Healthy Lifestyle Management System

by

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Dissertation submitted in partial fulfilment of

the requirements for the

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(Information & Communication Technology)

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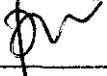
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CERTIFICATION OF APPROVAL

Healthy Lifestyle Management System: Intelligent Exercise Assistance (android application)

by

Muhammad Syazwan Bin Abu Bakar

A project dissertation submitted to the

Information Communication Technology Programme

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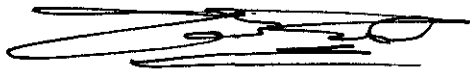Approved by,

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(Ms. Goh Kim Nee)

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TRONOH, PERAK

December 2011

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgement, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

(Muhammad Syazwan Bin Abu Bakar)

ABSTRACT

This project focuses on developing the intelligent algorithms to calculate and determines the duration of exercise, time to do exercise and the types of the exercise needed by a user daily. The factors that will affect the calculation of the algorithm are the current BMI (Body Mass Index) of the user; user needs to enter the weight and height to calculate the BMI, the user's body condition and the working hours of the user. System will store all the data inside the database.

The main objective of this system is to develop the intelligent algorithm to calculate the exercise needed by the user based on certain criteria. The intelligent algorithm that used in this application is Rule-Based algorithm. This project will help university student manage their time to do exercise just by using the android application inside their phone.

The methodology use to develop this project is RAD. This project will produce many versions of prototypes before the actual system. Intelligent Exercise Assistance was developed as the beta version of this project. In overall, this intelligent application will help the student to manage their time, life in healthy lifestyle and maintain their healthy body.

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CHAPTER 1

INTRODUCTION

1.1 Background

A healthy lifestyle is basically a better life, there is a good physical basis for a healthy lifestyle can reduce the incidence of the disease, (Chenghui Guo, 2011). Healthy Lifestyle also means self care. Self care is personal health maintenance. It is any activity of an individual, family or community, with the intention of improving or restoring health, or treating or preventing disease.

One way how we want to restore our health is by doing exercise. This project will focus more on how to develop the system using intelligent algorithm that will calculate the exercise needed by the user based on certain criteria entered by the user. There are many types of exercise and the suitable exercise for the user will be auto-selected by the system. This system will generate the schedule for the user to do exercise daily.

Among the UTP student, many of them want to live in healthy lifestyle. But they do not know what types of exercise is needed and what is the suitable time for them to do exercise. Students do not have enough knowledge on health and sometime this exercise can affect their body. Average of the university students spent their time at room. A lot of time had been spent in front of their personal computer. Some of them do exercise by playing sport. But is that sport is suitable for him or her at that time and is it good for their body? Some of them want to exercise or playing sport but they shy or afraid because they are overweight. This android application is develop to helps this student manage their time effectively to do exercise and to helps user make decision on what kind of exercise is suitable for them.

By creating this system that usable at the smart android phone, student can frequently access this system and know when the suitable time for them to do exercise. For the student that concern about their healthy lifestyle, they need to meet with the doctor or any expert person to manage their daily activity. Many of the students play sport every day without enough knowledge about the suitable time for them to play certain sport based on their daily schedule. Students think that if many time they spent for exercise they will be healthier without concerning about their body condition.

Focus will be more on the algorithm to calculate and generate the schedule for the user and how to make this system intelligent (Artificial Intelligent). Certain input needed by this system in order to do calculation. The types of exercise also will be calculated based on the user body's condition. Much software developed to help the healthy industries but not many of this software were developed to manage the person's lifestyle such as the software to analyze the suitable diet for the user (Dine® Healthy 7, 2011).

1.2 Problem Statement

The main part of this project is the algorithm of the system. The algorithm of this system must be able to automatically calculate and generate output based on the certain input. How to develop the intelligent algorithm that will calculate the exercise needed by the user? To solve this problem, the researches about how to develop the intelligent application, the types of the exercise and factors that affect the user to do certain exercise need to be done. There are many types of exercise such as flexibility exercise, strengthening exercise and cardiovascular exercise. To make the algorithm is able to calculate the suitable exercise, certain input was needed such as the user's body condition. The basic idea of this algorithm is, first this algorithm will get the inputs from the user. Next, do calculation based on the inputs and generate the output for the user.

