G52GRP Final Group Report

Project title   :   SpaceFit

Date   :   8 March 2018

Group Id   :   9

BOYS it's me Omar i know it's been sometime if you ever open this i hope you're all okay :D.

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1.0 Introduction

1.1 Problem Statement

Data are information that is stored in databases are crucial in every field in the modern world. Collection of data would provide insights on different users as it implies more understanding towards a specific or group of consumers. Based on the client of this software engineering group project, with the possession of these data health organizations would be able to learn more about the health condition of users.Therefore, a mobile app application is to be created which could collect these personal details and store them and while at the same time able to attract users to download and utilize this application.

1.2 Purpose

The purpose of this app is to collect information from different users who downloaded the app and to store information obtained into a database. The database would then be given to our client and the school of pharmacy.

1.3 Intended Audience

The intended audience for this application would be for the white-collar and younger generations which includes students. The primary target for our application would be students from University of Nottingham Malaysia Campus before expanding the application to the globe.

1.4 Project Scope Description

In this project, the objective is to create a mobile application through the use of Android Studio and Unity game engine which serves the function of collecting data and information from a wide range of users. At the same time, to promote a better and healthy lifestyle for them while storing their information in our databases.

A step tracker would be implemented in order to record the number of steps taken by a specific user and the users will be given a goal or target to reach. The goals are important as once reached users will be able to earn coins which would be allowed to use in the game to enhance their experience and upgrade certain features.

Besides that, as a health and fitness app, the project also contains a sleep tracker that can track the sleep duration of the user. This will increase the user's awareness of their sleep quality as population nowadays has less sleep when compared to the previous generation.

However, in an instant gratification world, the app must have a feature that can attract the users in the first place. Therefore, a game is implemented in the app to give users a purpose to walk more or sleep more so they can gain in-game currencies to upgrade their items.

Other than that, users could also proceed to the rewards section and claim various gifts such as coupons or discount on certain items using the virtual currency generated through achieving the targeted steps. The idea is to encourage users by rewarding them both in the virtual and the physical world for each effort that they have made.

The progress of the number of steps or other related health data extracted from the users would be displayed on the main screen represented with a progress bar. There is a virtual coin tracker that would display the current amount of currency users have in order to exchange it for exciting rewards. The theme of the app would be Space and therefore black and purple were decided as the primary theme colours.

In order to store the information obtained, Google's firebase service has been used to create the database. The information obtained would then be handed over and granted access to the client for pharmaceutical and healthcare reasons.

2.0 Literature Review / Background

Importance of health care

Technology and human life coexist with each other in the current generation as society are generally dependent on technologies. Humans use technology to travel, communicate, learn, to do business and to ease their lives further than before.With the advancement of technologies in the current generation, smart devices began to play a major role in our daily life which also results in the drastic increase of applications. Various activities and programs could be found and done through the use of these applications such as for health care purposes. Health care is defined as the efforts made to maintain or restore physical, mental, or emotional well-being especially by trained and licensed professionals. Health care plays a major role in society as health and wellbeing are the important factors for longevity. Therefore, it is important to take care of our health especially as in the modern world, individuals who are constantly connected to hectic lifestyle are prone to neglect their health for example if an individual is too busy, it could result in a stressful lifestyle and negatively impacts the individual's sleep which would deteriorate their health.

Mobile Health

With the emergence of mobile phones, various innovations has been brought forth for different sectors such as health sector. According to Marufu and Maboe (2017), mobile health is defined as the implementation of health care through the utilisation of mobile devices and internet services[1]. Generally, it is used to improve health condition and to manage the information of patients as the purpose of mobile health is to collect data and conduct surveillance on users rather than on actual patient care. Data collection

plays an important role in the current generation and it is prioritised more than actual patient care as data could provide us with insights and details.

Fitness App

Based on Higgins, by implementing online physical activity services, studies have shown that there is a drastic increase in the number of users performing physical activities[2]. Since most individuals in the current era owns their own personal smart devices, healthcare and fitness applications could assist pharmacists by supervising or even measuring the user's health and fitness to ensure that they maintain optimum condition at all times. Recent study has shown that participants who uses the fitness applications tends to be more active when compared to nonusers and past users based on the Journal of Medical Internet Research. Leib Litman, one of the stud's author along with his colleagues examined the exercise habits of 726 participants and they are then subdivided into three categories : the current app users, former app users and nonusers. Results has shown that 75% of current app users were more active compared to nonusers and former users. Therefore, it is concluded that fitness apps increases motivation to exercise. To further encourage users to conduct more physical exercises, the addition of daily goals and progression have proved to contain higher effectiveness.

Games

The reason games are added to applications is to invoke rich motivational experiences and bring excitements to people[3]. Most game designers implement reward system in their game such as virtual items or achievements because they would induce motivation in users[4]. An example where reward system is implemented which overlay the player's achievement would be the Microsoft's Xbox and Sony's PlayStation[5]. Not only that,

the system allows players to interact with the game physically and burn their calories in the process.

Rewards System

Rewards system are generally implemented in games as human likes to be rewarded and commended for accomplishing certain tasks or actions[4]. Different rewards such as mobile coupons could also be added into the rewards system as these virtual coupons would attract the attention of users[6] as studies have also proven that rewards often increase the extrinsic motivation of players where the game is played in order to obtain the rewards[7].

Global Positioning System

Applications that deals with health and fitness, exercises routine, dietary food intake, social apps and games are the most popular categories of smartphone apps.GPS contains various conveniences for example people may find themselves in an area where they have no information about and it also provides directions from an unknown location to a known place. There are many applications which uses GPS to calculate distance , time and average pace such as Endomondo Sports Tracker and MapMyRUN.

Step Tracker

Physical activity behaviour change apps provides the chance to provide tailored feedback and advice at the appropriate time and place as most society members carry their smartphones and have access to their data most of the time. Google Fit contributes to the evolution of tracking of physical activity with over 5 million download in the initial 6 months after it was made available to the public. The application is an

activity tracker that automatically recognises and records physical activities such as walking, running or cycling through the use of step-tracker function. Health and fitness applications adopts MotionX technology through the use of 3D accelerometers and pedometers in order to obtain movement.

Sleep Tracker

The quality and quantity of sleep plays a major role in the personal health of an individual. Smartphones and wireless smart trackers in healthcare system relies on recording activity and supervising significant signs for example sleep pattern. Sleep patterns and pulse are measured using wireless smart trackers and are then translated into health information.

Background

Spacefit is designed as a fitness and healthcare application. The idea was first introduced during the meeting with the client of this software group report. The purpose of this application is to promote health awareness among individuals of the society as the current generation are hindering their health due to their hectic lifestyle. Therefore , Spacefit is implemented as a fitness tracker application and at the same time the health data collected could also be used to analyzed by pharmacist in order to develop a better understanding of user's health and come out with ideas to improve them. The Spacefit application contains all major features as stated above in order to carry out its' function and purpose.

3.0 Group Organization Methodology

3.1 Meeting System

As mentioned, the project is estimated to take about [days/hrs] from [date] to [date]. The agile methodology that has been implemented would be the weekly scrum. Reason being so would be that scrum methodology is able to cope with complexity and risk. The main priority of scrum would be placed on decision making. There would be 3 major roles in a scrum which would be the product owner, scrum master and the team. These roles are to be divided among the project members accordingly to ensure good progression and teamwork and to avoid unneeded confusion. A scrum meeting would be held weekly to discuss the progression over the past 1 week and to update project members about the current problems faced and hope to come out with a better solution during the meeting.

Currently, two meetings had been held together with the client. The first meeting was held on the 1st of October 2017 with the presence of the group supervisor, Dr Geetha Baskaran and the project client, Dr Khoo Teng Jin from the school of pharmacy from University of Nottingham Malaysia Campus. The purpose of the prime meeting would be the briefing of the project task and to obtain as many requirements and details from the client regarding on the project. During the first meeting, Dr Khoo has provided a brief introduction towards the advancement of the project and specific functions for the purpose of the application. Emphasis on security and data of the application has also been made by the client on its' significance.

The second meeting with the client was held in order to display the current progress of the project. It is the member's responsibility to ensure that the client is happy with the flow of the project and to avoid any misunderstanding with the client. During the

meeting, it has been mentioned that the client hopes that this application would be marketable and to achieve the targeted industrial revolution 4.0 so that it would be able to compete with other similar applications. A prototype has been displayed to the client and was briefed on the basic functionalities of the application and current progress.

3.2 Time Plan
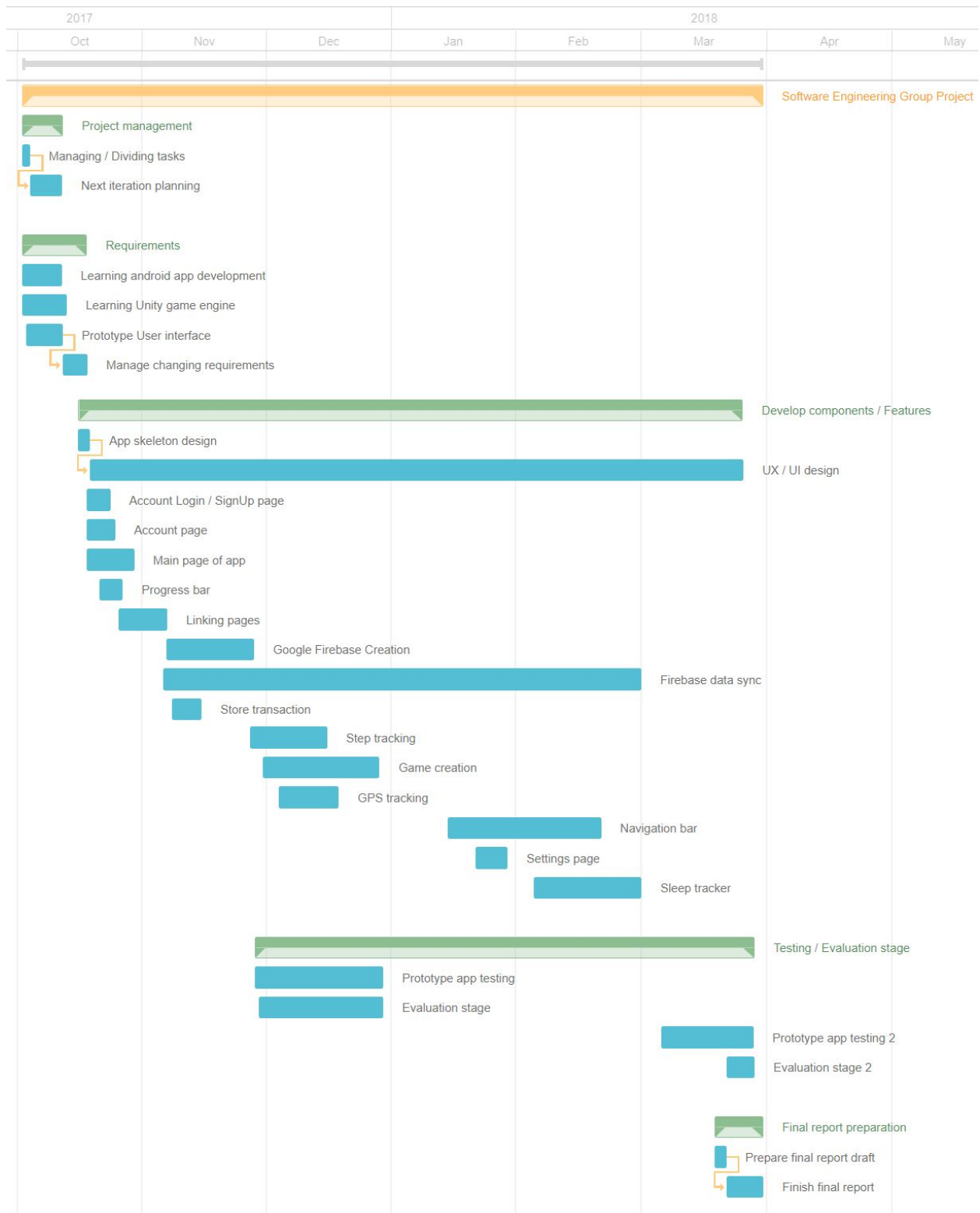
The initial phase of the project would begin on the 1st of October until the 31st of December 2017. Initially, a week was taken in order to create our software requirement system documents so that each and every member would have a clear guideline to follow and to subdivide the task and to execute them with the highest efficiency. As per request of the client, Android platform has been used to create the application and Unity game engine to create the game which required each of the project members approximately a week to learn android mobile app development through the use of Android Studio and game creation through Unity game engine.

