Staying Fit While Having Fun

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ABSTRACT

Staying Fit While Having Fun

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Consistent fitness is a key aspect in living a healthy lifestyle. Along with having a consistent fitness schedule, having a well-balanced and clean diet is also crucial. According to a 2012 health study published by Body Builders, 73% of people who set fitness goals ended up giving them up because they lacked the motivation to follow through. Another study done by President's Council on Fitness/Sports/Nutrition revealed that less than 5% of people participate in 30 minutes of physical activity each day. In general, only 35% of adults are physically active. Existing fitness applications have helped users record their health/fitness journey.

However, even with numerous fitness and health apps available, in the past many people failed to accomplish and follow through with their goals. People lack the motivation to be consistent in their efforts to living a healthier lifestyle. In order to stay consistent, they must have a schedule and a drive to follow up on that schedule regularly. In addition, there should be a physical item/object that they can refer to assure that they are on the right track. Since people nowadays have busy schedules, they often do not have the time nor energy to stop their daily activities to record a log of their fitness journey. There needed to be a way users can easily keep track of their health/fitness lifestyle in a fun and time efficient way.

This project employed a fun and useful application that helped engage more users to participate in a healthier lifestyle. By incorporating an easy to use health/fitness log along with a fun game like feel, users can keep track of their health/fitness journey with ease. The outcome has involved an abundance of users taking the steps to living a healthier lifestyle.

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Chapter 1. Introduction

1.1 Project Goals and Objectives

Our main goal for this project is to provide a platform for users to keep track of their fitness and health habits. With our mobile application, *miOLa* ("My Health"), users will be able to live a healthier and more fit lifestyle. Our application will implement key features to grasp the user's attention and keep them engaged. These key features include, animation, game, workout tracker, calorie counter and many more. At the end of the implementation process, our application miOLa, will provide users with a stable and reliable platform for them to consistently live their lives in a healthy and fit manner.

1.2 Problem and Motivation

Just like other applications, our application faces some problems. One main problem that our application faces is keeping the usage of our application high. In other words, the users might not consistently use the application. Our application can have as many key features as needed, but in the end it will come down to whether the user will use it or not. To conquer this problem, we will be implementing features that will be rewarding for the user. This way, the user will be inclined to use the app in order to obtain an award. Another problem that our application faces, is uniqueness. Currently, there are hundreds of thousands of health applications available on the market. Most of them claim to do the same thing, which is tracking health records of users. However, to conquer this issue, our application will include a gaming aspect. This game will be fun and enjoyable for the user. The user will be able to gain points to unlock levels in the game. Although there are some complications that might arise, the solutions for these potential problems have been established. This will guarantee optimal user experience.

1.3 Project Application and Impact

Staying healthy requires constant effort and attention. People tend to lack the motivation needed to achieve their health and fitness related goals. Our application will provide users with a platform in which they can track key aspects of their health/fitness lifestyle. This will have a huge impact on users because they will be able to visually see the steps they are taking to improve their lifestyle. Our target is to make an application that is fun as well as motivating and effective. Our application will not only help users to create a healthy lifestyle for themselves, but it will help better their overall way of living. By using our application, the user will be able to keep track of their daily food intakes and exercise routine, set goals, play games, interact with other people by sharing meals posts, and much more. The outcome of this project will be a well developed application that allows users to engage in a healthier and more fit lifestyle by incorporating the latest technological advances currently available.

This application will be an intersection of two very fast evolving components, health and technology. On average, 77 percent of Americans use smartphones. The popularity of cell phones is increasing day by day. People use phones to do various tasks, which includes keeping track of their health/fitness routines. Our application will have a positive impact on society as a whole for several reasons. One reason being, the convenience of using our application on a mobile device. This will allow users to keep track of their daily health at the convenience of their own cell phone. The second reason is that our application will be a complete package and will have all the necessary features for users to keep track of all key aspects of their health. Another reason is that with our application, users can set goals and will be more motivated to achieve those goals by playing the built in game feature of the application. All these reasons combined

makes improving one's daily health easier by simply using miOLa. If a person's health is where he/she wants it to be, then they will be a much happier and uplifted person. In addition, the person will also eliminate current health issues and will prevent future health complications from occurring. In doing so, the overall lifestyle of the user will improve dramatically by simply improving one's health/fitness habits. Our application will be a direct representation of the above topics.

1.4 Project Results and Deliverables

Our project's targeted market is any and every user who owns a smartphone. The expected results include an application that successfully integrates different services. The application database will store user's information and location services will show correct location vicinity. The animation will show correct images and suggestions based on the predefined data models. We will be using the Model-View Controller (MVC) pattern for our application development. The models will be used to maintain data and make decisions based on data input. The user interface, which includes the application look and feel, will be managed by the view part. The APIs and services, such as user invoked actions, will be managed by the controller components. The controller components will decide the logical flow of application. In the end, our project will be display a successful integration of the MVC pattern.

Our project deliverables includes an android application that will be developed based on our team's software engineering background and knowledge. The project's documentation process with detailed information will also be presented at the end. The deliverables will include all the UI designs and wireframes used in the application. It will also include the application

code and project's interface to different applications and services such as location services from google. Planned application functionality with decided features will be delivered as well.

The intended application is driven by the data model created by the user's habits and inputs. Designing a data model which includes all the required aspects to present a precise image of the user's health profile is necessary. The project deliverable will also include the one for all, well-tuned data model. It will incorporate all the possible user profiles. A test plan is necessary for any successful software project. A well tested application can go a long way to meet the user expectations. We will have test reports for each decided milestone. Our end goal is to have our android application completed with all the functional and nonfunctional requirements implemented. The final product will b deployed to the play store for everyone to use and enjoy.

1.5 Market Research

According to a 2012 health study published by Bodybuilders, two thirds of the people who live in the U.S. put fitness as part their new year's resolution. From those, 73% give up their goals because of the lack of motivation. Motivation is vital for continuous workout and calorie watch. The game version of our application is the motivation for our users. According to an article by Statista, currently 55.7% of the U.S. use mobile phones for gaming and by 2020, this percentage is expected to increase by about 10% ("U.S. Mobile Gaming Penetration Statistic", 2016). Since the demand for mobile phone gaming is growing, we plan to fulfil the user's interest in gaming, as well as exercising and eating habits all in one with our application, miOLa.

Chapter 2. Background and Related Work

2.1 Background and Technologies

We followed the agile development process throughout the course of this project. The overall design of our project follows the MVC pattern. Nowadays, having a phone is critical. People use their phone for almost everything and have their phones with them at all times. With millions of applications available at the touch of a finger, phones are capable of performing tasks that makes daily lifestyle easier for users. For this reason, we chose to make a mobile application. We are using object oriented languages, such as Java, to code our project. Everyone in our team are experienced Java coders and have a software engineering background. For this reason we chose to make an android application over an iphone application, since android development is coded in Java.

For this project, many different technologies are used to create our final android application. Since we were creating an android application, we used android studio as the main platform for creating our application. We also used Firebase as our database system. This guarantees that the data being stored in our application is secured and available to users in a timely manner. In order to gage the user's attention, the use of animations is heavily focused on. Our application has animations all throughout the user's experience to make the application visually pleasing for the user. To create various logos and backgrounds, we are using Adobe Illustrator. Together, all these technologies are used to guarantee optimal user experience. Here are the courses team members have taken which helped the team in developing this application.

- **CMPE 137:** Couple of team members completed wireless mobile software engineering course. This course covers android and iphone application development. As we were developing an android application as part of this project, it is essential to have some experience in the field. The course helped the teammates with basic knowledge of android platform and enabled them to make new application from scratch.
- **SE 165:** Few team members completed software engineering process management class by implementing a web application as a final project. This web based application was integrated with firebase database to keep record of online transactions on the website. Team members got the chance to develop their skill on the firebase implementation which was utilized in this project.
- **CS 151:** Object oriented programming class is a requirement for the software engineering student. Team completed this course with software engineering core course to learn different design patterns. Both classes provided vital understanding to implement different design patterns in different situations across this project.
- **SE 133:** This software engineering class is a major core course. Software development life cycle, software architecture and advanced software engineering topics were learnt. Each team member completed this class and learned about UML modeling and software reuse as well as computer aided software engineering. This course was really helpful in planning of this project.