Intelligent system is the system that can adapt to the current environment. Purpose to create the intelligent system is to have the system that work better than human or can work faster than human mind. There are many types of intelligent algorithm such as Rule-Based algorithm, Fuzzy algorithm, artificial neural networks and many more. Which one of this algorithm is most suitable to be used in order to complete and succeed this project? The possible problem that occurs when developing this application is to make this application intelligent. The system will automatically calculate and produce output without getting request from the user. For example, if the user updates his or her weight or height, system will automatically update all the data that will affect the calculation without getting request from that user.

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What are the things to consider as input? The output of this software is the type of exercise, duration to do exercise and time when the user should exercise. To generate this output, certain input is needed. User must enter the information when he or her first time enters the software. User need to enter their height, weight, daily schedule, body condition (fever, feeling not well). This input will help the algorithm to do calculation and produce output.

The current problem faced by the student in doing exercise is they do not know the suitable exercise and suitable time for them to do exercise. There is no guidance on how to do exercise. Some of these students like to do exercise but what make them stop is they choose a wrong type of exercise and that exercise is too hard for them to do. Student does not like exercise because they think that if they do exercise, it will affect their body. They will feel tired and will affect their study. This software will guide this student on how to manage their time in doing exercise and choose suitable exercise for them. Many information in the internet regarding to exercise was to help the normal weight person on how to choose the right exercise and not many of them to guide the underweight and overweight person. If student who is underweight follow this information they got from the internet, it will cause negative impact to them.

Based on the current method on how the users want to plan their exercise schedule, they need to meet with the expert. Users need to spent time and a lot of money to meet with this expert person. By developing this system, user can reduce their time and money expend. Users just need to enter some input and this application will generate the time suggestion to do exercise. This android application also will give some advice and articles for user to view and gain knowledge about the exercise that they will do.

The android application must be attractive to make the user like to use it and will use it frequently. University student always busy and got a lot activity to do. It is difficult to get the attraction from the university student to use certain application. To solve this problem, this software/system must display the "not complex" design. Sometimes, user

doesn't like the software that needs to enter so many inputs. This system must calculate all possible data without getting input from the user. The design also must attractive for user to use.

1.3   Objectives

The objectives of this project are:

- Develop the intelligent algorithm to calculate the exercise needed by the user based on certain criteria.
- To develop the system that can help the student to make decision about the suitable exercise and manage their time to do exercise.
- To compare and benchmark the studies of this project with related works.

1.4   Scope of Study

This project will cover on how to implement the intelligent algorithm inside the health android application. There are many types of android application but not many of them using the intelligent algorithm in process of developing the application. There are many types of algorithm that can be used to develop the intelligent algorithm. The research about what types of algorithm is suitable to this application must be done. This algorithm will be design using java for android development as the programming language. The knowledge about SQL also needed to develop the database. Interface design will focus more on how to attract the user among the university student. The design must be simple and easy to understand.

This project also will cover on how to make the university student to manage their time by doing exercise and live with healthy lifestyle. Exercise is one of important part on how to develop the healthy lifestyle. To make this application is usable; a lot of research about the effect of the user's BMI, body condition and working hour toward the exercise must be done. The most important knowledge to be collect is the factor that will affect the suitable duration of time and types of exercise. By getting this information, the algorithm is able to be developed.

CHAPTER 2

LITERATURE REVIEW

2.1   Artificial Intelligent

To develop an Artificial Intelligent system, there are three methodology need to be considered. Methodology is the method that must have in developing this system's algorithm. There are three methodologies to be use in developing the AI system; Symbolism, Connectionism and Behaviorism. Symbolism is the ways how we want to present a certain agent/algorithm operate by using the symbol. The system or computer does not understand this symbol but this symbol is use to make hypothesis of our system. Connectionism is how we connect all the agents or methods. Connection is important to relate or to compile the output and to distribute the task among agents. Each agent contains different task. How to make the agent know and doing the task effectively is by make each agent having its own behavior (Behaviorism), (Deyi Li and Yi Du, 2008).