After learning on the basic functionalities of Android Studio and Unity game engine, the execution of the task has begun. Primarily, a basic application design and also the progress bar had been created, which took about 2 weeks to complete. 11 weeks were then given to design the pages and user interface as it is an ongoing process. After finishing the previous phase, the creation of an account signup and login page had been decided, which it would take about 1 week time to complete. Then, those pages would be linked up together in 1 week. Assuming the account creation and sign-in page was a success, storing user data into a database through the use of Firebase application would be possible.

Approximately 3 weeks were given to create the database because learning and coping with the new firebase service required a significant amount of time. With the completion of basic functionalities of the healthcare app, the testing stage for the prototype was followed up to make some evaluation on it.

A basic step tracker was implemented into the app in 3 weeks time. Then, the Unity game design took about 1 month to complete because learning Unity from scratch required some time for the project members. Finally, GPS tracking took about 2 weeks to complete. Basic game design prototype was also created on paper and slowly being tested in a controlled environment.

The second phase of the project started from the 14th of January until the end of March 2018. A navigation bar which took about 1 month was added into the app to make navigation around the app easier. Then, about 1 week was given to create a settings page for users to log out. Roughly about 1 month's time was given to add a sleep tracker page to record user's sleeping time.

Finally, all records, activities and progress were compiled into the final report which would be done by the end of March.

3.3 Scrum Framework

3.3.1 Product Backlog

-step tracker	-database
-heartbeat rate	-game
-gps	-fun facts
-thumbprint login	-UI design
-store	-sleep tracker
-leaderboard	-Google Fit integration
-account creation	

3.3.2 Release Backlog

-step tracker	-UI design
-account creation	-store
-Gps	-database
-sleep tracker	
-game	

3.3.3 Sprints

Sprint 1 : (8 October 2017 - 21 October 2017)
- progress bar
- redesign of progress bar
- creating account page
- creating login page
- creating startup page

- linking pages together

Sprint 2 : (6 November 2017 - 26 November 2017)

- BMI value calculation

- creating database using firebase

- creating virtual currency

Sprint 3:(27 November 2017 - 3rd December 2017)

- allow users to edit profile

- UI-design

- Step-tracker

- Virtual currency generation

Sprint 4:(4 December 2017 - 4 January 2018)

- Built-in video game

- Gps

Sprint 5:(12 January 2018 - 31 March 2018)

- Navigation bar

- Sleep tracker

- Setting page
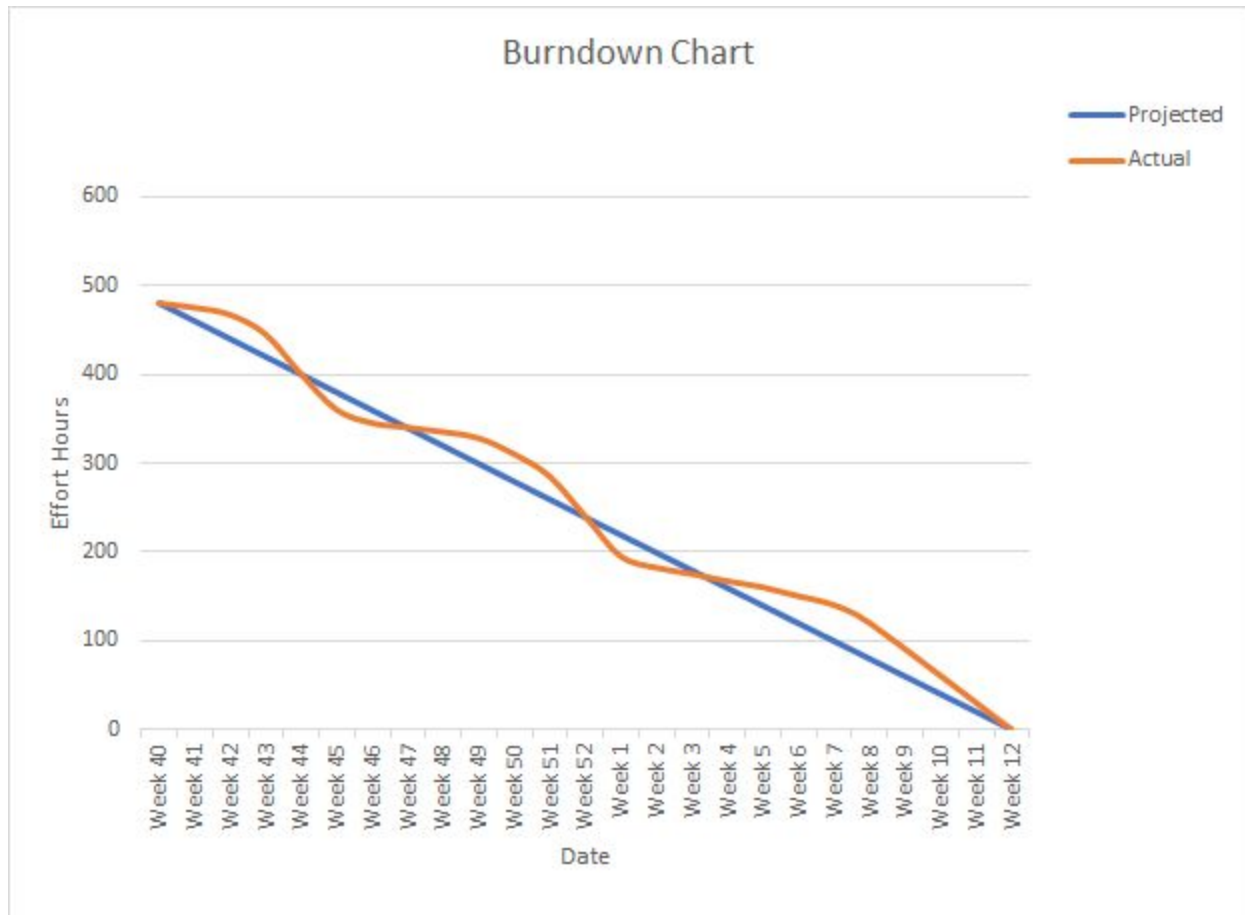
3.3.4 Burndown Chart

Figure 3.3.4 Burndown Chart

The burndown chart above corresponds to the Gantt chart for this project. The projected line is the optimum effort for the development team to put in each week. However, there will be setbacks that will delay the process and opportunities to speed up the process. The actual line represents the actual time taken for the development team to create the designed app.

4.0 System Design / Software Requirement Specification

4.1 Functional Requirements

4.1.1 User Class - User

4.1.1.1 Functional Requirement 1

ID:FR1

TITLE:Sign up an account

The user can sign up an account by entering their sign up details on the sign-up page. After signing up, they are automatically logged in into the app. Another alternative for the user would be signing up using a Google Account.

4.1.1.2 Functional Requirement 2

ID:FR2

TITLE:Sign in

If the user is not signed in, the user can login into the app by entering their login details on the login page. Identical to signing in, through using a Google account user can also login using the same way.

4.1.1.3 Functional Requirement 3

ID:FR3

TITLE:Sign out

The user can sign out of the app on the settings page which will bring them to the login page of the app.

4.1.1.4 Functional Requirement 4

ID:FR4

TITLE:Profile Page

The user can view personal details on their profile page where their age, weight, height, total steps, sleeping hours for the day, and BMI rating are shown.

4.1.1.5 Functional Requirement 5

ID:FR5

TITLE:Edit Profile Page

The user can edit their details and their sprite through the profile page.

4.1.1.6 Functional Requirement 6

ID:FR6

TITLE:Purchase in-app items

The user can purchase in-app items using virtual currency on the store page.

4.1.1.7 Functional Requirement 7

ID:FR7

TITLE:Play the built-in game

The user can access and play the game by pressing a pre-built button on the main page that will link to the game.

4.1.1.8 Functional Requirement 8

ID:FR8

TITLE:Set up the alarm clock

The user can choose a time they wish for the alarm clock to ring.

4.1.1.9 Functional Requirement 9

ID:FR9

TITLE:Turn off the alarm clock

The user can turn off the alarm clock anytime after turning it on.

4.2 Non-functional requirements

SYSREQ1: **Profile authentication**

SYSREQ1.1:The system will verify all details entered by each user when they sign up for the first time.

SYSREQ1.2:The system will display an error message indicating that the email existed in the database and the system would prompt the user to use a different email to sign up.

SYSREQ1.3:The system will validate the email and the password of the user when the user log in to the application. The system will display an error message which indicate either the email or password entered by the user is incorrect and does not match the database record.

SYSREQ2: Bmi calculation

SYSREQ2.1:The system will retrieve the weight and height data of the user from the database.

SYSREQ2.2:The system will calculate the BMI of the user and will display the value of it on the profile page.

SYSREQ3: Virtual currency calculation

SYSREQ3.1:The system will reward users with virtual currency that can be used to exchange for vouchers and in-app purchases whenever the user completes certain tasks such as reaching targeted daily number of steps or walking for a certain amount of distance.

SYSREQ3.2:The system will deduct the appropriate amount of the currency from the user's account when the user purchases items from the application store page.

SYSREQ4: Store transaction

SYSREQ4.1:The system will add the selected item while deducting the corresponding amount from the user's account when the user successfully purchases an item from the store page.

SYSREQ4.2: The system will display a warning on errors related to transaction fails due to insufficient funds or server error and no deduction will be made.

SYSREQ5: Updating user database

SYSREQ5.1:The system will automatically update the database with the latest data whenever user data as shown below is changed in the app

- Weight   -Age
- Height
- Coins
- Sleep
- Steps
- GPS

SYSREQ6: Retrieving database data

SYSREQ6.1:The system will retrieve user data from the database and update the user interface on the user profile page and menu bar when the user login to the app.