Listed below, is a concise list of technologies that we are using throughout the course of this project.

- **Android SDK:** Android software development kit is a set of android application development tools. It consists of required libraries, documentation and required tutorials for android operating system.
- **Android Studio:** Being an android application, the project heavily used the android studio. The Android studio is an Integrated development environment(IDE) for android platform development. It is an official android development tool. It not only provides platform for high quality application development but also provides tools for rich code editing, debugging, testing, and profiling tools.
- **Illustrator:** Application employs the animation to get the appealing factor for users. Developing animation characters required a tool which is easy to use and economical for the purpose. Adobe illustrator leads the industry of vector imaging softwares. This tool was used to create logos, icons, sketches, typography, and complex illustrations for print, web, interactive, video, and mobile.
- **Test and Verification tool:** The application needed to go through exhaustive testing to achieve the best production quality. Initially, the team focused on manually testing of each component. Android platform also has specialized automation tools which helps project maintain its sanity. Automation as well verification tools were employed based on the requirement of the particular project stage.
- **Firebase:** The project has an interface to store the data and user profile from application interactions. These data needed to be stored somewhere. Deploying a platform with all the required tool just for the application encompassed extra work. There are many readily available mobile application platforms in the market. Firebase has a free spark version for

basic integration. It provides real time database integration, application storage and hosting and a testing lab. Firebase also provides interface specific to android studio.

- **Github:** Project with multiple team members and different project milestones made it mandatory to maintain the stable version of the source code. Git is most widely used version control system in the market today. Github is the web based UI for the GIT. Team members used their respective github accounts to check-in and check-out source code.
- **Slack:** Team member collaboration is required for the project of this stature. Slack is the latest web based application for the team members to collaborate on. Chats and document sharing is available in each slack channel. Team continuously used this tool to decide on meeting place, date and data to cover. This tool also has a very user friendly mobile application.
- **Microsoft Office and Google tools:** Documentation and presentations are integrated parts of any project. Documentation makes it easy to maintain and enhance project in future. Microsoft office provides the essential tools like word and powerpoint to document and present the project in right manner. Google docs and slides' web application were also used for the same purpose.

2.3 Literature Search

Health and fitness are key elements to living a balanced lifestyle. Research has been done to promote living a healthier and more fit lifestyle. Advanced technology has influenced the

promotion of living a healthier lifestyle. The three referenced sources listed below, heavily relate to the domain of this project.

The first article shows the importance of fitness trackers and how it can benefit people by motivating them to keep moving. This study proves the effectiveness of keeping track of a person's fitness routine. The article claims that by using a fitness tracker, accountability, accuracy, and motivation increases (Godman, 2015). Our application provides users an easy and accessible tool to keep track of their fitness and eating habits at the comfort of their own mobile device.

The second article shows how biomechanics, such as animation, can help analyze human movement in-depth. Animation can help mimic human movement. This particular animation software is a big plus for our project. By using animation techniques, a person's body movements can be tracked. Tracking and analyzing body movements can lead to positive exercise suggestions for that particular user. Animation software tools are very useful to our application and increase to reliability of our application.

The third article explains the importance of health games and how it can be crucial in the diagnosis of cancer patients. Health games, especially virtual health games, can provide a lot of information about a person's cognitive and sensory behaviors. The implementation of a health related game enhances our application tremendously. By incorporating a game into a fitness/health application, the user will be attracted and more inclined to using the application, which will help the user be consistent. Thus, guaranteeing positive results.

In conclusion, this project exercises all of the techniques mentioned in the articles above. The outcome of this project will be a well developed application that allows users to engage in a

healthier and more fit lifestyle by incorporating the latest technological advances currently available.

2.4 State-of-the-art

Living a healthier lifestyle is constantly being promoted. New technologies are emerging that are efficient and convenient for users. The use of a mobile phone is crucial to a person's daily life. It is required to perform various tasks throughout the day. There are millions of applications that are downloadable at the touch of a button. This convenience is what users like and are drawn to, so incorporating health and fitness related tasks into an application that is available to everyone will be extremely beneficial to users.

For this particular project, there are wide ranges of available resources, which will help guarantee optimal user experience. Since this project is an android application, Android Studio is heavily used as the foundation of the entire project. More than 80 percent of smartphones use Android as their operating system. Since a wide range of electronics use android as their operating system, this will guarantee the availability of the application. As a result, more users will have easy access to this application.

This application also incorporates animation to engage users. This work is in progress and currently uses various animation software developments such as, Unity, Game Maker: Studio, Godot Engine, etc. All these animation tools help enhance the application to promote optimal user experience. The use of animation increases the user's engagement towards the application.

This application also incorporated location services to allow users to perform various location related actions. In order to enable location properties in an application, personal user

information is required. This functionality would be very difficult to implement if there wasn't already a full stack location API, such as Google API. Google API provides all the necessary information needed to implement the location feature in any application. The use of location services within the application increases the accessibility of the application.

There are thousands of various fitness and health related apps available in the market. Nowadays anyone can make and publish an application that the world can use. The resources to do that are available to everyone. Also, new technologies are constantly emerging to keep the engagement of the users. These state-of-the-art tools and techniques available help guarantee optimal user experience.