One example of the intelligent algorithm is the rule-based algorithm. This rule-based algorithm contains of the database and the domain knowledge that represented by a set of IF-THEN production rules. This data stored will be compared based on the fact in the interface engine then the result will be generated. Then the result will be updated into the database (Michael Negnevitsky, 2005). The android application that will be developed will use this rule-based algorithm as the main algorithm that will generate output. One of advantages in rule-based algorithm is, uniform structure. Production rules have the uniform IF-THEN structure. Each rule is an independent piece of knowledge. The very systax of production rules enables them to be self-documented. Second, the rule-based algorithm separate knowledge from its processing. The structure of a rule-based expert system provides effective separation of the knowledge base from the inference engine. Third advantage is, rule-based algorithm deal with incomplete and

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uncertain knowledge. Most rule-based expert systems are capable of representing and reasoning with incomplete and uncertain knowledge.

The intelligent software is the software that can support human to make decision (Decision Support). At one time, human cannot think of many factors that can affect the decision he or she will make. The wrong decision making must be because of the stress or that person doesn't have the knowledge in certain area. This system must help the user to make the decision on what is the suitable exercise and time for the user (Zhengxin Chen, 2000). The important of artificial intelligent software is it is capable of independent action. Independent action means the system know what to do without waiting action from the user. This concept is call multiagent system. Multiagent system consist of many agents that each agent has their own goal or objective. Then the result from each agent will be combined to produce the output of the system (Mike Wooldridge, 2001).

Two types of artificial intelligence are strong and weak. Strong AI is the system that self- aware. The system aware of its environment is the strong AI. Weak AI system is the system that cannot work at the human-level intelligence. These system fail to follow the users need and cannot solve problems, (Robin, 2010)

The AI system is the system that contains of problem-solving agent. The system must consist of present situation and desire situation. Present situation is the initial state and desire situation is goal state. The agent's task is to get from the initial state to the goal state by means of series of actions that change the state. The problem is solved if such a series of actions has been found, and the goal has been reached (F. Heylighen, 1998).

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```
function SIMPLE-PROBLEM-SOLVING-AGENT( percept) returns an action
    static: seq, an action sequence, initially empty
            state, some description of the current world state
            goal, a goal, initially null
            problem, a problem formulation