SYSREQ7: **Alarm clock ringing service**

SYSREQ7.1:The system will play a song if the time set by users has been reached. The system will stop the song when the user turns off the alarm clock or once the song has ended.

SYSREQ8: **Step tracking**

SYSREQ8:The system will update the steps progress bar and save the number of steps to the database when the user takes a step.

SYSREQ9: **Location tracking service**

SYSREQ9.1:The system constantly tracks the location of the user and sends it to the database. However, the location will not be shown to the user.

4.3 UML diagrams

4.3.1 Use Case diagram
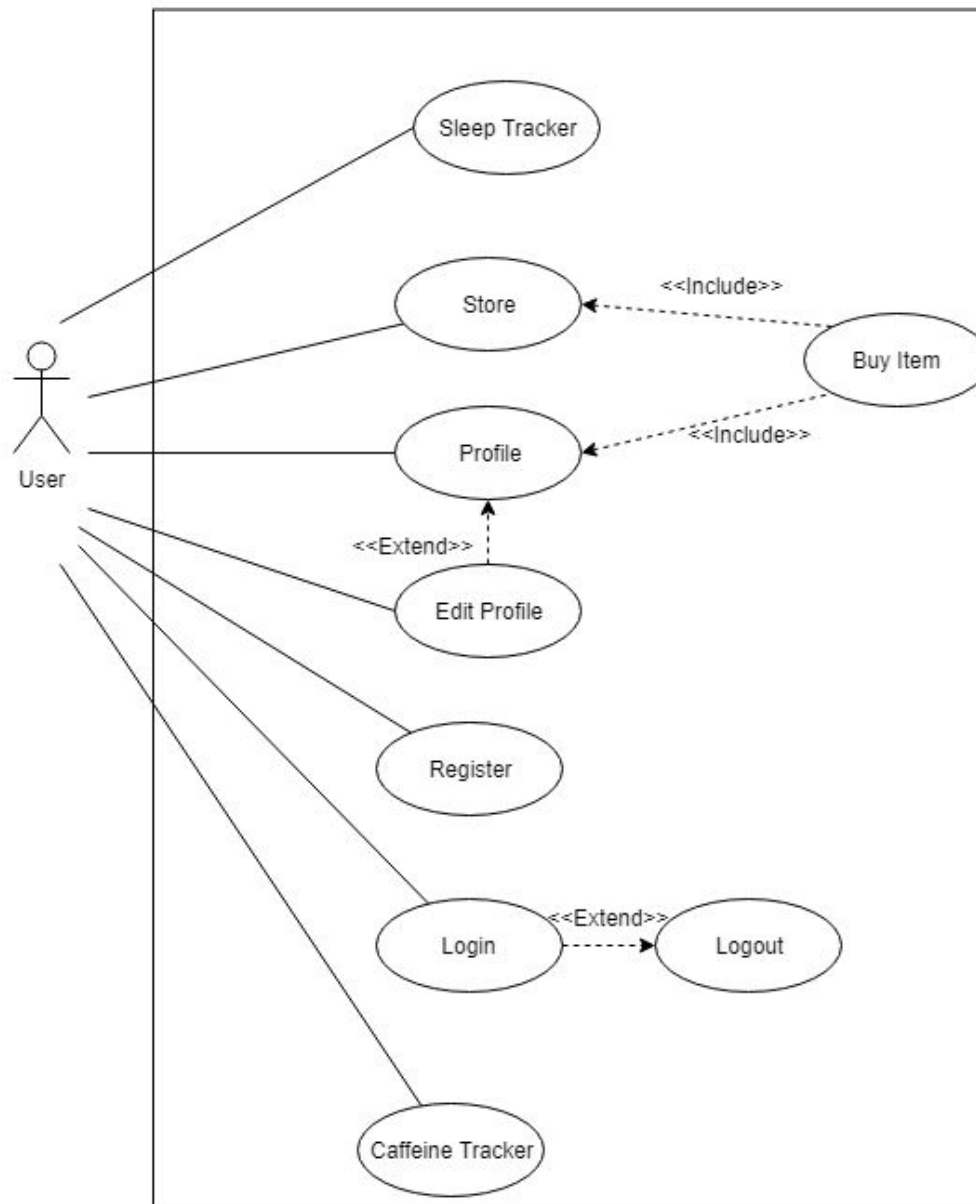
Figure 4.3.1 Use case diagram

The diagram above refers to how the app works. The user is only allowed to interact with the above functions in the app. The function register requires user to input certain data that will be stored in the database. Sign out extends login because the user can only sign out of the app if they are logged in. The same concept applies to edit profile. Purchasing items is included in both profile page and store as users can buy items from the two.

4.3.2 Activity diagram
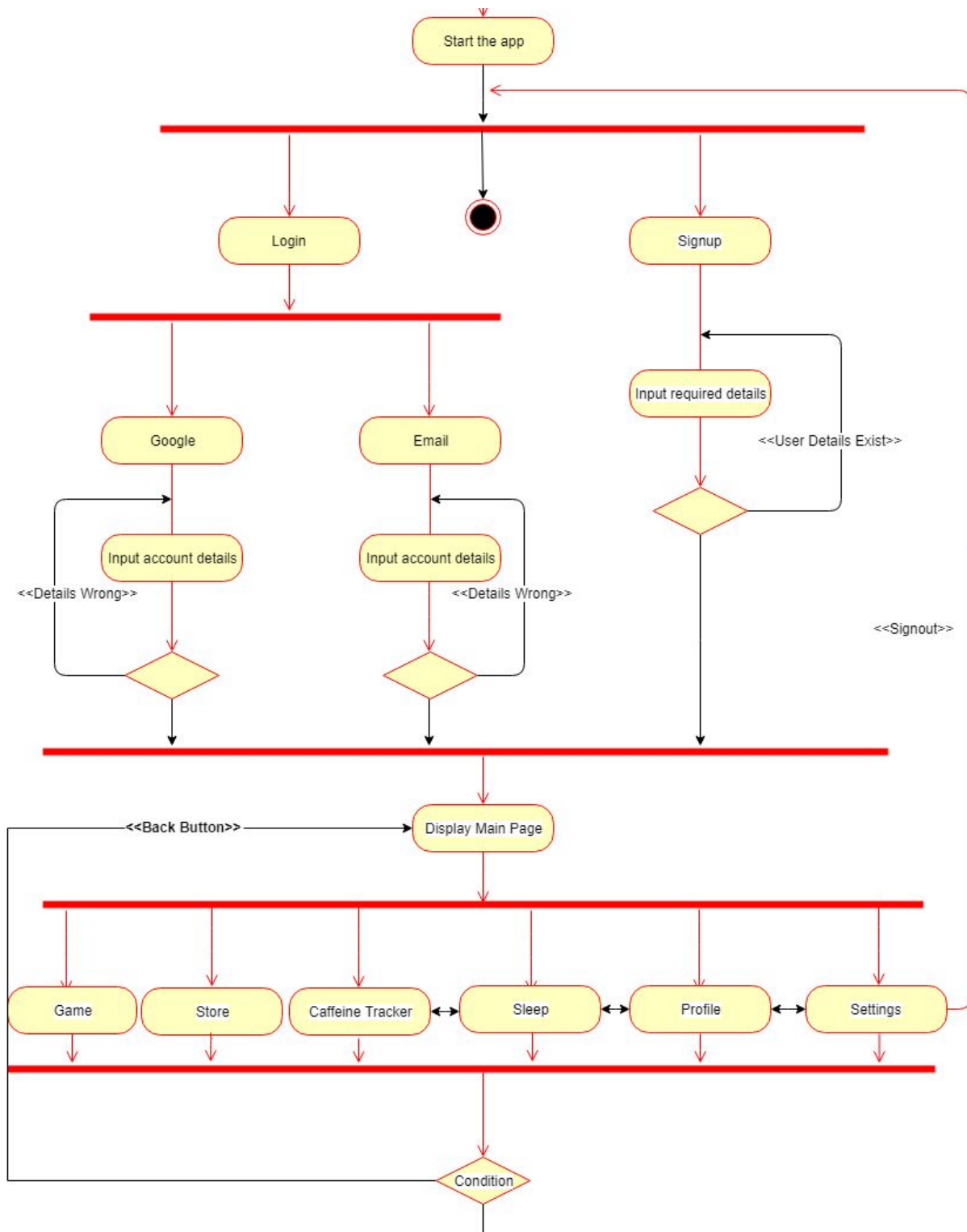
Figure 4.3.2 Activity diagram

The diagram above shows the flow of the app. Firstly, the user will start the app. From then onwards, the user has the options to choose either signup or login, either through Google or personal email verification. For signup, if the email entered already exist in the database, the user would have to re-enter their details with a different email. For the login, if the user input does not match the data stored, the user would have to re-enter their details. Google verification however, requires a valid Google account. All of the above options would then lead to the main page of the app. From there the user can choose to view their profile, enter the store, play our game,use the caffeine tracker and use the alarm clock function.