Chapter 3 Project Requirements

3.1 Domain and Business Requirements

3.1.1 Activity diagram

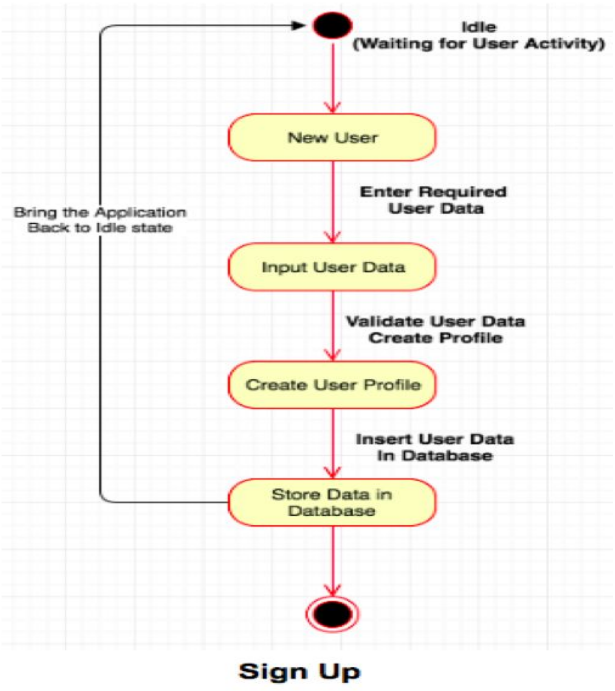

Figure 1: Activity Diagram for Sign up

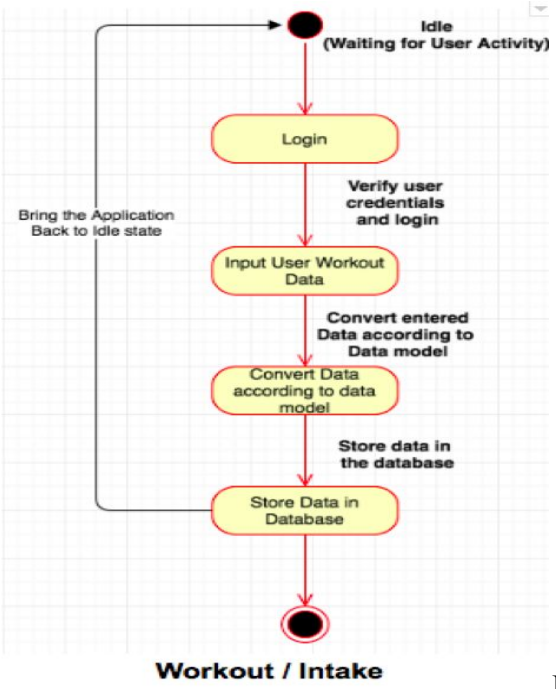

Figure 2: Activity diagram for Workout and Intake

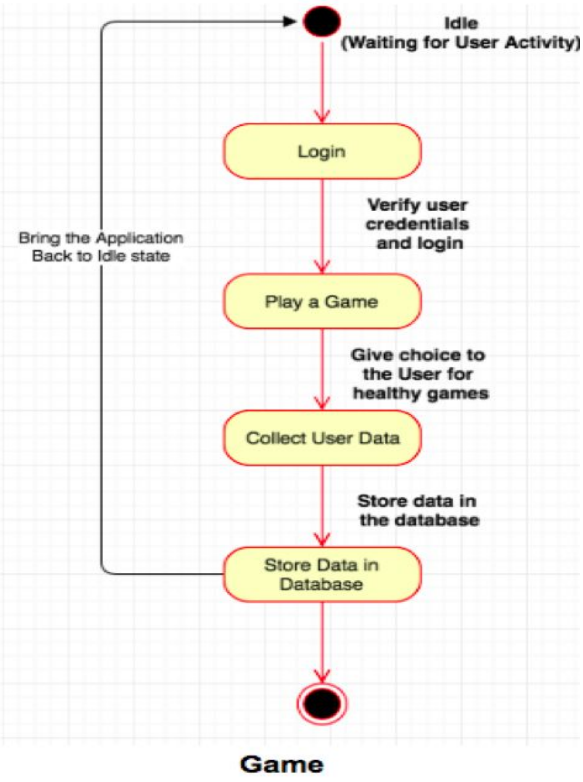

Figure 3: Activity Diagram of Game

3.1.2 Class diagrams

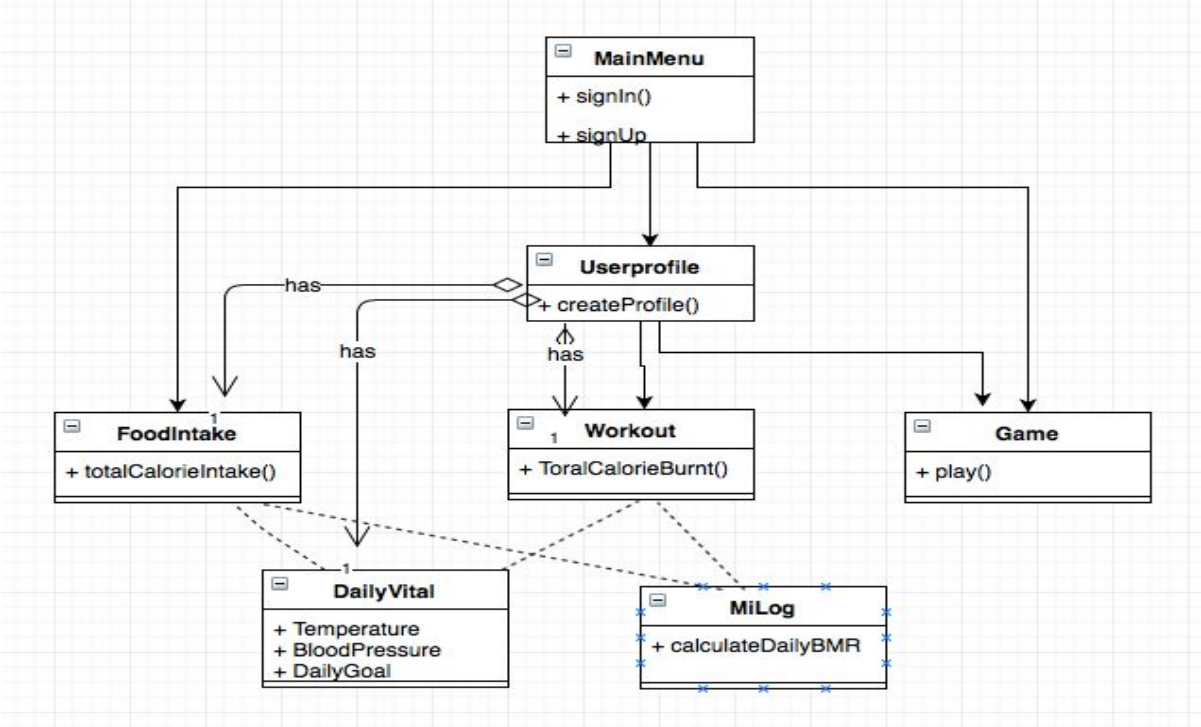

Figure 4: Application Class Diagram

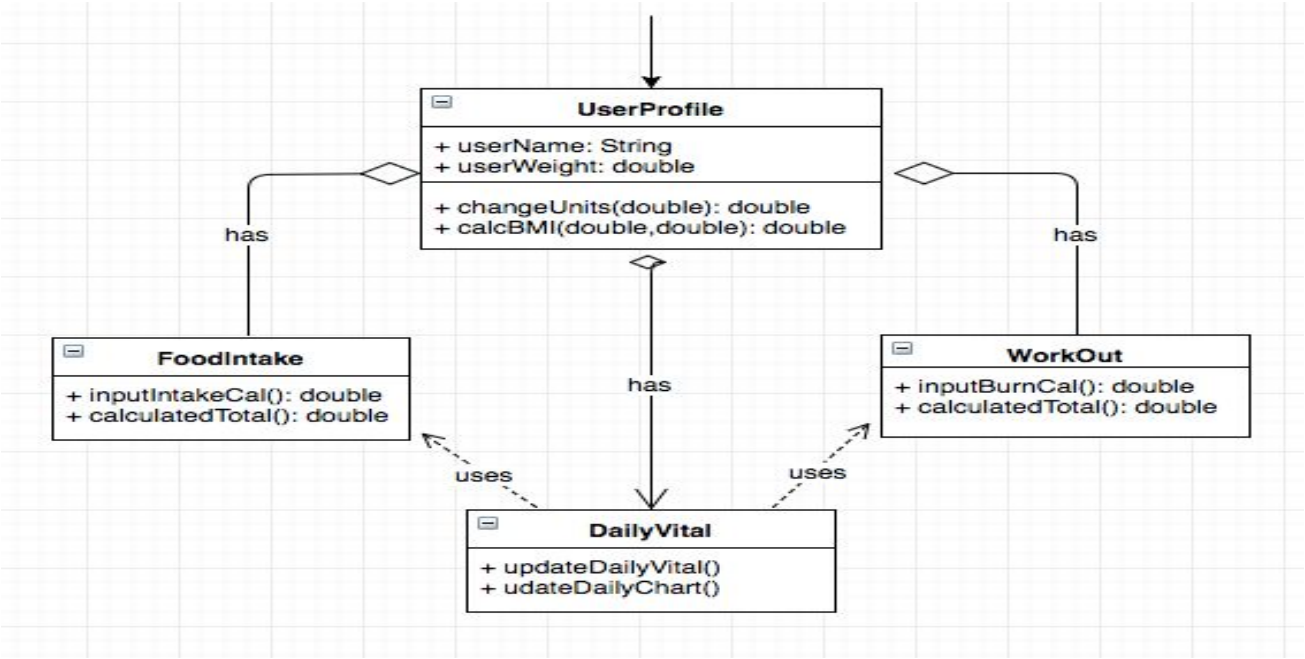

Figure 5: Class diagram for User Profile, Food Intake, Workout, and Daily Vital

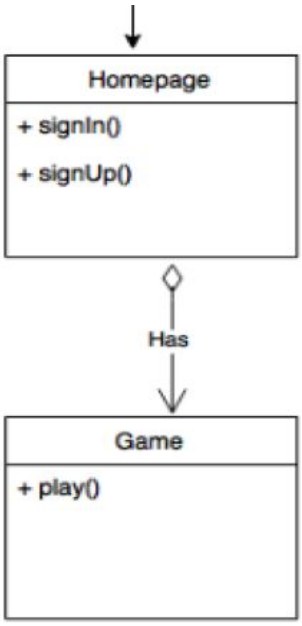

Figure 6: Class Diagram for Home Page and Game.