    state ← UPDATE-STATE(state, percept)
    if seq is empty then do
        goal ← FORMULATE-GOAL(state)
        problem ← FORMULATE-PROBLEM(state, goal)
        seq ← SEARCH( problem)
    action ← FIRST(seq)
    seq ← REST(seq)
    return action
```

Figure 1: Example of Problem-Solving Algorithm

2.2 Architecture and Design

The failure of the certain software is based on its Architecture and design. Architecture is the entire content inside our system. It covers all information, and how was our system work. Design only covers certain part of the system. i.e. the interface of this software. The architecture of this system must cover all aspects not only the algorithm but also the interface, the database and how to make this system work efficiently. Each part of this system must be design carefully, (Nikhilesh Krishnamurthy and Amitabh Saran, 2008).

2.3 Interface

This project is to develop the software or system. To develop the software that is user friendly, the interface plays the important role. The way how user interacts with the system is known as human Computer Interaction (HCI). To develop the health care software/system, we must combine HCI and UE. UE mean usability engineering. Usability engineering is the software's interface that very user friendly and having high usability. Interface for Healthy Lifestyle Management System must be very user friendly and this interface is working fine and easy for the user to understand and use it, (Andreas Holzinger, Harold Thimbleby and Russel Beale, 2010).

Good interface design is the design where the user can understand what the system all about is at the first time the user enters to the system. From the overview of a software about healthy, (Fitness assistant 3.0, 2011) the interface is very important. The buttons must be recognizable, input from user must not be requested frequently and not too complex display for the user. To make the user understand how to use the system, we can guide the user by provide the user guideline.
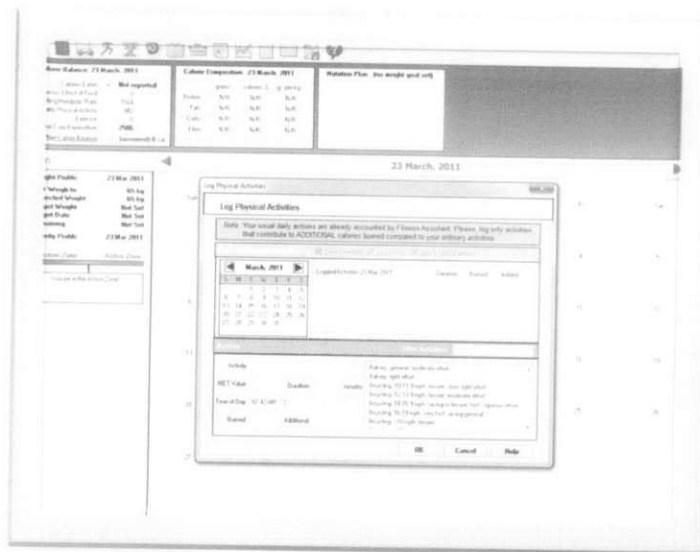

Figure 2: Fitness assistant 3.0