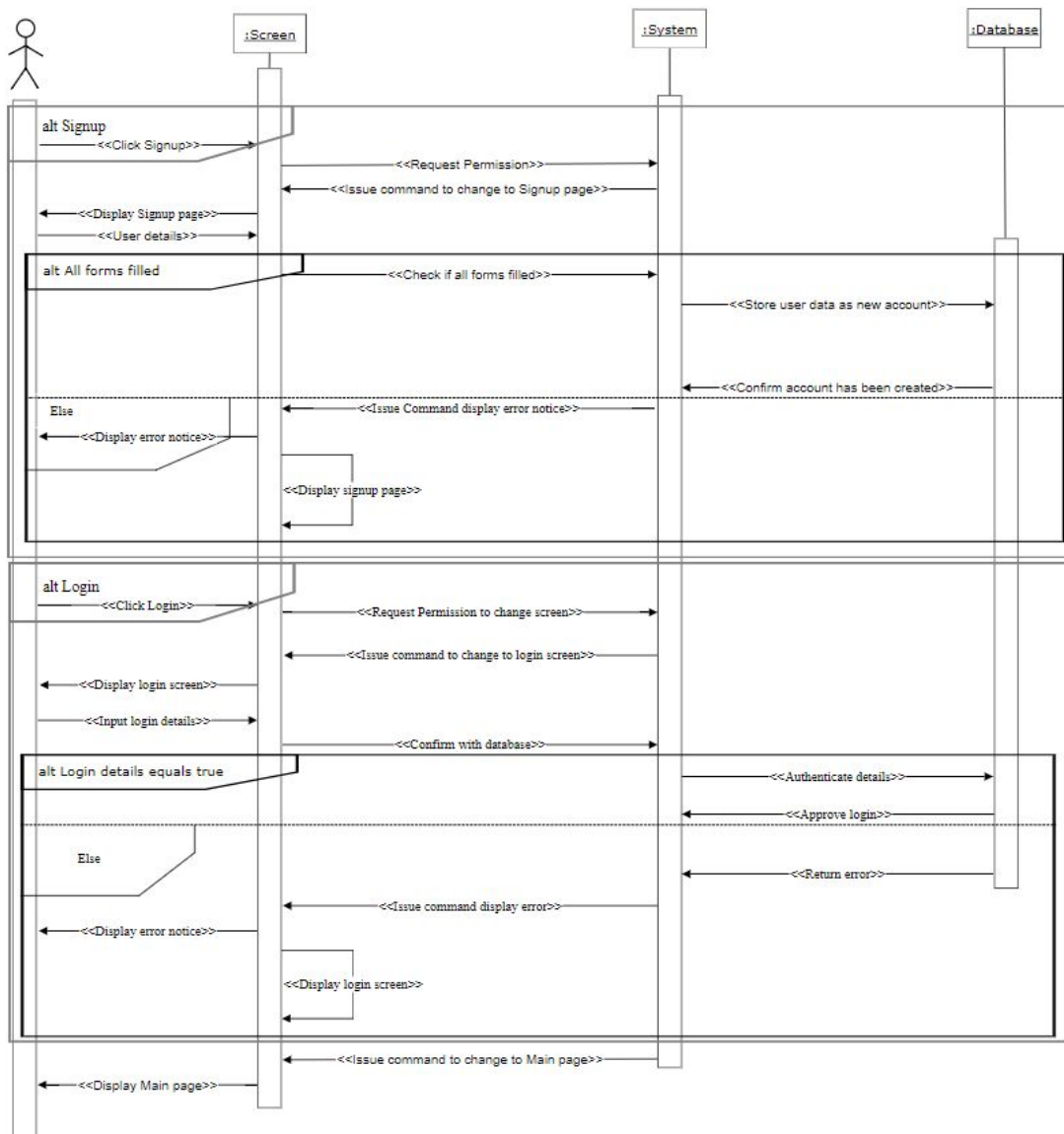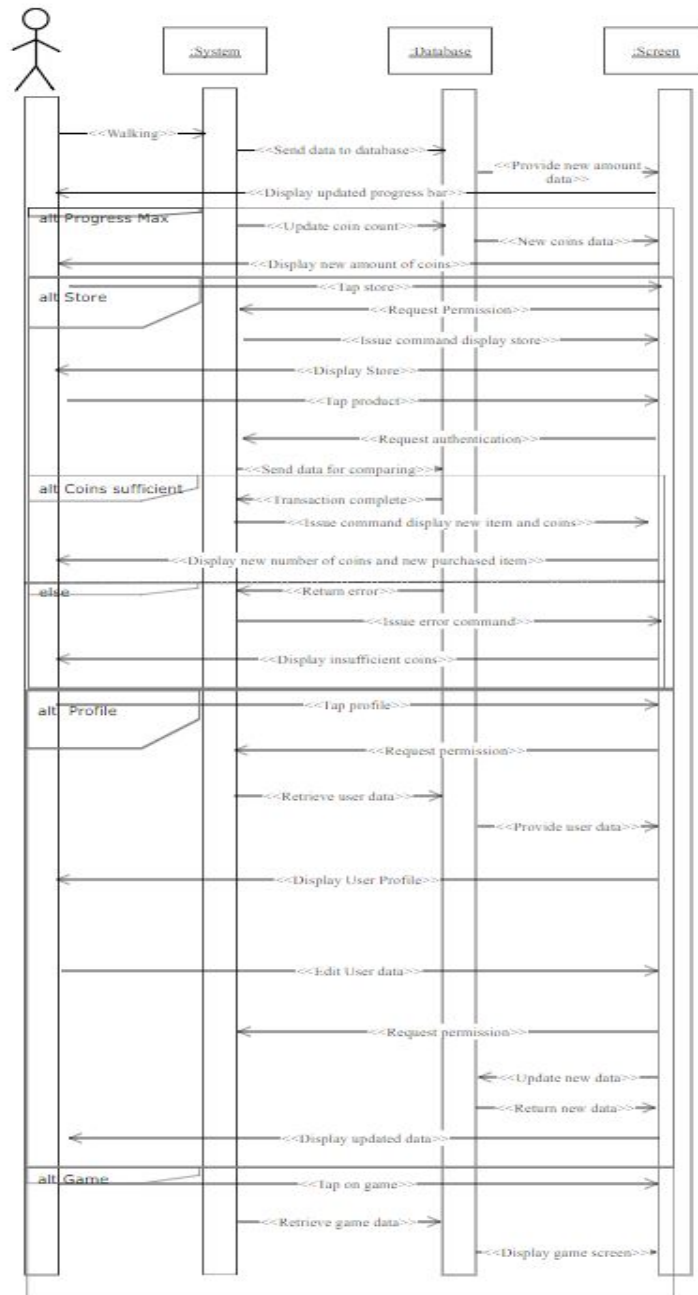### 4.3.3 Sequence diagram (part 1)

Figure 4.3.3 Sequence diagram (part 1)

The diagram above shows how the login and signup system of our app works. There are 3 activities that are involved in the interaction between the user and the app. The 3 activities include the screen, system and the database. The screen is used as a platform for the user to interact with the system. The system issues a command to the

database and the screen. The database stores and sends out data that is necessary. 'Alt' in the diagram represents if statements in actual code. For example, there is an alt symbol next to Signup, if the user clicks on signup, everything in the box of signup will happen. Same goes for the login. For signing up, the user would have to ensure that all fields in the form are filled up otherwise they would not be able to create their account. As for the login, if the details entered don't match the details in the database an error message will appear prompting the user to re-enter their details.

4.3.4 Sequence diagram (part 2)

needs changing(sleep)

Figure 4.3.4 Sequence diagram (part 2)

This first diagram was used to display the sequencing of signing up and logging in to the app. Whereas the diagram above is used to show the sequencing of what happens in the app. As shown in the diagram above, the main activity of the app occurs when one is walking which is why it is placed first. The next activity that follows would be the update on the user's coin count. The user can then use the coins gain to purchase things from the store. If the user decides to edit some of their details, they can do so on their profile page. The user can also set up the alarm clock on the Sleep tracker page. Finally, the user can access the game at the main page anytime.

4.3.5 Flowchart diagram
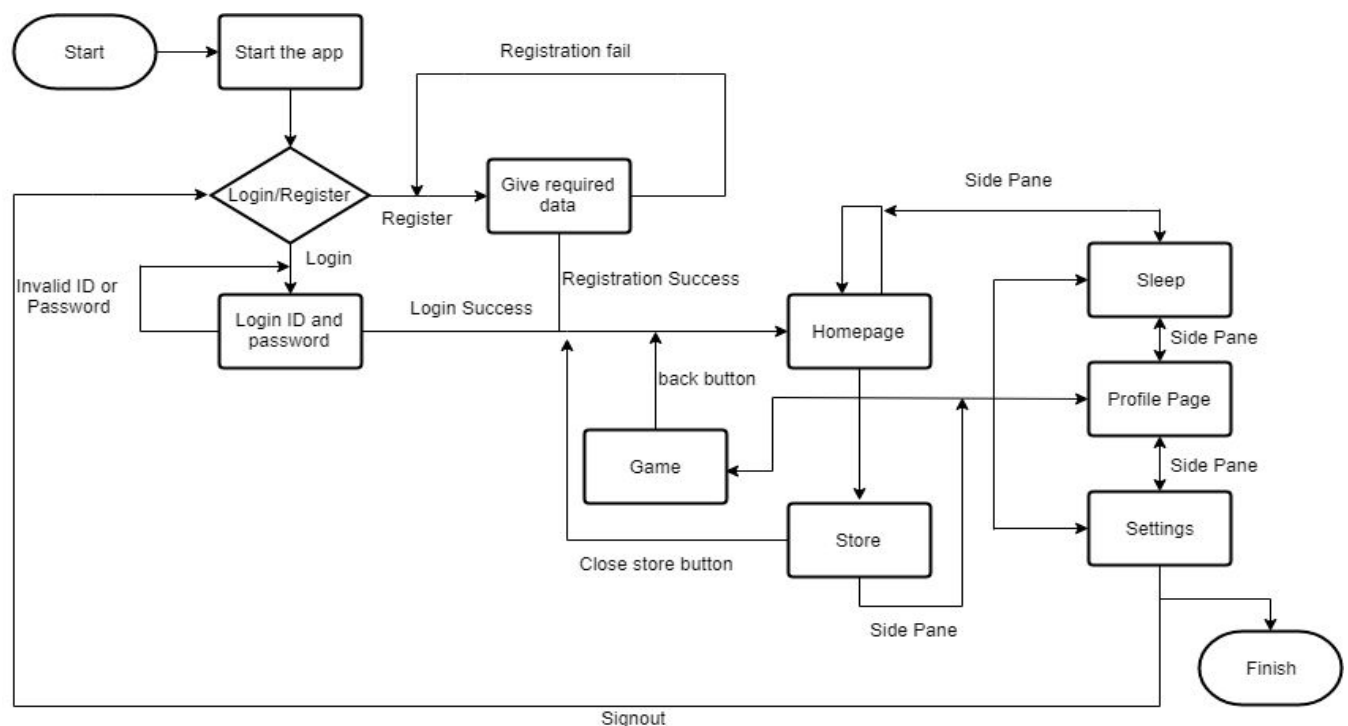
The diagram above shows how the app works from start to end and all its possible states. The user starts off by starting the app which will then lead them to the starting page where they can register or login. If the user fails to login or register, they will be

requested to refill their information. After logging in or registering they will be brought to the main page where they can access the store or game through buttons found in the homepage. Aside from that user can also freely switch between different functions using the side pane which has the options homepage, profile page, sleep and setting. The setting option allows user to log out where they will be brought back to the login and register page. They can also choose to stop using the app after logging out.