3.1.3 State machine diagram

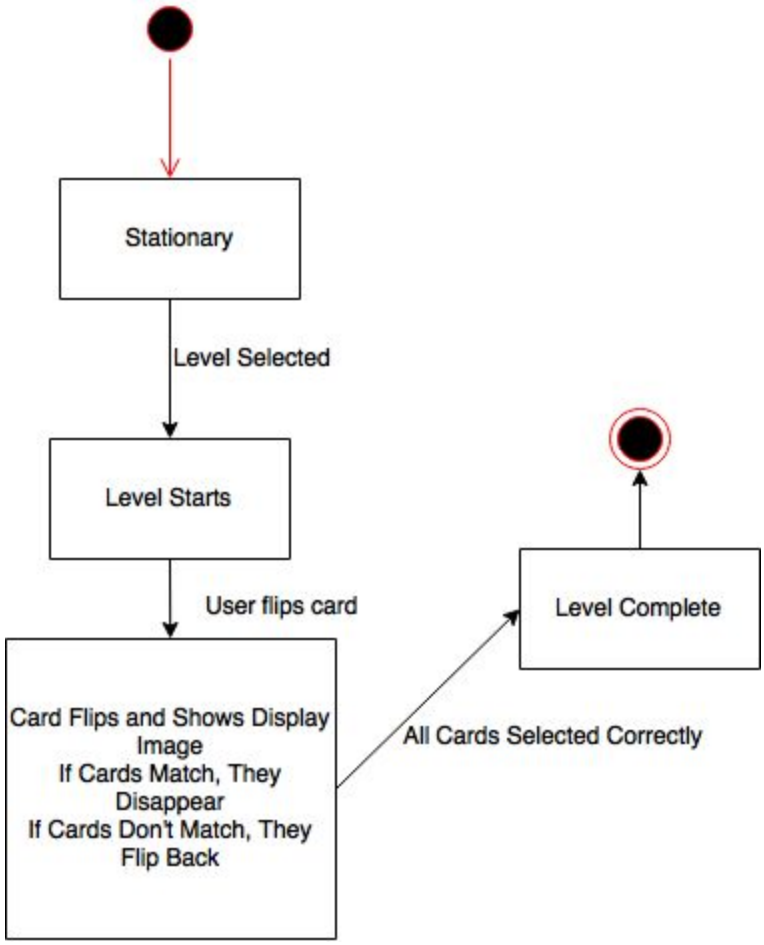

Figure 7: State-Machine Diagram for Game.

3.2 System (or Component) Functional Requirements

The goal of this application is to help people live a healthier and more fit lifestyle. To achieve this goal, a variety of specifications have been considered in order to guarantee optimal user experience. The user must be able to perform certain functions consciously, while other actions are being implemented automatically.

Functional Requirements (1):

(1.1) Required:

1.1.1. Create account: Users should be able to create an account by inputting desired username and password.

- As a customer, I want to create an account by filling out a form so that I can keep track of my diet and exercise routines efficiently.

1.1.2. Delete account: Users should be able to delete their account by clicking a delete button, which should remove their related information in the database as well.

- As a customer, I want to delete my account by simply clicking a button and confirming my decision/request. Therefore, assuring me that my past user history is erased.

1.1.3. Login: Users shall be able to type in their names and passwords in order to login.

- As the customer, I want to create my account by entering my inputted username and password from the create account form.

1.1.4. Log-out: Users shall be able to sign out of the application at any time.

- As the customer, I would like to sign out of my account by simply clicking a single button.

1.1.5. Input calorie intake: Users must be able to input the calories they obtained. The user can either input the number of calories obtained or select the foods from a list.

- As the customer, I want to input my food consumption by either entering the calorie as an amount (number) or selecting a certain food from a list of options.

1.1.6. Input exercise activity: Users must be able to input calories burnt. The user can either select specific exercises from a list of options or they can simply input the number of calories burnt as an exercise entry.

- As the customer, I would like to input the number of calories I burnt for a particular period of time.

1.1.7. Play game: Users shall be able to play the game built into the application.

- As the customer, I would like to play a game that will give me reward points to keep me motivated to use the application.

1.1.8 MiLog: Users shall be able to keep track of their vitals (blood pressure, heart rate, weight, height) on a daily basis using their MiLog.

- As the customer, I would like to upload my vitals, so that I can keep track of my vitals on a daily basis and in one location.

1.1.9 User Profile: Users shall be able to create a user profile, which will save their personal information, as well as their photos.

- As the customer, I would like to have a profile, so that I can view my personal information at anytime.

1.1.10 Calendar: Users shall be able to view information for Food Log, Daily Vital, and Workout Log by selecting any specified date.

- As the customer, I would like to view by inputs for various days through a calendar view.

(1.2) Desired:

1.2.1. Present Effort Chart/Graph: Users can see their effort (i.e. total calorie intake/ total calories burnt for a day/week/month/year) in the form of a chart or graph.

- As the customer, I would like to see my eating and exercising history in the form of a chart or graph.

1.2.2. Earn Daily Points: Users can earn daily reward points by inputting basic information such as: body temperature, blood pressure, heart rate, and weight daily.

- As the customer, I would like to earn daily points by inputting the basic information mentioned above.

1.2.3. Obtain points from game: Users must be able to gain points by playing the game and surpassing certain levels.

- As the customer, I would like to obtain reward points by playing the game so that I can perform various tasks throughout the games with my points such as, make purchases, feed my animated pet, unlock special levels etc.

(1.3) Optional:

1.3.1. Count steps: Users shall be able to keep track of the number of steps taken in a particular day.

- As the customer, I would like to count the number of steps I took within a specified period of time.

1.3.2. Make purchases: Users shall be able to make purchases from points received in the game to enhance their animated characters and personal spaces.

- As the customer, I would like to use my reward points to make purchases throughout the application.

1.3.3. Create animated pet: Users shall be able to adopt an animated pet to keep in their personal space.

- As the customer, I would like to have an animated pet in my personal space in order to have a more pleasant and enjoyable user experience.

1.3.4. Customize animated character: Users shall be able to customize the physical features of their animated characters such as: eyes, nose, lips, hair, body measurements, etc.

- As the customer, I would like to be able to customize my animated character to best fit my personality.

1.3.5. Customize personal space: Users shall be able to customize their personal space such as: wall color, furniture, etc.

- As the customer, I would like to customize my virtual personal space by adding new furniture and items.

3.3 Non-functional Requirements

Category	***Nonfunctional requirement***
Usability:	● The application user interface shall have touchscreen capability ● The application shall be easy to follow for users of ages from 10 to 80 without training ● The applications buttons names shall be written in a language user understands no technical words.
Reliability:	● The system should display error messages within 5 seconds of a failed action. ● The system should display confirmation requests within 1 minute.
Supportability:	● *T*he application shall notify users when there is updates. ● The application shall notify users bugfixes after release. ● The application shall notify users when new features added.
Portability:	● The application shall be transferable to different wireless Android mobile devices.
Performance:	● The application shall respond within 10 seconds after the user's input. ● The application shall be capable of supporting 30,000 users at the same time.

Security	● The application provides access to only authenticated users ● Only user holding the role "admin" can update clients can access "update client"
Legal:	● The application must keep personal information inputted by user private. ● The application must abbied to Google's firebase rules. ● The application must abbied to copyright rules.

Table 1: Non Functional Requirement of the Application

3.4 Context and Interface Requirements

The context environment supporting development, testing and deployment include android phone and computer. Computer is needed for development and testing. The application is also tested on android phones. MiOLa application sticks to common user interface design principles. The application used buttons, spinner, drop down buttons and the UI widgets to make the application easy and attractive to the the users. The names of the buttons are self explanatory and consistent throughout the system. Users can easily recognize all of the application interface's task even coming across them for the first time. For instance, create user profile button is consistently used for creating a user throughout the system.

3.5 Technology and Resource Requirements

Technologies required for the application to be build can be broadly divided three which were software, hardware and technology requirements. Android studio was one software requirement which helped in compiling and building the user interfaces along with the business logic. Google's cloud based real time database firebase was another software needed. It has a

capability of data storing and synchronization in real time for connected clients. Adobe Illustrator were used for drawing and miOLa characters for the animated character feature of the application.

Hardwares needed for the application are android phone to test and run and computer for all the implementations and testing. The cloud based firebase was one technology implemented for data manipulation and storage.