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2.4   Types of Exercise (output)

In order to make the system know what exercise is needed by the user, the system must know the types of exercise available and which exercise is suitable for the user. There are many types of the exercise. This application will focus on three types of exercise which is flexibility exercise, aerobic exercise and anaerobic exercise (Ningthoujam Sandhyarani, 2009). Our muscle need to be move to prevent muscle stiffness and joint pain. To prevent this, the suitable exercise is flexibility exercise. Aerobic exercise is the exercise that can enhance the performance of our cardiovascular and anaerobic exercise is the exercise to build our muscle.

There is another type of exercise which is stretching exercise. This project does not focus on this exercise because user need to have knowledge on how to do this exercise correctly such as Yoga and Tai Chi, (healthtalknow.com, 2011).

There are many factors that can affect the suitable exercise needed by the user. Because of the focus of this system is the university student, the age of the user is between 18 to 25 years old. One of the factors is age. "Not only is exercise for students important for overall health, but it is also thought to be able to increase learning abilities and concentration. Avoiding a sedentary lifestyle whilst in university is difficult for many students, which is why an exercise routine that includes cardiovascular exercise should be used on a regular basis", (wisegeek.com, 2011). By doing exercise, student can increase the concentration at class. Another factor is time to do exercise. This system will calculate the suitable time for the user to do exercise based on the user's schedule. "Research on lung function, body rhythms, temperature, and hormone levels says one thing - to exercise around 6 pm. Surveys on exercise habits say another - to exercise in the morning before other commitments distract you, or during the day when you have a free period of time", (walking.about.com, 2011). This system will allocate the suitable time for the user to do exercise either at morning, day or evening. Exercise is also based