4.4 Prototypes

4.4.1 Low-fidelity

A low-fidelity prototype is a rough sketch on a paper about the basic layout for our app. The following low-fidelity prototype serves as a backbone for our project.
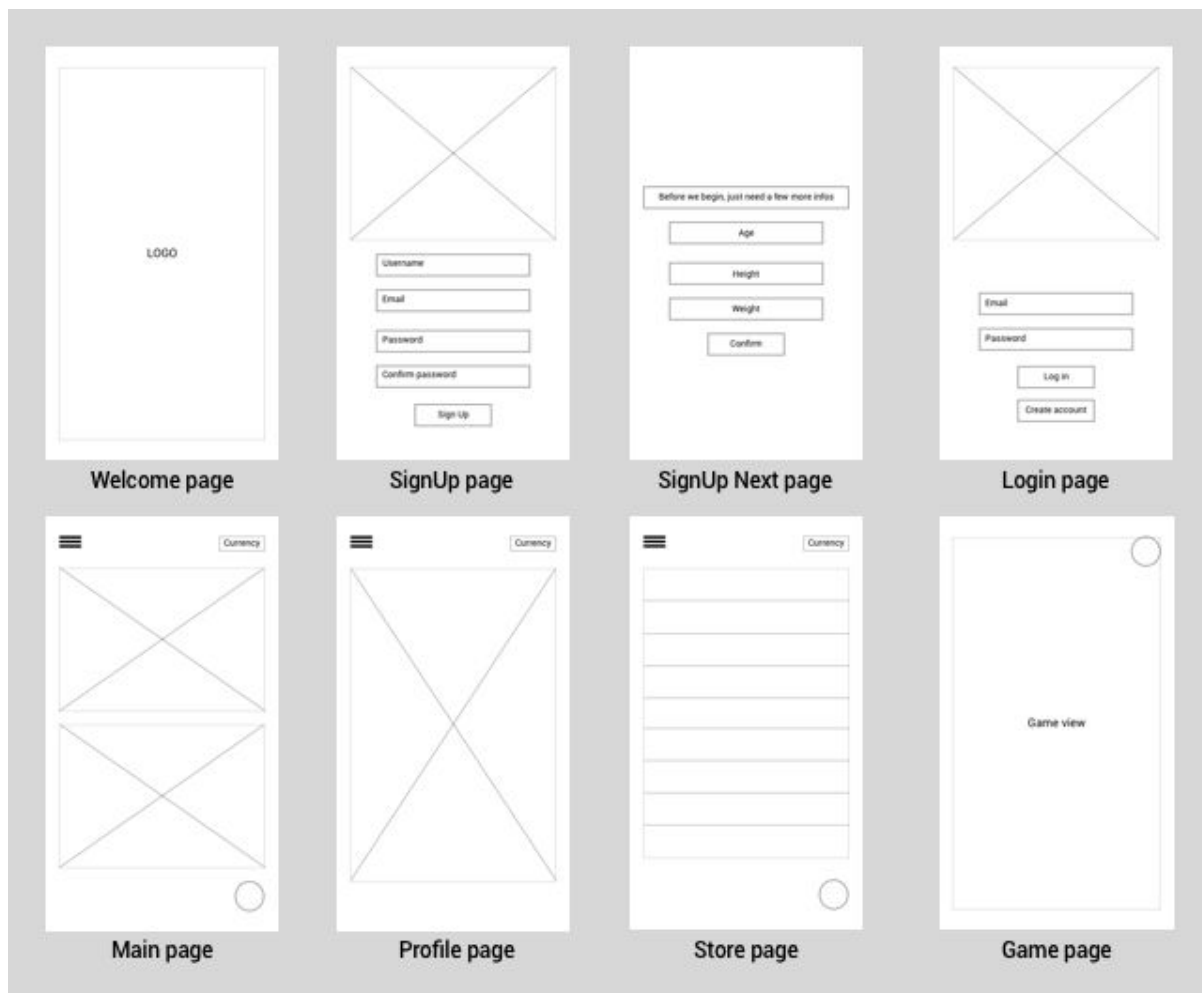

Figure 4.4.1 Low-fidelity prototype

4.4.2 Mid-fidelity

A mid-fidelity prototype will contain a little bit more details compared to low-fidelity prototype. Images, icons and texts will be placed in the layout for better visual enhancement. The following mid-fidelity prototype shows the progress of our current app.
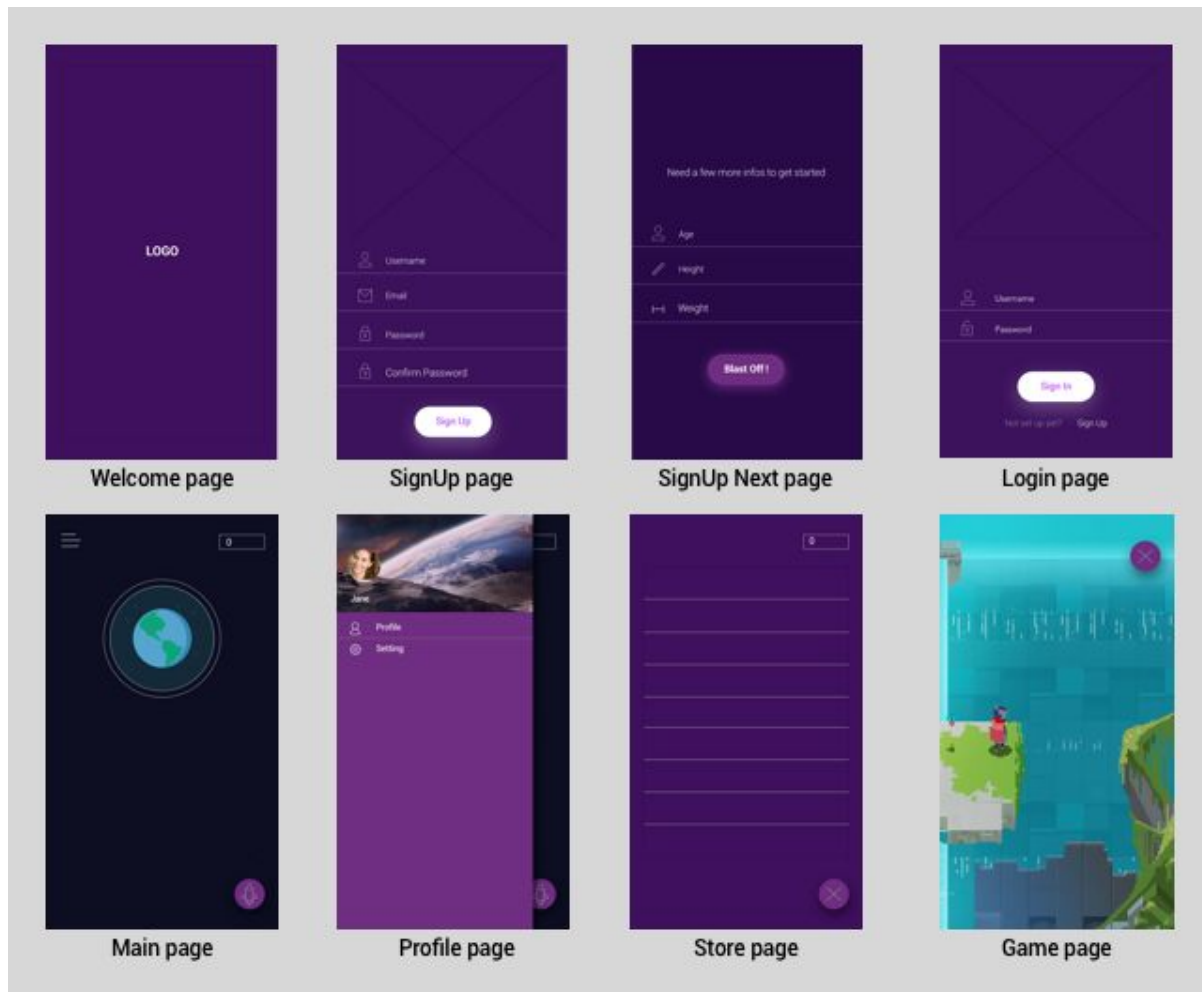

Figure 4.4.2 Mid-fidelity prototype

4.4.3 High-fidelity

A high-fidelity prototype will look like a completed design of our project. Everything from UI design, images, texts, hover states etc have been added to the prototype. The following high-fidelity prototype will be our targeted design at the end of our project.
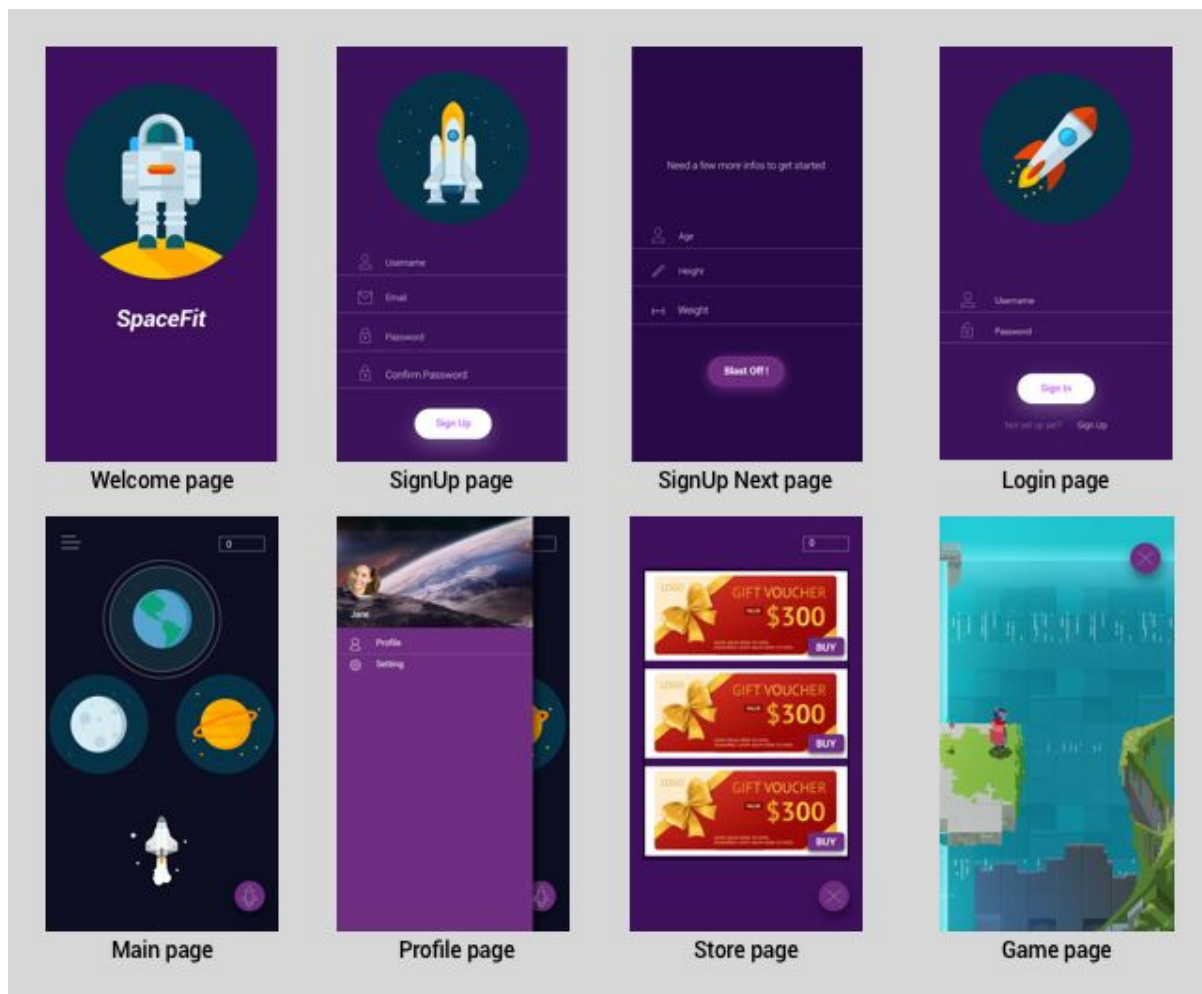

Figure 4.4.3 High-fidelity prototype

5.0 Algorithm

5.1 Body mass index (BMI) calculation

```
//Method for Bmi calculation
public float bmi_calculation(int h, int w)
{
    float x = (float) h/100;
    x = w/(x*x);
    int y = (int)x;
    return y;
}
```

Figure 5.1 Algorithm to calculate body mass index

Space Fit application contains the algorithm to calculate the body mass index of the user based on the height (in centimetres) and weight (in kilograms) inputs by the user after signing up a new account.