	Software Requirement	**Hardware Requirement**	**Technology**
1	Android studio	Andoid phone	Cloud
2	Firebase Database	Computer	
3	Adobe Illustrator		

Table 2: Technology and Resource Requirement

Chapter 4 System Design

4.1 Architecture Design

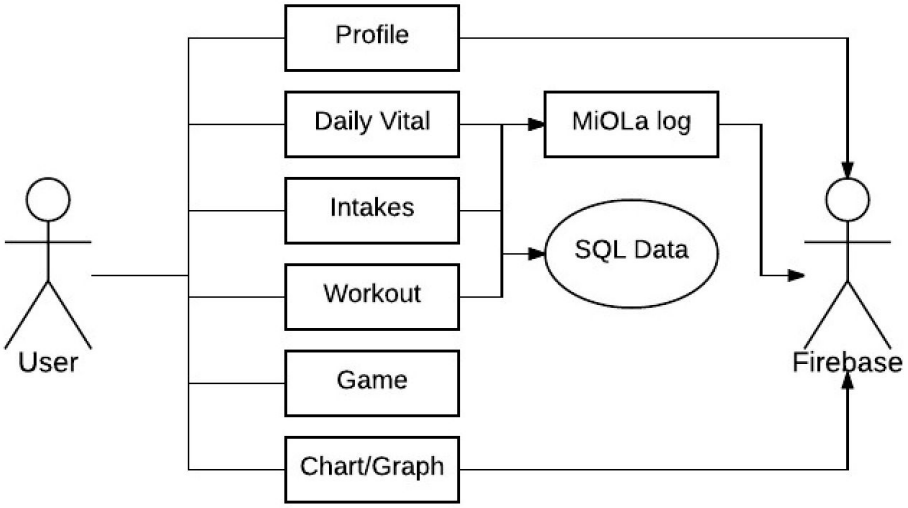

Figure 8: Client-Server Architecture Design

User: To display input fields simply for every user.

MiOLa Log: It shows a user's daily vitals, intakes, and total calories.

Firebase: To store all data which a user inputs.

User Input Data: There are three category fields.

- To input vital information which contains blood pressures; top and bottom blood pressures, heart rate, body temperature and weight. Those data directly connect to Database.
- To input category intake. After daily intake data such as names of food are inputted, those are converted to estimated calories by SQL Data, so users do not need to calculate how many calories they take.

- To input work out with specific activities such as running, walking and muscle training. The data also are calculated by SQL data based on their age and weight, and are converted to actual consumption of calories automatically.

Those data go to Database and convert to reward points.

Game Field: Based on user's rewards how many point they get. Based on the points, UI shows a game field with animations. The data stores on user's device from Database, so users do not need to connect the Internet when they open the game field.

Chart/Graph: To show their data with graph or chart: for examples, weight, steps and calorie. The data invoked from Database based on their input.

4.2 Interface and Component Design (based on Scott W. Ambler)

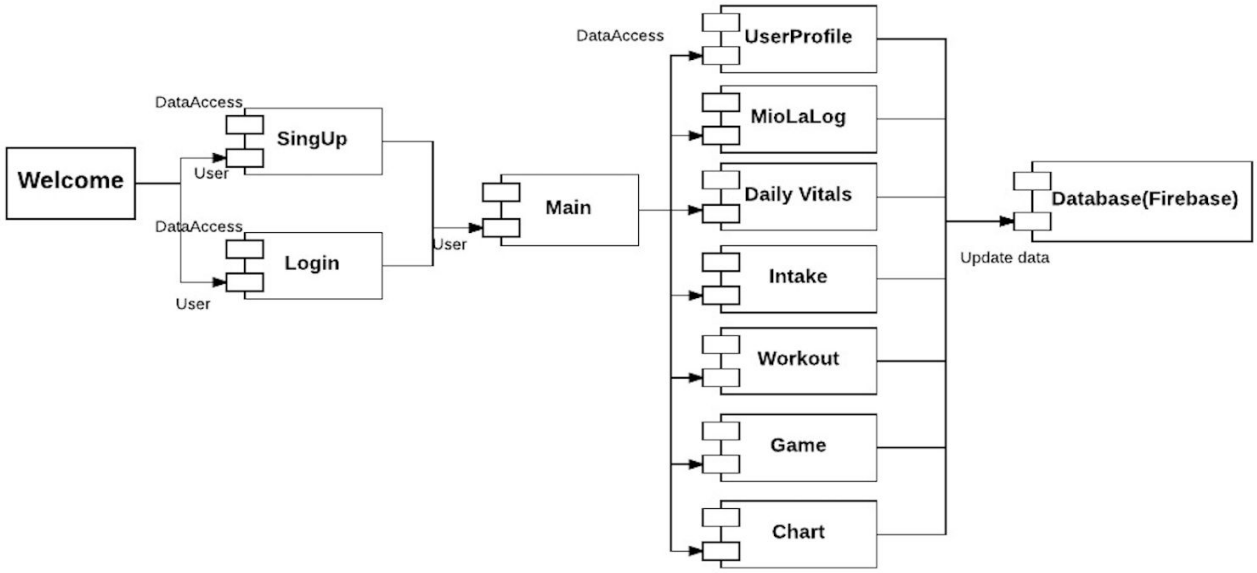

Figure 9: Interface and Component Design

Welcome: The first page of the application.

SignUp: Signing up if a user does not have any account.

Login: Logging in if a user already signed up.

Main: After logging in, a user can select features.

UserProfile: A user can create own profile that contains its birthdate, current weight, height, gender, and a goal with picture.

MiOLa Log: It shows a user's daily inputs which contain daily vital, intake, and workout.

Vitalchek: A user input his blood pressures, body temperature, heart rate, weight, and daily goal.

Intake: A user can choose what he eats daily; for example, breakfast, lunch, dinner, and snack.

Workout: A user can choose if he works out.

Game: A user can play a game with reward points which gains from inputting data.

Chart: It shows how a user intakes or works out daily or monthly on a chart.

Database(Firebase): All input data goes to Firebase.

4.3 **Structure and Logic Design**

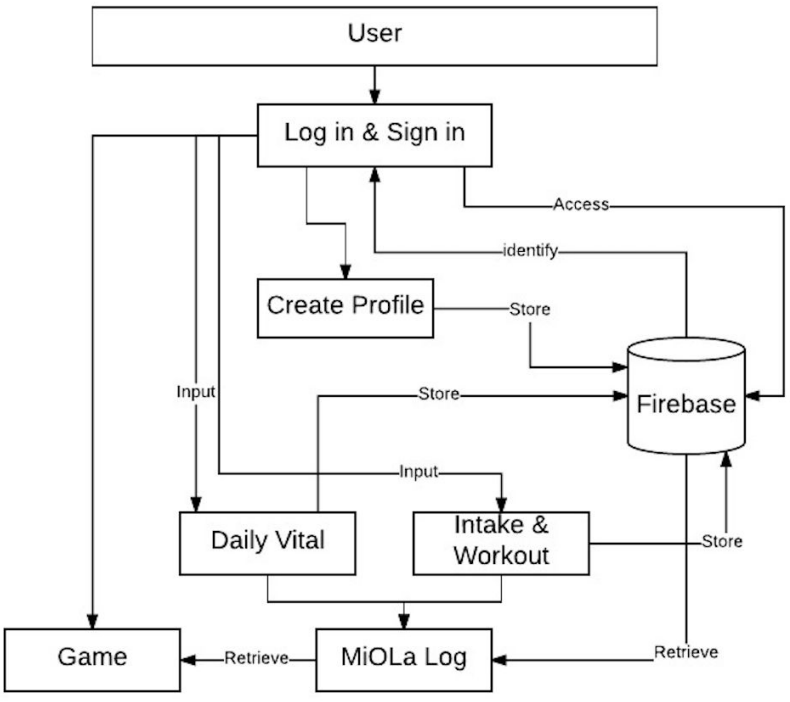

Figure 10: Structure and Logic Design

User: If a user sign in first, his email and password stores in Firebase.

Log in & Sign in: Through Firebase with email and password, the user can use all features.

Create profile: Input data are stored in Firebase.

Daily vital: Storing in Firebase

Intake and Workout: Data are storing in Firebase.

MiOLa log: Retrieving data from Firebase which is based on a user's input.