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on the body's condition. For example, if the user feeling stress with study, the system will advice the suitable exercise for the user. "From doing gentle stretching exercises to keeping up in a physically demanding aerobics class, stress relief can be achieved through a wide range of activities", (stress-relief-exercises.com, 2011).

CHAPTER 3

METHODOLOGY
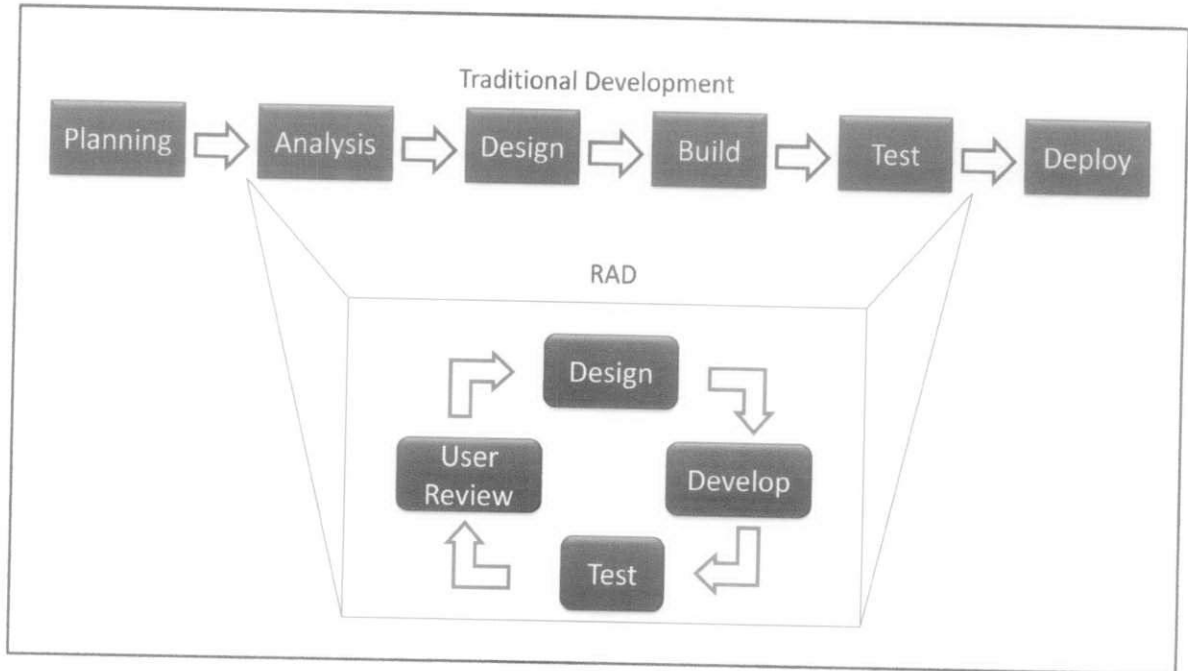
Figure 3: steps of RAD system development

Traditional development methodology state that every development process must have planning, analysis, design, builds, test and deploy. This process was done only once for overall system development. The problem will occur when the system got error, it will be difficult to trace the error in the whole system.

Difference with the RAD design, develop, test and user review is loop many time based on how many prototype version we want to create. When every version finish, all version will be combined and will become a finish system.

Second phase of developing this project by using RAD methodology is analysis and quick design. Developer need to do research, analysis it and produce the quick design. Based on these design and research, the project will determine either this project is possible to be done or not.

Then, developer will develop the first prototype. This prototype will be present to the user, get feedback from the user and do changes. If user wants to do changes, developer will redesign it and will demonstrate the second prototype. If there are any changes, developer will conduct testing of the system.

During the testing stage, user will be learnt on how to use that software correctly and will feedback again to the developer. If got changes, developer will redevelop the system. If not, proceed to the last stage which is Implementation. System will be implement to the actual environment can ready to be use.

3.1 Explanation of development process

