 minutes)	- Fix objectives. - Plan the delivery of milestone #1. - Schedule a team meeting and decide on the work to be done before the meeting.	- Scheduled a team meeting for Jan 30th. - Fixed work to be done for the meeting. - Team agreed to use Slack to communicate.
Jan 30th 2018	All	Team meeting at Concordia (2 hours)	- Brainstorm ideas. - Discuss opportunities. - Decide evaluation criterias. - Evaluate opportunities.	- Team agreed to use Google Drive to work on project related document. - Team shared ideas and agreed on 6 final opportunities and evaluation criterias..
Jan 30th 2018 - Feb 1st 2018	All	Finalize milestone #1 at home (2 hours each)	- Evaluate opportunity statements - Rank opportunities - Make a mission statement and finally deliver milestone #1.	- Opportunity statements completed and ranked. -Milestone #1 completed, reviewed and submitted.
Feb 9th 2018	All	Team meeting at Concordia (30 minutes)	- Plan the delivery of milestone #2. - Schedule 3 interviews - Schedule next meeting	- Fixed work to be done before the interviews. - Interviews scheduled during the upcoming weekend. - Meeting fixed next wednesday to finalize the submission.
Feb 12th 2018	All	Interview with a nurse and an elderly person (4 hours)	- Do the interview, ask questions and get as much information as possible from these two stakeholders. - Document the meeting.	- Meetings were a success. - Interviews were documented and reviewed.

Feb 13th 2018	All	Interview with a pharmacist (2 hours)	- Do the interview, ask questions and get as much information as possible from this stakeholder. - Document the meeting.	- Meeting was a success. - Interview was documented and reviewed.
Feb 14th 2018	All	Team meeting at Concordia (1 hour)	- Review and decide the final format of the submission of milestone #2.	- Agreed on the final format of Milestone #2 and split the remaining tasks.
Feb 15th 2018 - Feb 16th 2018	All	Finalize milestone #2 at home (3 hours each)	- Review interview documentation. - Review product backlog. - Review ethical dimensions. - Review simulation and finally deliver milestone #2.	- Interview documentation completed. - Product backlog completed. - Ethical dimensions completed. - Milestone #2 completed, reviewed and submitted.
Feb 19th 2018 - Feb 20th 2018	All	Product Backlog grooming (1 hour each)	- Write stories of the app - Decide the stories going to do in Sprint 1	- 4 stories are wrote - sensor and microcontroller (BK-1) will do in sprint 1 - Skeleton (BK-2) will do in sprint 1
Feb 21st 2018	All	Brainstorm (30 minutes)	- Decide what electronic component we need - Design the Skeleton of the app	- Arduino Uno will be used - need two OpenPIR sensors - Skeleton contains 5 Activity
Feb 22nd 2018 - Feb 25th 2018	All	Writing Sprint 1 backlog and prepare the meeting with professor at home	- Fill in the Sprint 1 backlog - Divide the task for each Stories - Estimate the time needed to finish each task - prepare the meeting	- Sprint 1 backlog is completed and submitted - Ready for the meeting
Feb 26th 2018	All	Sprint 1 meeting with professor (1 hour)	- Present our product - Present what we are going to do in Sprint 1 - Get comment from professor	- OpenPIR sensor may not the best option - Documentation and Product Backlog grooming need to

				include in Sprint backlog
Feb 27th 2018	All	Review the comment from the meeting (1 hour)	- Improve PBL and Sprint Backlog - Brainstorm new sensors will be used	- Stories on PBL is in order documentation include in Sprint backlog - Hall Effect sensor will be used
March 5th 2018	All	Team meeting (15 minutes)	- Team members show what they are done	- Skeleton is in progress
March 7th 2018	All	Team meeting (15 minutes)	- Team members show what they are done	- Skeleton is completed - Start working on Sprint backlog - Product Backlog grooming
March 11th 2018	All	Communicate on Slack (2 hours)	- Review the PBL and Sprint 2 Backlog - prepare for the meeting	- Sprint 2 Backlog done and submitted - Ready to meet with professor
March 12th 2018	All	Sprint 1 review and Sprint 2 planning with professor (1 hour)	- Present what we done in Sprint 1 - Present what we are going to do in Sprint 2 - Get comment from professor	- Need a physical medication box - The data transfer must be done as soon as possible - need prevent user accidentally change the reminder
March 14th 2018	All	Review the comment from meeting (30 minutes)	- Design Login page - Try to get all the electronic staff	- Login Page to restrict people access - Electronic component will buy after meeting
March 16th 2018	All	Team meeting (15 minutes)	- Report what we have completed	- Medication box is built - Start working on BK-3, BK-4, BK-5, BK-6
March 19th 2018	All	Coding meeting (3 hours)	- Coding together to share knowledge - Communicating face to face for more efficiency	- BK-5 and BK-6 is done
March 21th 2018	All	Coding meeting (3 hours)	- Coding together to share knowledge - Communicating face to	- BK-5 and BK-6 is done - BK-4 is in progress

			face for more efficiency	
Mar 23 2018	All	Documentation meeting (1 hours)	- Start to working on Sprint 3 backlog - Start to write the PDF file	- Sprint 3 backlog is in progress - BK-4 is in progress
Mar 24 2018 - Mar 25 2018	All	Communicate on Slack (3 hours each)	-Work on the documentation -Try to finish Bluetooth connectivity	- All the documentation is done and submitted - Bluetooth still in progress
March 26th 2018	All	Sprint 2 review and Sprint 3 planning with professor (1 hour)	- Present what we done in Sprint 2 - Present what we are going to do in Sprint 3 - Get comment from professor	- Get some feedback on our app
Mar 28 2018	All	Review the comment from meeting (30 minutes)	- Change the style, front, and size of the product	- All the message and icon are big enough to see
April 3th 2018	All	Meeting with TA (1 hours)	- Get some feedback from TA - Get help for Bluetooth connection	- Get some ideas for the final demo meeting. -Get the source for Bluetooth connection
April 5th 2018 - April 8th 2018	All	Coding meeting (3 hours)	- Bluetooth coding (4 hours each)	-Bluetooth connection completed - product is done
April 9th 2018	All	Final presentation prepare	- Debug all the code - Create a PPT for speech - Prepare the speech	- Product run perfectly - PPT is done - Ready for presentation
April 10th 2018	All	Final product demonstration	- Present and demonstrate our product	- Presentation complete
April 15th 2018- April 17th 2018	All	Final Report completion	- Assemble and complete de final report with existing and new material	- Final report is completed