5.2 Sign up verification

```java
public boolean validateForm (User user) {

  boolean validate = true;

  if (!EmailValidator.getInstance().isValid(user.getEmail())) {
    emailText.setError("Invalid email");
    validate = false;
  }

  if (passwordText.getText().toString().length() < 6) {
    passwordText.setError("Must be at least 6 characters long");
    validate = false;
  }

  if (!passwordText.getText().toString().equals(checkPasswordText.getText().toString())) {
    checkPasswordText.setError("Password does not match");
    validate = false;
  }
  return validate;
}
```

Figure 5.2.1 Temporary account verification

When user tries to sign up for the first time, the system will verify all information keyed in by the user. These includes the email, password, age, height and weight. The system requires that the user enter a valid email address. The system will ensure that the password is at least of length 6 of any characters. For safety purposes, the system will require user to key in their same password for a second time. Then, the system will try to create a temporary account for the user. If it fails, it means that the user's email address already exists in the database. After that, the system will verify the user's age, height and weight. The age must be within 1 and 100, height must be within 100 and 250, and the weight must be within 1 and 300. Then, a complete account will be created for the user to use in the app.

```java
private void firebaseAuthWithGoogle (final GoogleSignInAccount acct) {
    Log.d(TAG, "firebaseAuthWithGoogle:" + acct.getId());

    AuthCredential credential = GoogleAuthProvider.getCredential(acct.getIdToken(), null);
    FirebaseAuth.getInstance().signInWithCredential(credential)
            .addOnCompleteListener(this, (task) -> {
                if (task.isSuccessful()) {
                    // Check if Google account is new or old, then go to respective page
                    Intent mainIntent = new Intent(Login.this, GoogleSigninAuthentication.class);
                    startActivity(mainIntent);
                } else {
                    // If sign in fails, display a message to the user.
                    Log.w(TAG, "signInWithCredential:failure", task.getException());
                    Toast.makeText(Login.this,"Sign in Failed", Toast.LENGTH_SHORT).show();
                }

            });
}
```

Figure 5.2.2 Google sign in verification

If signed up using Google, the system will bring the user to the page requiring the user's age, weight and height. The system will also follow the same procedure as above by verifying the user's age, weight and height.

5.3 Login verification

```java
private void login () {
  mAuth.signInWithEmailAndPassword(emailText.getText().toString(),
                                passwordText.getText().toString())
     .addOnCompleteListener(this, (task) → {
        if (task.isSuccessful()) {
          // Sign in success, update UI with the signed-in user's information
          Log.d("LogIn", "signInWithEmail:success");
          Toast.makeText(Login.this, "Log in successfully.", Toast.LENGTH_SHORT).show();

          Intent intent = new Intent(getApplicationContext(), MainActivity.class);
          startActivity(intent);

        } else {
          // If sign in fails, display a message to the user.
          Log.w("LogIn", "signInWithEmail:failure", task.getException());
          Toast.makeText(Login.this, "Incorrect credentials.", Toast.LENGTH_SHORT).show();
        }

        // ...
     });
}
```

Figure 5.3 Login verification

The system will pass the login details keyed in by the user to the database and validate the details. On success, the system will direct user to the main page of the app.

5.4 Location tracking

```
PendingResult<LocationSettingsResult> result =
    LocationServices.SettingsApi.checkLocationSettings(mGoogleApiClient, builder.build());

result.setResultCallback((ResultCallback) (locationSettingsResult) → {

    final Status status = locationSettingsResult.getStatus();

    switch (status.getStatusCode()) {
      case LocationSettingsStatusCodes.SUCCESS:
        // All location settings are satisfied. The client can initialize location requests here
        getLocation();
        break;
      case LocationSettingsStatusCodes.RESOLUTION_REQUIRED:
        try {
          // Show the dialog by calling startResolutionForResult(),
          // and check the result in onActivityResult().
          status.startResolutionForResult(MyLocationUsingLocationAPI.this, REQUEST_CHECK_SETTINGS);

        } catch (IntentSender.SendIntentException e) {
          // Ignore the error.
        }
        break;
      case LocationSettingsStatusCodes.SETTINGS_CHANGE_UNAVAILABLE:
        break;
    }
});
```

Figure 5.4 Location tracking

Upon entering the main page of the app, the system will require users to allow GPS to access their location. On success, getLocation() will be called as shown on the figure above and the location of the user will be obtained then stored into database.

5.5 Alarm clock service

```
//alarm not ringing and alarm on button pressed
if(!this.isRunning && startId == 1){
  mediaPlayer = MediaPlayer.create(this, R.raw.sexiest_romantic_mp3);
  mediaPlayer.start();

  this.isRunning = true;

}
//alarm ringing and alarm off button pressed
else if (this.isRunning && startId == 0){
  mediaPlayer.stop();
  mediaPlayer.reset();

  this.isRunning = false;
```

Figure 5.5 Media Player service

When the user presses the button to turn on the alarm, the system will send a delayed broadcast to the ringtone service, which will enable the media player to play a song. To turn off the alarm clock, user can either wait for the ringtone to finish, or press the button to turn off the alarm clock. User can also choose to preemptive turn off their alarm clock by pressing the same button. The system will then cancel the delayed broadcast.

5.6 Step tracking

```java
@Override
public void step(long timeNs) {
    if (dataValue == null){
        dataValue = new StatisticData();
    }
    dataValue.setSteps(dataValue.getSteps() + 1);
    user.setTotalSteps(user.getTotalSteps() + 1);

    //Every 10 steps increase the coin value by 1
    if (dataValue.getSteps() % 10 == 0)
        user.setCoin(user.getCoin() + 1);

    //Reaching the goal awards the user 100 coins
    if (progress_of_steps.getMax() == dataValue.getSteps()){
        user.setCoin(user.getCoin() + 100);
        Toast.makeText(this, "100 coins for reaching goal!", Toast.LENGTH_LONG).show();
    }

    //Update the UI
    TvSteps.setText(TEXT_NUM_STEPS + dataValue.getSteps());
    progress_of_steps.setProgress(dataValue.getSteps());

    //Update the database
    User.updateData(user);
    StatisticData.updateData(dataValue, date, "steps");
```

Figure 5.6 Step tracking algorithm

The application uses the accelerometer of the device to sense the movement of the user. When the user takes a step, the system will increment the step counter by 1 and update the UI in the main page of the app accordingly. Walking a certain amount of steps rewards the user a small amount of virtual currency to purchase in app items. Then, the data is stored into the database.

6.0 Implementation

After a rigorous design process, the implementation of the app is planned and executed. When the implementation phase began, the project team was split into 2 groups. 1 group will be responsible for the user interface (UI) of the app while the other focused on the backend of the app. For the UI team, the built-in game in the app was built using the Unity game engine. In the process, there was a lot of problems as the documentation to implement a game inside an app for the Unity game engine is lacking in depth. Therefore, a lot of time had been spent in solving the problems for the game. After a certain amount of time, the game's implementation problems were finally solved by combining various techniques available at the moment.

Once the game was done, the UI team started implementing the design based on the high-fidelity prototypes that had been prepared during the design phase. However, the UI team was new to the android app development platform. Hence, the UI team started learning how to develop an app for Android from several resources available on the web. Once the UI team had a firm grasp on the process of developing an app, the design of the app can finally be implemented as promised to the client.

As for the backend team, the database server that was provided by Google which is Firebase had an abundance of documentation for newcomers to refer to. It took a considerable amount of time for the backend team to learn the why and how of the system. Thenceforward, the backend team was able to craft an elegant solution to store all the user's information on the server which is accessible to the clients if needed.

After the completion of the game, UI and the database, the teams were recombined to build the step tracker together. At first, the idea was to implement a data extraction system that can extract data from the phone's built-in health tracking app which is

Google Fit. Despite the grand idea, the documentation for Google fit service is outdated for a few years, making the implementation unsuccessful after multiple trials and errors. Since the idea was not working as expected, another implementation method was used instead. The team decided to build a step tracker from the ground up that uses the phone's built-in accelerometer to track the user's steps count. This was done by using a combination of API provided by Google and some extra Java codes to store the steps count read from the phone.

Once the steps tracker was completed, the teams started brainstorming idea on how to implement the sleep tracker. Since sleep tracking algorithm was too advanced, a simple solution was adopted by having an alarm clock in the app that tracks what time the user sleep and wake up. Although the sleep tracker had no significant difference when compared to a phone's built-in alarm clock, the sleep tracker provides the user with some virtual currencies if the user successfully achieves the goal of sleeping at least 7 hours a per night, giving the user a reason to use the sleep tracker instead.

Furthermore, the profile page of the app was implemented by gathering all information stored in the database and show them to the user in 1 hub. At the same time, the profile page grants the user the ability to edit their personal information if they wish to do so. An avatar customization feature was also added to the profile page to add a personal taste to the app.

Finally, a location tracker is added into the app by using a third-party library that was able to track the user's location utilizing the phone's built-in Global Positioning System (GPS). Location data is required to help the client identify the user's frequently visited locations thus able to target the users with coupons and vouchers from nearby pharmacies.

7.0 Results

7.1 App (user)

Figure 7.1.1 Splash screen

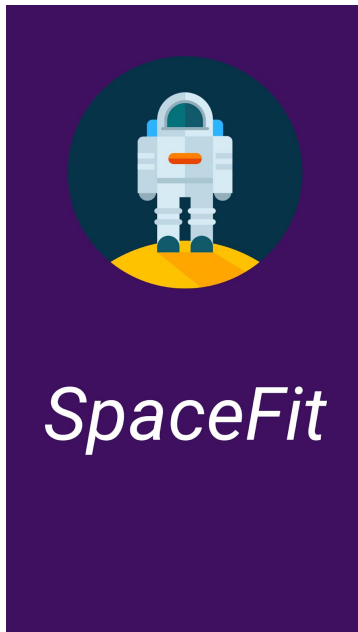*Figure 7.1.2 Sign-in page*

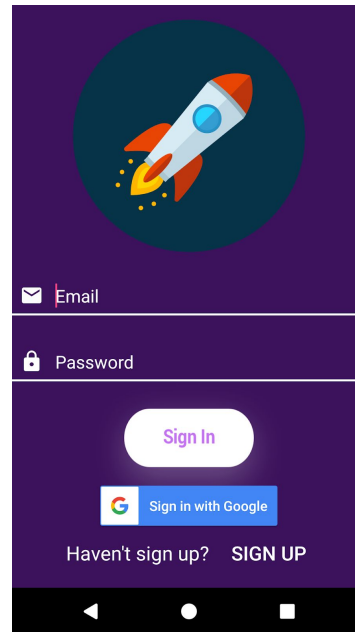When the app is clicked, an image of our app logo will be presented for a few seconds then transition into sign-in page.