Game: Based on reward points, a user can use it to play game which data retrieves from Firebase.

4.4 Design Constraints, Problems, Trade-offs, and Solutions

4.4.1 Design Constraints and Challenges

Daily vital and intakes: Constantly having to input daily vital and intakes is hard for users. How to make users input data every day and involve in their daily lives.

Animation: Using a game feature. Showing some movement with animation.

4.4.2 Design Solutions and Trade-offs

Daily vitals and intakes: Rewarding some points which is for playing a game is a good way for users to keep inputting their daily vital and intakes. Also, they can get the points from achieving their daily goal as well.

Animation: Implementing attractive character makes users fun to play a game.

Chapter 5 System Implementation

5.1 Implementation Overview

Many things were considered while deciding a platform for the senior project. The duration of the entire project was two consecutive semesters. Our team decided to create a mobile application because that would allow us to implement key deliverables, while still being able to present a completed project at the end.

So, for this project our team decided to make a mobile application. Since all of every member in our team are Software Engineering majors, we decided to create an Android mobile application. Android development is based on the programming language, Java. All members of our team are experienced in Java programming. Therefore, the team felt most comfortable with implementing an Android application.

Having decided on an Android mobile application, our team had to establish all the required tools (Hardware and Software). The required software tools included, Android Studio, Firebase, Adobe Illustrator, and Github. The required hardware tool included, an Android compatible phone. The necessary software tools help the team with implementing the application. The necessary hardware tool help the team with testing and debugging the application.

5.2 Implementation of Developed Solutions

To implement our developed solutions our team has resorted to having 1-2 members work on each feature. Our sprints are two weeks long and at the end of each sprint, our team meets up and combines each feature together into our main application. Then, new tasks/features

are assigned for the following sprint depending on our progress for the previous sprint. This way each person has an equal balanced workload for each sprint, which allows the person to devoted their time to a single feature.

5.3 Implementation Problems, Challenges, and Lesson Learned

Throughout coding this project, our team was faced with many different challenges regarding various areas of the implementation process. One challenge included having an active and running Database. We chose to use Firebase as our database system because it allowed us to view real time feedback. Creating the initial database system and connecting it to our application was our first step. Then, we needed to store the user's information for creating an account, so the user would be able to login successfully. After the completion of these two steps, we needed to implement the "save user's inputs" aspect of the database. This is where we ran into some issues.

At first the user's data would only be saved for a single user. When we tried to fix this issue, the user's data was not being connected to the original login information stored in the database already. Trying to solve this issue required us to disconnect all aspects of the code that was not directly related to the database and implement a method that allowed us to convert the data and create a relationship with the user's already existing login information.

Chapter 6 Tools and Standards

6.1. Tools

- Android Studio: Being an android application, the project has heavily depended on android studio. Android studio is an Integrated development environment(IDE) for android platform development. It is an official android development tool. It not only provided us platform for high quality application development but also tools for rich code editing, debugging, testing, and profiling tools.
- Illustrator: The application employed the animation to get the appealing factor for users. Developing animation characters require a tool which is easy to use and economical for the purpose. Adobe illustrator leads the industry of vector imaging software. This tool helped us create logos, icons, sketches, typography, and complex illustrations for our animation characters and setting of the surrounding environment in our application.
- Firebase: The project have an interface to store the data and user profile from application interactions. These data needed to be stored somewhere. Deploying a platform with all the required tool just for the application might encompass extra work since currently there are readily available mobile application database platforms in the market. Firebase has a free spark version for basic integration. We have been using it for a real time database integration and resource storage. Firebase has an interface specific to android studio.
- StackOverFlow: Most of member in the team weren't familiar with android development. While implementing certain features, issues arose. To solve these issues, the team resorted to using Stackoverflow. Stackoverflow is a platform where users can post issues and people can respond with various solutions. This platform has solutions to problems

from a wide range of languages, such as Java, C, Ruby, Python, Swift, Android, etc.. This is a really helpful platform to refer to when uncertain of why certain issues occurred.

- LG G4: This is a mobile device that supports Android. We used this device to test and run our application. This device was helpful in the testing and demo phase.
- Samsung S6 Edge: This is another mobile device that supports Android. We used this device to test and run our application as well. This device was helpful in the testing and demo phase.

6.2. Standards

Standards are followed to receive industry wide acceptance. Standards also help organizations work efficiently by making it easy to maintain and develop. Our project has multiple components with standards to follow. Our team used software accepted throughout the software industry. Android Studio is a standard application used industry-wide for software development. This software has coding and design standards pre-installed on it. Variable naming, indentation, comments, module and file naming standards are automatically followed. MiOLa is an application helping its user with their health. From health industry point of view, we have many standards to follow but we have filtered out few based on our requirement. Calculating user's BMI as well creating the health profile required a standard formula. We took multiple references from sources accepted industry-wide to create these formulas.

Information security requires many standards to be followed in order for wider adoption of the application. Our application handles sensitive user information. We used APKtool and various certified applications to verify security aspect of our application. Application is using

Firebase database which is a service provided by Google cloud platform for storing application data. This database conforms to most of the database standards. IEEE 1024-2008 and ISO/IEC 25010:2011 standard is specifically designed software verification and validation. This standard helped in building quality software during its lifecycle. The standard touches the field of environment, operator/user, hardware and other software used during the product lifecycle. Android is an open source project. All standards followed by the android operating system also apply to this project. Google also provides API guidelines for android on its platform. These guidelines were closely followed for our project design and architecture.

Chapter 7 Testing and Experiment

7.1 Testing and Experiment Scope

Testing is a major fundamental task for our software application. In order for the user to have an optimal user experience while using our application, every feature must be bug and error free. In order to achieve this we have established an efficient testing strategy. For this project we split up our testing into two main phases. The first phase would consist of white-box testing strategies and the second phase would be black-box testing strategies. We had to take into consideration both software and hardware aspects of our application. Although, our application is mostly software based, it was also required that we have access to an android mobile to test and demo our application. The physical android mobile is the key hardware component of our project. Throughout the whole testing process, every part of the software was broken down to test for bugs and error. Then, it was rebuilt to fix any current bugs/errors as well as prevent future ones from occurring.

We decided to break up our testing methods into two different components. First, we would test each individual feature. Then we would combine all features together and test the entire application as a whole. We performed four different types of testing strategies throughout the course of the entire testing process. These testing types include unit testing, regression testing, system integration testing, and usability testing. The two main testing techniques we focused on are unit testing and system integration testing. The objective for unit testing was to guarantee that each feature was complete and working correctly before integrating all features together. This way we would be able to catch any bugs/errors in the early stages of the implementation process. We would also be able to work in an efficient and productive manner.

The objective for system integration testing was to guarantee that the application would run in a uniform way once all features were combined together. In order for the entire application to have optimal performance stamina, we chose to perform unit testing within each individual feature first, before combining all features together and performing system integration testing. Our testing strategies made our overall velocity increase. Thus, allowing us to work in an efficient and productive manner while fixing any bugs/errors along the way.

Along with performing various unit and system integration testing strategies, we also have incorporated usability and regression testing into our project. Once a feature passes various unit testing strategies, we must check to see if we introduced any new bugs/errors while fixing already established ones. This is where regression testing comes into play. After unit testing, we would perform various regression testing strategies in order to catch all potential bugs/errors that would not be notice during previous debugging and correcting processes.

Furthermore, our application targets users with various android mobile devices. So, we must to guarantee all users will have the same optimal and enjoyable UI/UX experience at all times. In order to achieve this goal, we opted to perform various usability testing strategies. Combining all four critical testing strategies, allows us to ensure all targeted users will have the same desired user experience.

7.2 Testing and Experiment Approach

As mentioned above, we have broken down our testing methods into two different components. During the first phase of testing, we performed various white-box testing strategies such as control flow and data flow testing . Our goal for white-box testing was to catch any errors within the internal structure of the our application before running the application in the

emulator. By completing these white-box testing strategies, we would be able to catch all errors inside our source code. This allows us to check each individual feature and assure the logic of the source code is correct. During the second phase of testing, we performed various black-box testing strategies such as equivalence partitioning, use case testing, and boundary value analysis. Our goal for black-box testing was to check the functionality performed by the external system itself. By completing these black-box testing strategies, we would be able to catch all errors made by the system itself when simulated. This allows us to check for software-hardware compatibility errors. In other words, our software-based features might behave or perform differently that expected/desired.