3.1.1 Activity diagram for RAD methodology
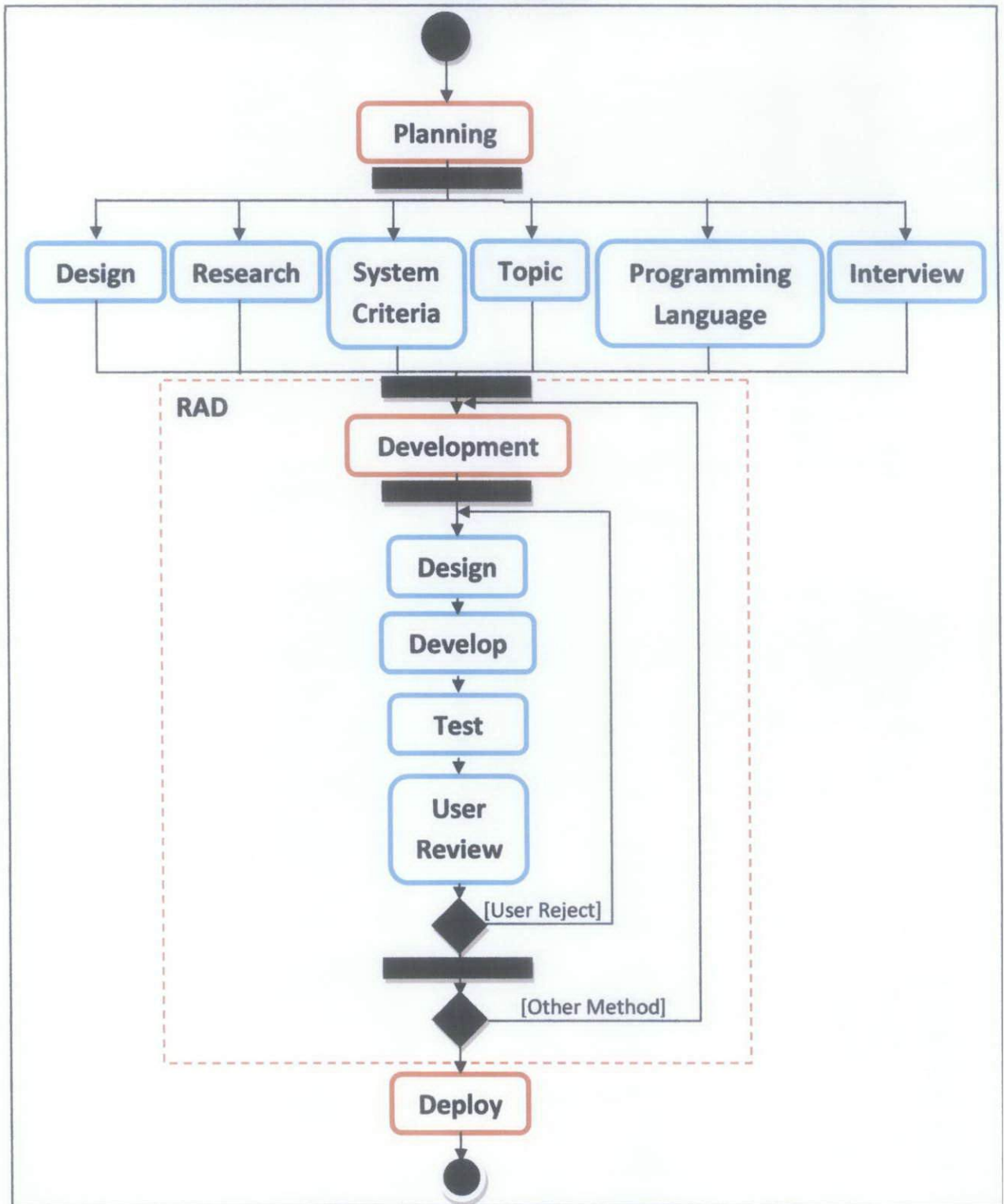
3.1.2 Planning

Planning is the stage where the idea is searched on what system to be developed and the information is gathered. For this project, planning stage involve the research on what android application to develop. This application must be new or enhanced from the current system. Healthy lifestyle system is new intelligence system to calculate the exercise needed for the student. Then the system was proposed to supervisor and get permission to continue this project. After the proposal was accepted, research on the system's criteria was done. The source of the research is taken from the journals, web sites and books. When all criteria, information and data had been finalized, the development stage will start.

3.1.3 RAD

In this phase, design, develop, test and user review must be done frequently before finish the final system. The development of the whole system is dividing into multiple milestones. For this system, each milestone is based on the user input to calculate certain result before get the main output for the system. For example, to get output about types of exercise, the system needs to know user's BMI and body condition. First, we need to design and develop the algorithm to calculate BMI based on user input which is height and weight. When finish development, the result is test and get the user review. Next, same step is done to calculate the suitable exercise for the user. Both result then combine, recalculate using difference algorithm and get the main output of the system.

The development of this application was consists of many version based on the milestone. Every time the milestone was reached, the new version will be out. The first version of the application was deployed when the interface design was finish and the basic flow (without intelligent algorithm) was developed.
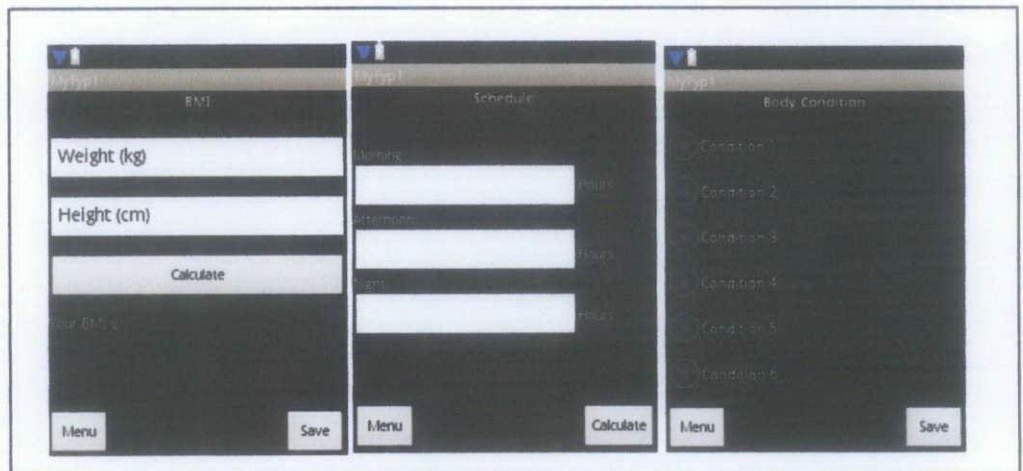

Figure 4: Version 1.0 of the application