The system provides a form for user to enter their login details. Alternatively, the user can choose to sign in (or sign up) using their Google Account.
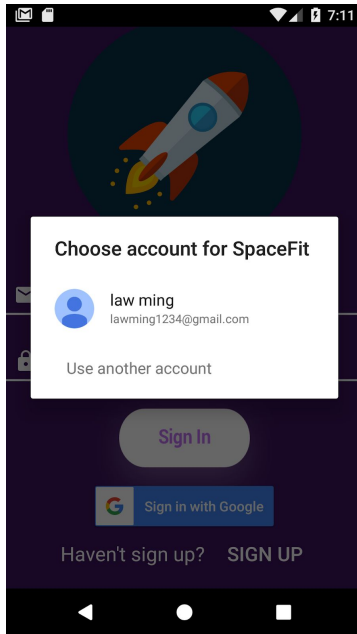
Figure 7.1.3 Sign-in (google)

Upon clicking on the Google sign in button, the current screen will be shown. User can login using a previously signed in account, or use another account to sign in.

Figure 7.1.4a Sign-up page

Figure 7.1.4b Sign-up page

Clicking the sign up link on the login page will direct user to the sign-up page. The user can enter their details on this page and sign up for a new account.
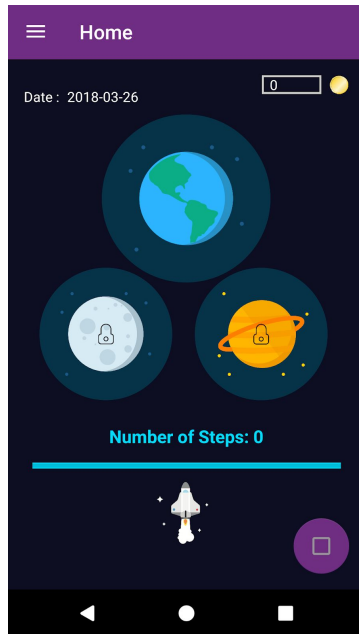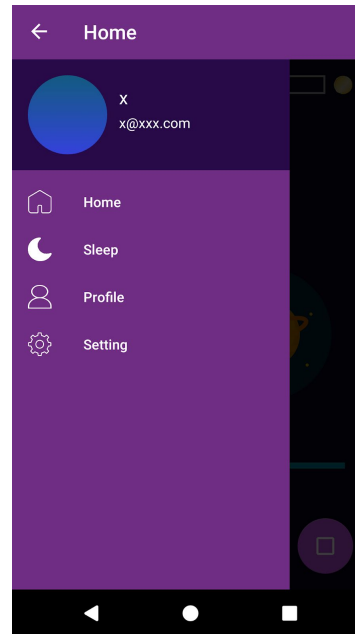

Figure 7.1.5a Home page

Figure 7.1.5b Menu bar

Homepage will have the output of user's steps count and the planets buttons needed to trigger the game page. The menu bar is also accessible from the home page

Figure 7.1.6 Game page

When the planets on the homepage are clicked, the game page will pop up for the user to play the built-in game.
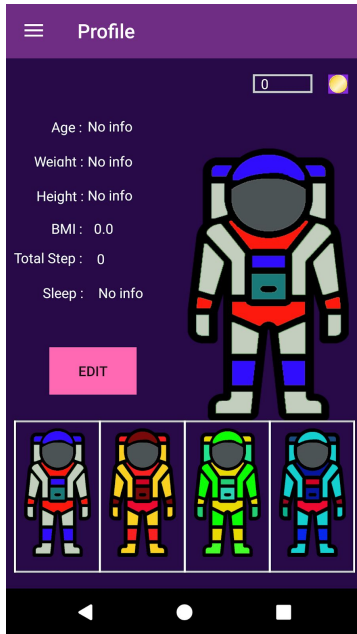
Figure 7.1.7 Profile page

The profile page contains the informations that the user had entered and system generated information like body mass index (BMI) and totals steps count.
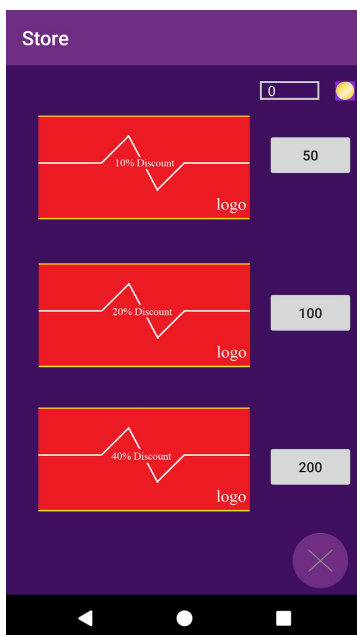

Figure 7.1.8 Store page

The store contains vouchers and coupons that will be provided by our client's partners which are the pharmacies.
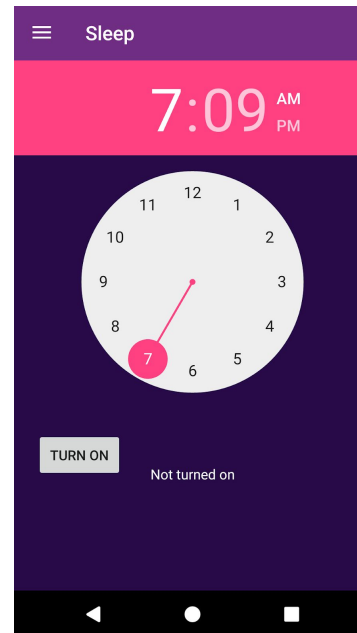
Figure 7.1.9 Sleeptracker page

Sleeptracker page contains an alarm clock that will ring on time according to the user's set time.
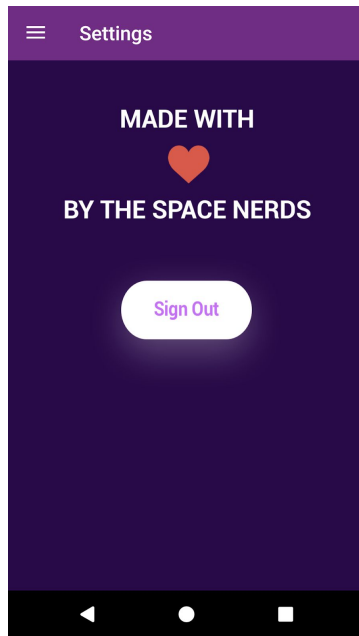
Figure 7.1.10 Settings page

Settings page has a sign out button that give user the option to sign out.
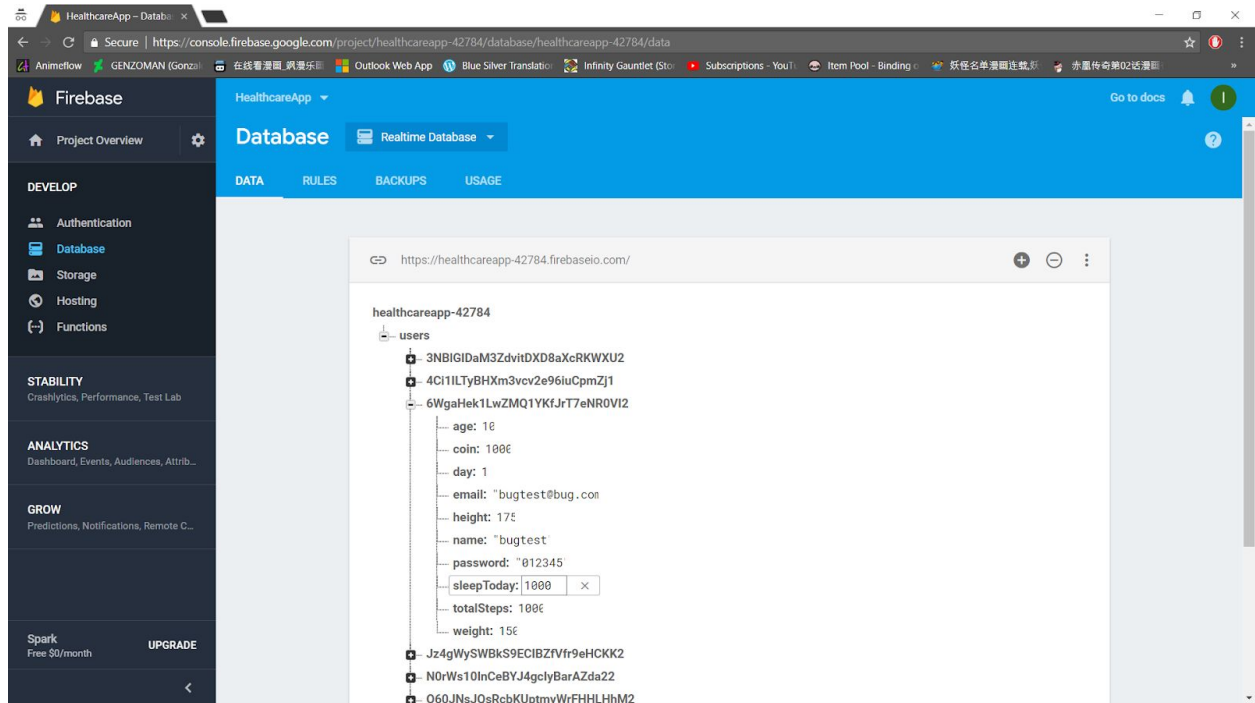
7.2 Database (admin / client)

Figure 7.2.1 Firebase data

The admin has the privilege to access and manage user data. Anytime user data would be stored into Firebase, it would be updated in the Firebase too.

8.0 Bug Testing / Evaluation

Throughout the development of the application, certain bugs were discovered. The first one was that the alarm clock did not ring exactly on the specified time and was delayed for a few seconds. The second bug was related to the implementation of the game. The sprites in the game did not render in the application. We found out that many other programmers faced the same problem too. Despite our efforts, we were unable to solve problem and left it as it was. The final bug that we encountered was when the app crashed as soon as it was launched. The app ran out of memory while trying to render the images which were too large. Thankfully, we were able to solve it by reducing the dpi (density-pixel index) of the images which lowered the memory consumption.

9.0 Discussion and Conclusion

In this part we deal with the project as a whole as throughout this project we have learnt a plethora of things. Some are have to do with technical skills and some are just simply interpersonal and formal skills but it wasn't just skills that we picked up it was also experience and that was gained through observing the gradual progress in the project whether we are progressing forward, falling behind or just simply standing still because of a Deadlock that is soon to be broken and through this we were able to determine the degree of success of our success as we realized it was mostly a success as we achieved a great deal of the requirements demanded by the client .to elaborate on this we must first talk about the parts of the project as it is distributed into UI , implementation with code and the database . thankfully they were all on schedule except only two parts of the implementation which will be discussed in the following lines. First The " UI " with every implementation we successfully managed to make an eye-pleasing space themed " UI " that is very easy to navigate through as it is well labeled and structured . Second part which is the core of all our work is the algorithmic implementation the degree of difficulty vary from simple to convoluted as some are easy such as Login / Signup which was Simple to execute unlike the step tracker that took a lot of time and effort in order to achieve proper completion (you can refer to the implementation section for extra details on that matter) .Thirdly the database was established from a huge help from Google's Firebase as it saved us an enormous amount of time because if it weren't for google we would have had to set up an entire database in real time without any knowledge of the limit or number of users that will use this application which would've been a bit of an inconvenience but thankfully google was there to help furthermore now all the user's data can be safely and successfully stored in their respective accounts .