White-box Testing Methods	**Black-box Testing Methods**	**White-box + Black-box Testing Methods**
Unit Testing	System Integration Testing	Regression Testing
	Usability Testing	

Table 3: Various Testing Methods

White-box Testing Strategies	**Black-box Testing Strategies**
Control Flow Testing	Equivalence Partitioning
Data Flow Testing	Use Case Testing
	Boundary Value Analysis

Table 4: Various Testing Strategies

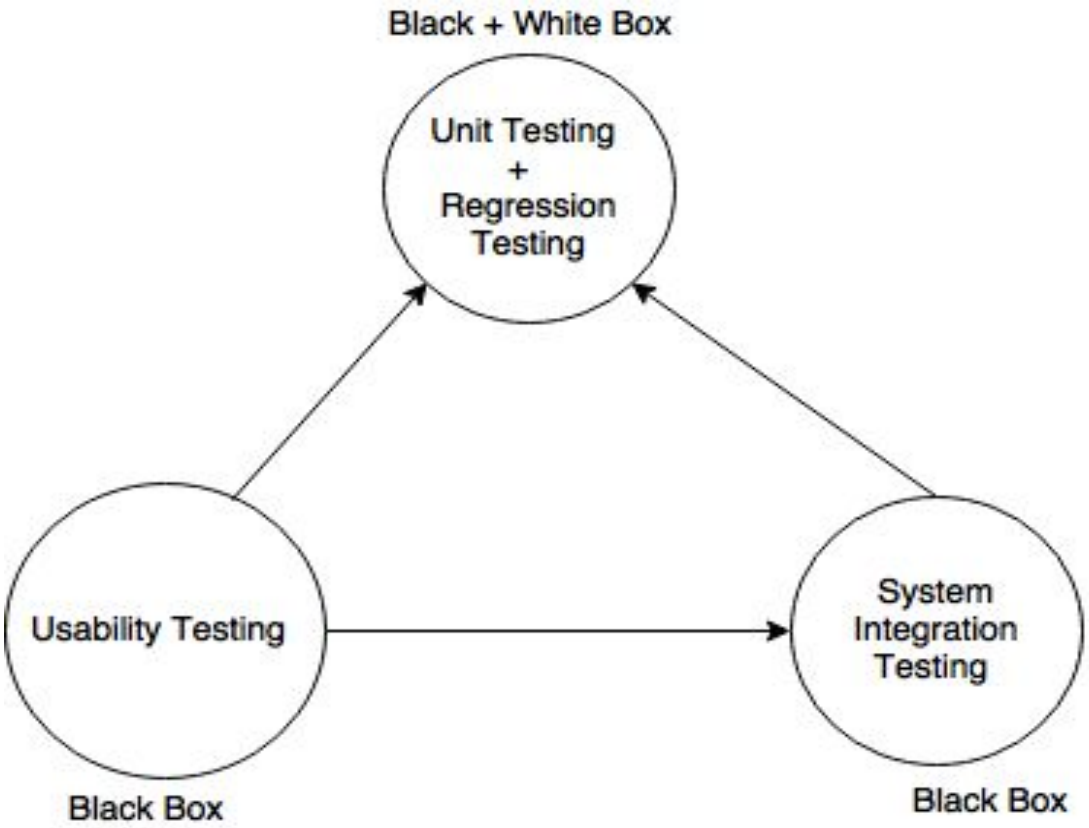

Figure 11: Testing Life Cycle

7.3 Testing and Experiment Results and Analysis

We are currently in the final stages of our implementation plan. We performed various unit testing strategies for each individual feature. Once we have completed the implementation process for two features, we perform code integration sessions. During our code integration sessions, we combine source codes for the two features involved. Once the two features are combined successfully, we perform the various unit, regression, system integration, and usability testing strategies mentioned above. Once we are done implementing another feature, we perform the same cycle that includes all four key testing methods mentioned all over again to ensure no bugs/errors go unnoticed. Later on, we will be performing system integration and usability

testing at a higher scale. This section will be completed later on, once we have completed our implementation plan for all features in our backlog.

Control Flow Testing Example for Selecting a Food Item:

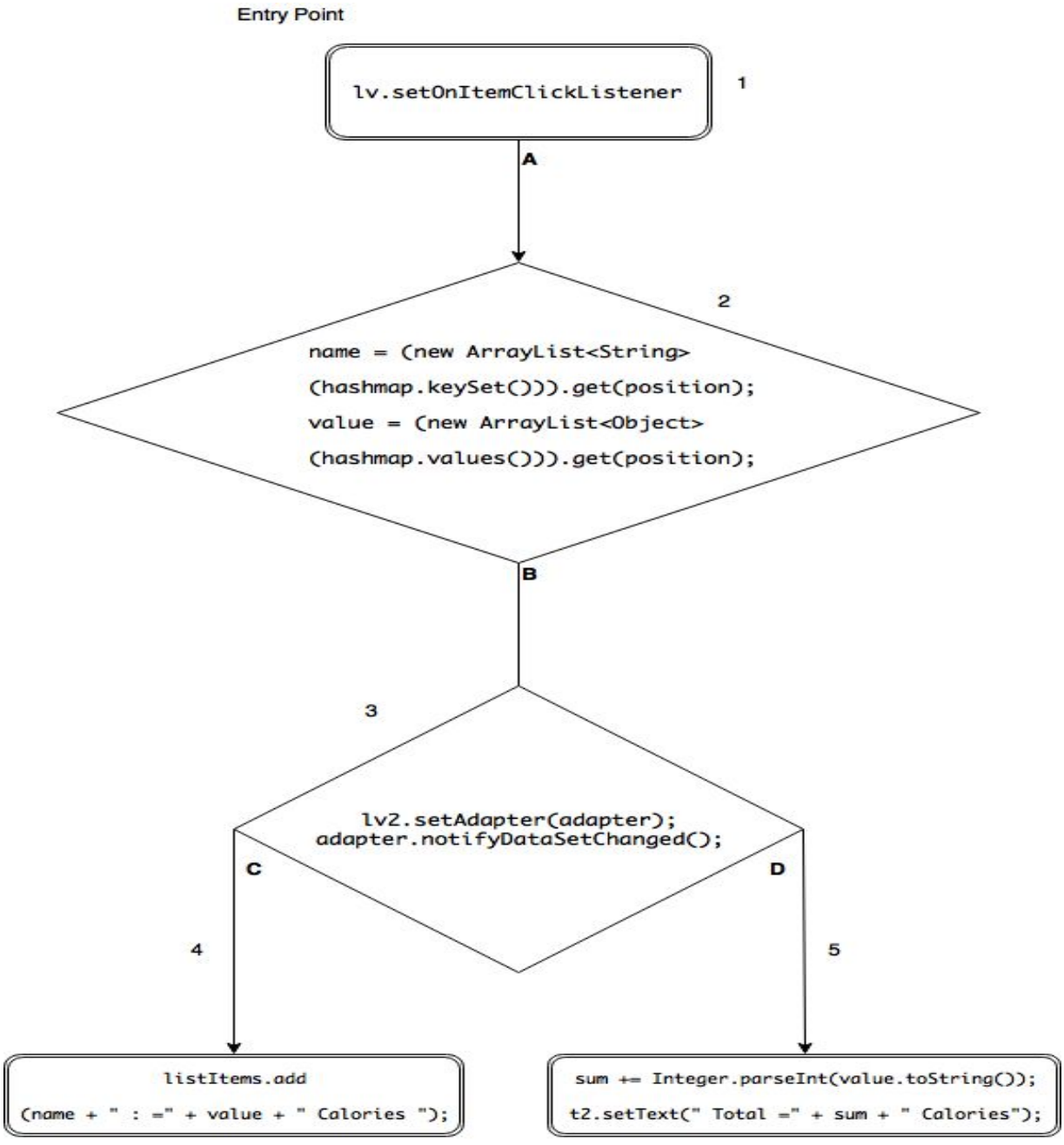

Figure 12: Control Flow Diagram

Data Flow Testing Example for Signing In:

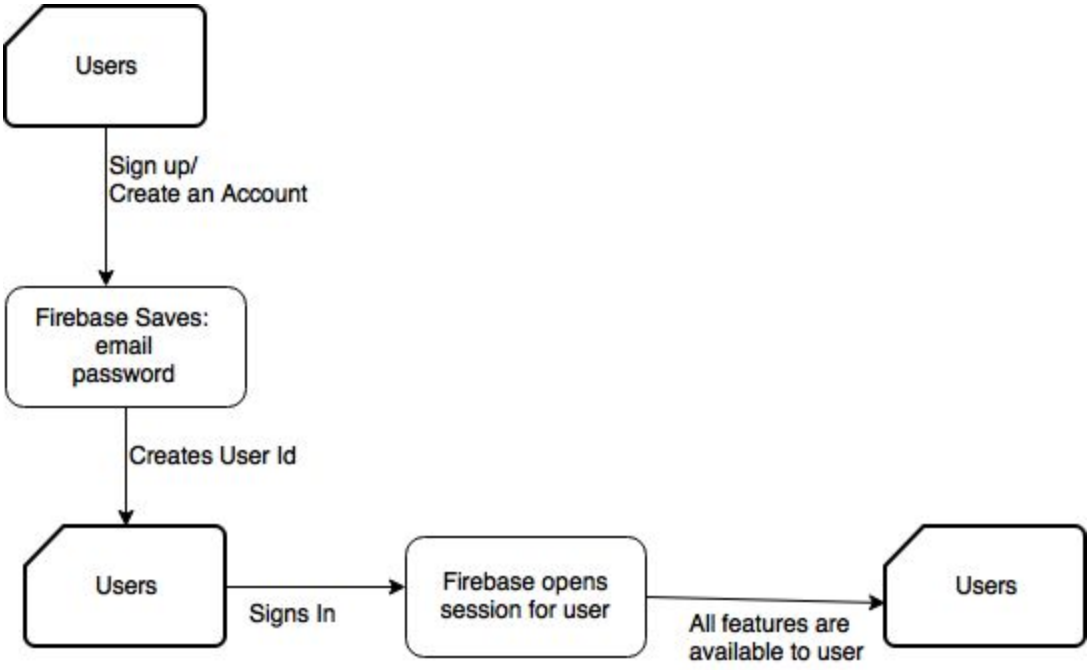

Figure 13: Data Flow Diagram

Equivalence Partitioning Example for Signing In:

Test Input	**Expected Output**	**Equivalence Class**
Email: ayadawa@gmail.com Password: hello1234	Account successfully created so user can sign in	Valid email Valid Password
Email: test@yahoo.com Password: 123	Account successfully created so user can sign in	Valid Email Invalid Password
Email: hello@gmail Password: 12345678	Account successfully created so user can sign in	Invalid Email Valid Password
Email: sarah@gmail.com Password: school1111	Account successfully created so user can sign in	Valid email Valid Password

Table 5: Equivalence Partitioning

Boundary Value Analysis for Manually Inputting Foods:

Test Scenario Description	Expected Outcomes

Boundary Value = 0 (cal)	System should accept
Boundary Value = 100 (cal)	System should accept
Boundary Value = 200.0 (cal)	System should not accept
Boundary Value = 10000000000000 (cal)	System should not except

Table 6: Boundary Value Analysis

Example feature with all testing strategies mentioned above →

Feature: 1.1.5 Input Calorie Intake

[Users must be able to input the calories they obtained. The user can either input the number of calories obtained or select the foods from a list.]

Unit Testing (White-box) was performed

Regression Testing (White-box + Black-box) was performed

System Integration Testing (Black-box) was performed

Usability Testing (Black-box) was performed

Once all of the listed testing methods pass, the feature (1.1.5) will satisfy our "Definition of Done" and marked as complete.

Figure 14: Example Feature Description

Test Cases: Required Functional Features

Test Case Name	Input	Expected Output	Actual Output	Pass/ Fail
1.1.1. Create Account	Email, Password	Data Saved to Firebase, User Id Created	Data Saved to Firebase, User Id Created	Pass
1.1.2 Delete Account	"User must be signed in"	User account info deleted from Firebase	User account info deleted from Firebase	Pass
1.1.3 Login	Email, Password	User's session starts on Firebase, User is directed to home	User's session starts on Firebase, User is directed to home	Pass

		menu	menu	
1.1.4 Log-out	Button Activity	User's active Firebase session is stopped, user is redirected to sign in page	User's active Firebase session is stopped, user is redirected to sign in page	Pass
1.1.5 Input Calorie Intake	1. User can select item from a list 2. User can manually input item	1. User's selected item is added to the list 2. User's manually inputted item is added to the list	1. User's selected item is added to the list 2. User's manually inputted item is added to the list	Pass
1.1.6 Input Exercise Activity	1. User can input specific calorie amount from a list of exercise activities 2. User can manually input a specific calorie amount	1. User's inputted calorie burnt value will be added to the fitness page 2. User's manually inputted calorie burnt value will be added to the fitness page	1. User's inputted calorie burnt value will be added to the fitness page 2. User's manually inputted calorie burnt value will be added to the fitness page	Pass
1.1.7 Play Game	Select level	User will be able to play game for selected level	User will be able to play game for selected level	Pass
1.1.8 MiLog	Blood pressure, heart rate, blood pressure, Weight, BMI, BMR, Daily Goal	User can view Blood pressure, heart rate, blood pressure, Weight, BMI, BMR, Daily Goal	User can view Blood pressure, heart rate, blood pressure, Weight, BMI, BMR, Daily Goal	Pass
1.1.9 User Profile	Username, Age, Weight, Height, Gender, Goal, Activity Level	User can view Username, Age, Weight, Height, Gender, Goal, Activity Level anytime	User can view Username, Age, Weight, Height, Gender, Goal, Activity Level anytime	Pass
1.1.10 Calendar	Select day of any month	Info for Daily Vital, Food Log, and Workout Log will be displayed for date selected by user	Info for Daily Vital, Food Log, and Workout Log will be displayed for date selected by user	Pass

Table 7: Test Cases for Required Features

Chapter 8 Conclusion and Future Work

8.1 Conclusion

The senior project provided us with a platform to learn and experience many different things. Some of the skills we worked on mastering throughout the course of this project are communication skills, team management, time management, presentation skills, team work, work load management, implementation methods, writing skills, and leadership. As a team, we have had many experiences where we had to step up. Throughout the course of this project, we all had to take on leadership roles. When conflicts arose, we came up with solutions immediately. There was a strong sense of communication within the entire team and everyone's voice was heard. The senior project allowed us all to grow as individuals as well as engineers.

Our main goal for this project was to provide a platform for users to keep track of their fitness and health habits. Throughout the implementation process, our vision of the application changed in a few ways. We wanted to make sure we presented our application in the best way possible. In order for us to accomplish this, we made some changes. As a team, we wanted to make sure our main focus area was fitness/health. To make our application reliable and accurate, we made some changes to the animation, location, and game features. Instead of having an application which included a separate gaming and animation aspect. We decided to combine those two features into one. The game is a health-based game. The game incorporates a form of animation, which enhances the UI of the feature and entire application in general. By combining these two features, we were able to keep the main focus of our application, which is health/fitness, as well as, improve the runtime and reliability. As for the location feature, it brought the user's attention away from the health/fitness aspects of the application. Also, the

location feature was lowering the runtime and durability of the application. For these reasons, we decided to remove this feature.

Based on the results of this project, we have accomplished our original goal. By focusing on features that enhance our application's main goals, we were able to successfully implement an application that allows users to consistently keep track of their health and fitness goals by using a stable and reliable platform.

8.2 Future Work

As for future work, we are planning to deploy our application to the android play store. Our intentions were to create an application that users and use so that they can keep track of and improve their health fitness lifestyles. With this being said, it is crucial for us to provide users with the platform to accomplish their health/fitness goals. Therefore, we do plan on making our application available to all android users. With this extra step we are aiming to make miOLa the ultimate platform for users to keep track of anything health/fitness related.