The Benefit isn't just exclusive on the technical part as we have gained a year's worth of

experience in dealing with the client , holding meetings and presenting our ideas in a chronological logical order that would help deal with clients who aren't very familiar with ' IT ' work so our software engineering requirements have most certainly leveled up Not to mention on the steep learning curve of learning on how to deal with you workmates , superiors and subordinates in work which is a success in it's own right at the beginning it was quite difficult for us as we had to agree on time slots for meetings and places to hold the meetings and the question of " who does what and when " there was very bad coordination as we were all new to a this sort of work another issue was that we all live away from each other so it was tiring not to mention hectic this bad coordination problem which we slowly but surely overcame eventually by working together and understanding each other's strength and weakness and then we using this to our advantage from the work and team coordination perspective . another problem that we faced was prioritizing it as we didn't have any intuition as what should take the top slot and what should be the least attended to but we were fortunate enough to fix this by researching the parts that are required of us to do and from that we will gain some sort of heuristic on what to do first and as to what to delay. so despite the fact that this module "Software engineering group project" was intended to teach us how to write report which it did a tremendous job in it successfully taught us all the previous in a rather indirect way. So to reflect and to sum up there were " atomic failures " but an " overall Success " from both aspects the Technical & the Social aspects of the project .

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Article Title: How to display Toast in Android?
Date Accessed: october 29, 2017

11.0 Appendix

11.1 Meeting minutes

MEETING MINUTES 1
[Software Engineering Group Project 2017/18]

Opening:

The meeting was held between the members of the group and the client on 1st of November 2017 at B1B26 commencing at 3:30pm.

Present were:

Alvin Loh Jin Xian (Group Leader)

Yap Cheng Yee (Group Member)

Lim Way Shearn (Group Member)

Omar (Group Member)

Law Zhe Ming (Group Member)

Dr. Khoo Teng Jin (Client)

1) Approval of Agenda

This is the first meeting commenced between the software engineering group project and the client with the presence of supervisor. The purpose of the meeting is to determine the assignment of task provided by the client and to obtain further details regarding on the project.

2) Announcements

Alvin Loh Jin Xian was unanimously elected as the group leader which will provide guidance to the members and to lead them so that each individual would be able to contribute and perform at their best.

3) Open Issues / Discussion

Client has provided a brief introduction towards the advancement of the project and specific functions on the purpose of the application. The general idea of the application or project is to collect and obtain personal healthcare data of users so that they could be applied for pharmacists. The application also contains good security and would be able to attract users to download it. The current idea in which after a short discussion was made is to implement a gaming system so that users could use the app through walking which would promote a healthy lifestyle and at the same time to be able to obtain their data through the extraction of data on secondary healthcare application. An estimated of 1-2 weeks was made so that each member would be able to grasp a better understanding in mobile app development in the Android platform. A Gantt chart has also been provided to the clients and weekly scrum meeting has also been decided and unanimously agreed by all group members.

4) Agenda for Next Meeting

a)   The progress of application

b)   Problems encountered during the building of the app

c)   Additional / Extra functions needed to be implemented in the application

d)   Rewards system

Adjournment:

The meeting was adjourned at 12:30 pm by Dr. Khoo Teng Jin. The next general meeting will be held once the confirmation of the availability of client has been done.

Minutes submitted by: Yap Cheng Yee

MEETING MINUTES 2

[Software Engineering Group Project 2017/18]

Opening:

The meeting was held between the members of the group and the client on 1st of November 2017 at B1B26 commencing at 3:30pm.

Present were:

Alvin Loh Jin Xian (Group Leader)

Yap Cheng Yee (Group Member)

Lim Way Shearn (Group Member)

Omar (Group Member)

Law Zhe Ming (Group Member)

Dr. Khoo Teng Jin (Client)

1) Approval of Agenda

The purpose of this meeting is to inform client on the current progress of the group and to obtain new ideas from the client for improvement purpose on different aspects.

2) Announcements

The client hopes that the application will be marketable and to achieve the targeted industrial revolution 4.0 and to be able to compete with current and future apps.

3) Open Issues / Discussion

A prototype has been shown to the client and future progress are briefed so that we could check and maintain our progress on time, client emphasize on data once again along with the aspect of security, client suggested that the circular progress bar could be visualized as the earth so that it would provide knowledge and to attract users to use it. Focus on industrial revolution 4.0 (Technology) and to get ready for it so that consumer in that age will use it (demand). Design is very important because it will make the app more interactive. We proposed to use virtual currency and client is interested in the idea and customers/ users can use the virtual currency to claim their vouchers.

Client proposed that our users could start with our own university's students. Survey has been done by the client and has shown that different gender has different requirement for the health care application. When entering the application, a request for the user's gender will be prompted so that different vouchers could be generated so that it suits the users. Users are also separated into teams to compete among each other. Priority is placed upon database. Client also suggest that we could request financial support from MAD funds from the next semester (January 2018). Adding fun facts for certain steps taken and improve our User Interface Design. If possible add in GPS function and thumbprint function including some motivational quotes.

4) Agenda for Next Meeting

Step tracker done

BMI done

Adjournment:

The meeting was adjourned at 17:04 pm by Dr. Khoo Teng Jin. The next general meeting will be held once the confirmation of the availability of client has been done.
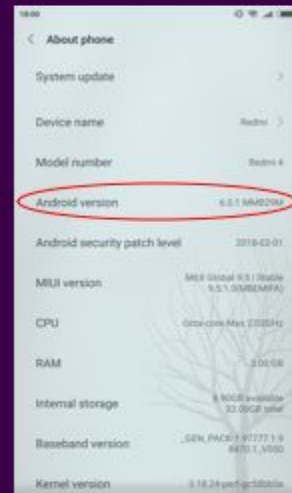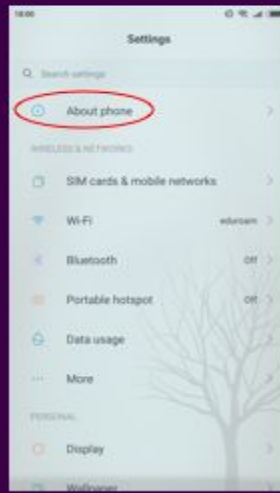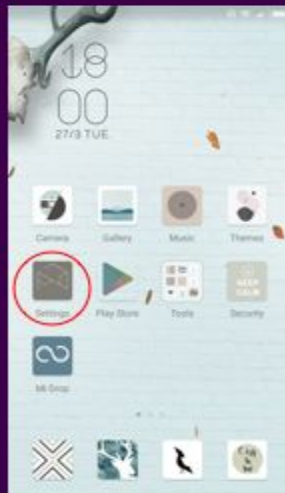
Minutes submitted by: Yap Cheng Yee

11.2 User manual for the app

WELCOME TO SPACEFIT, ASTRONAUT!

Before we begin our journey,
Let's have a checkup on your phone's android version.

On your phone,
Go to 'Settings' app ->> About phone ->> Android version

Ok trooper, if your android version is higher than 5.0 then you are good to go.

Before you start your first flight, take a look at the surviving guide that we had prepared in the next few pages.
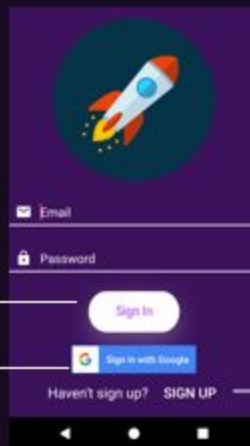
Over.

Hello, my name is Pixy.

The following screenshots will explain what features does the app have and how to navigate them in sequence.

Sign-in button
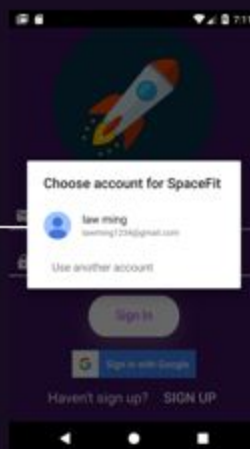This button will bring you to the main page

Sign-in with Google
You also have an option to sign-up and sign-in to this app with your Google account

Account Sign-in details
Enter your email & password if you had created an account

Sign-up button
Click on this button if you don't have an account yet

Google account
Choose which google account that you want to use for sign-in & sign-up

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Account Sign-up details
Enter all details necessary
to create a new account

Next page button
This button bring you
to the next page to
complete your sign-up

Extra details
Few more details that
need to be filled to make
the journey to space
a success

Blast off button
Once you finished
creating an account,
then it is time to go
to space

66

"My life constantly under construction. There's always something to improve."

Navigation bar
Show a list of pages that you can navigate to improve yourself

Virtual currency display
Display your total coins gained from working out

Game planets
Click on the planets to travel to space and fight enemies that want to conquer the universe

Steps progress bar
Progress bar show how close you are in achieving your daily steps goals, astronauts need to be fit all the time

Store button
This button navigate you to the space store to buy things that make you stronger and better

Information
Your username & email are displayed here

List of pages to go
List of features that can access at anytime

67

"Improvement begins with I."

Store purchase button
You can purchase vouchers or coupons that can strengthen the quality of your health

Store back button
You can exit the store and continue your adventure at anytime

Spaceship information
Your spaceship's health and score for shooting down enemies are shown here

Spaceship move control
The movement of your spaceship is controlled by you, your fate is in your control

Shoot button
When you are in space fight, the only way you can survive is to shoot down your enemies' spaceships

"Self-knowledge is the beginning of self-improvement."

Sleep

7:09 AM PM

Alarm clock picker
Pick the time that you want
wake up and resume your
space mission

Alarm trigger button
Turn on the alarm clock
to track the duration of
your sleep

TURN ON   Not turned on

Profile

Age : No info
Weight : No info
Height : No info
BMI : 0.0
Total Step : 0
Sleep : No info

EDIT

Spaceship information
Your spaceship's health
and score for shooting
down enemies are shown
here

Edit profile button
You can change your
details if they are
inaccurate

Spacesuit changer
Even astronauts need to
have style, you can
change your spacesuit
after you had bought them

69

Settings

MADE WITH

♥

BY THE SPACE NERDS

Sign Out

Sign out button
When you feel it is
time to return home,
you can sign out &
take a break from your
space journey
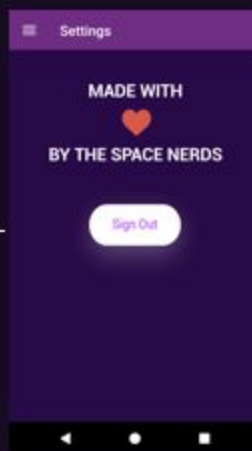
Appreciation message
A short message to remind
you how much we
appreciate you as an
astronaut that seek to find
peace in the universe

That is all to the survival guide.

Good luck on your space journey!
If you have any questions, email us at
SpaceFit@gmail.com
We will be serving you 24/7

3, 2, 1 …
Blast off!