Second version was deployed when the algorithm and interface to get the first inputs needed by the system was developed. User can enter their weight and height, and the system will calculate the BMI of the user using this second version. Then the system will determine either the user is underweight, normal weight or overweight.
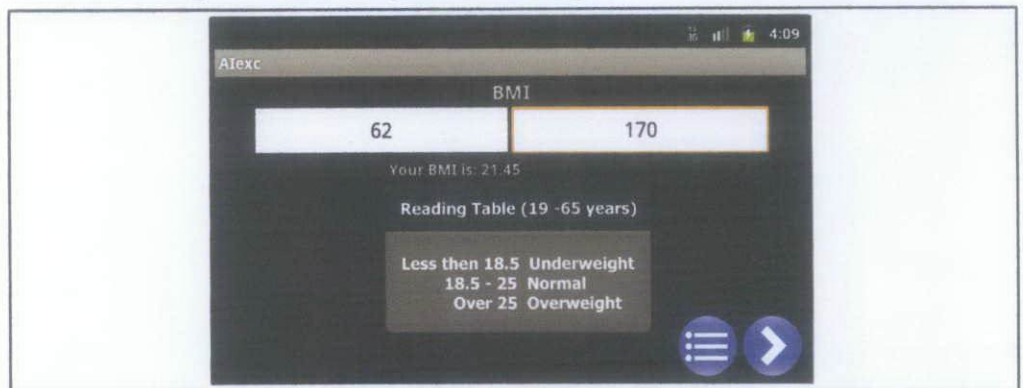

Figure 5: Version 2.0 of the application

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Third version of the application was deployed when the interface and the algorithm on the user's body condition was finished. In this version, user can choose the current body condition and the system will know what is the user's body condition and what exercise in the database that suitable for the user.

Figure 6: Version 3.0 of the application

Then, the forth version was deployed when the interface and the algorithm of the user's working hour was finish developed. The system will determine when to exercise (morning, afternoon or evening) and between how many hour(s) user can exercise.
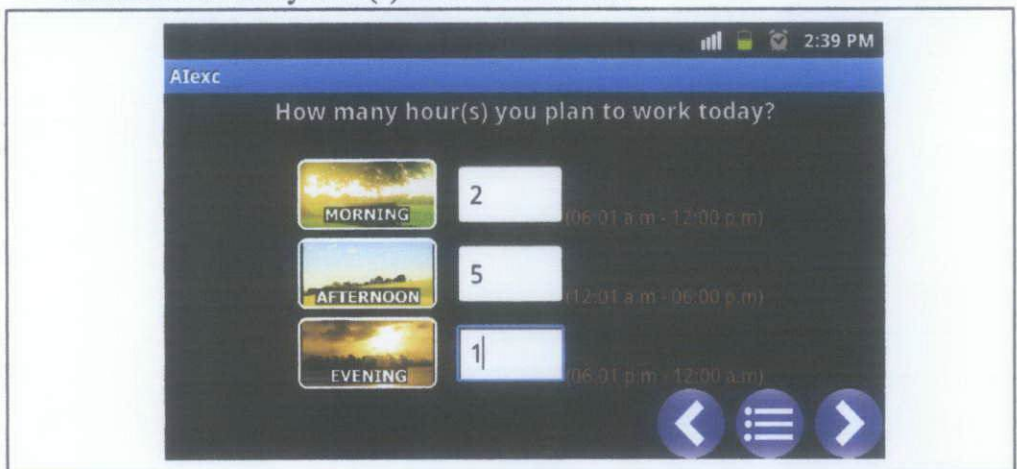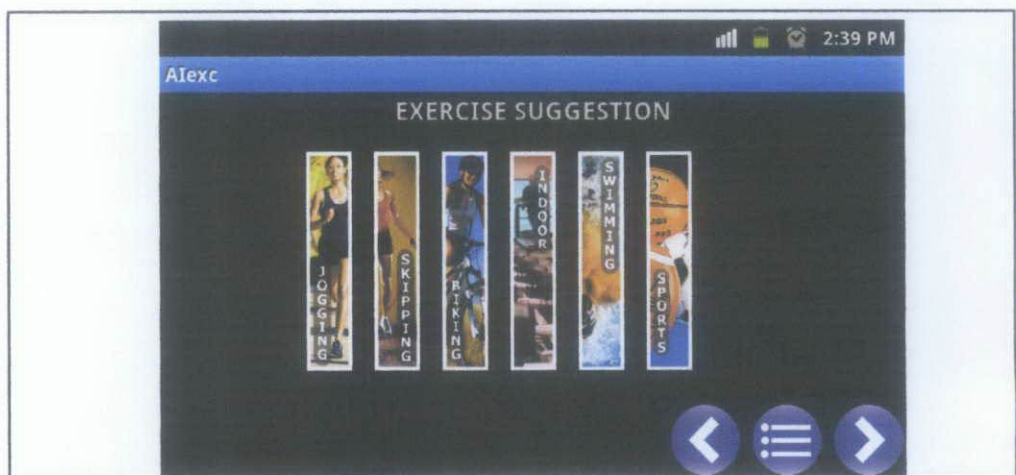

Figure 7: Version 4.0 of the application

The last version of the system was deployed when the interface and intelligent algorithm to determine the suitable exercise for the user based on the user's input (BMI, body condition and working hour(s)) was developed. The intelligent algorithm which is the rule-based algorithm was applied in the system in order to make the system intelligent (will be describe more in result and discussion section). This application will provide several suggestion of the exercise, determine when the user can exercise, between how many hour user can exercise, and some info about the exercise.

Figure 8: Version 5.0 of the application

3.1.4 Deploy

Last stage of development process is deployment. When the prototype is tested by the user, and users satisfy with the result, the application will be deployed to the actual environment and can be used by the actual user. Every version of the prototype will be tested and will be redeveloped if the user is not satisfy with the current version result.
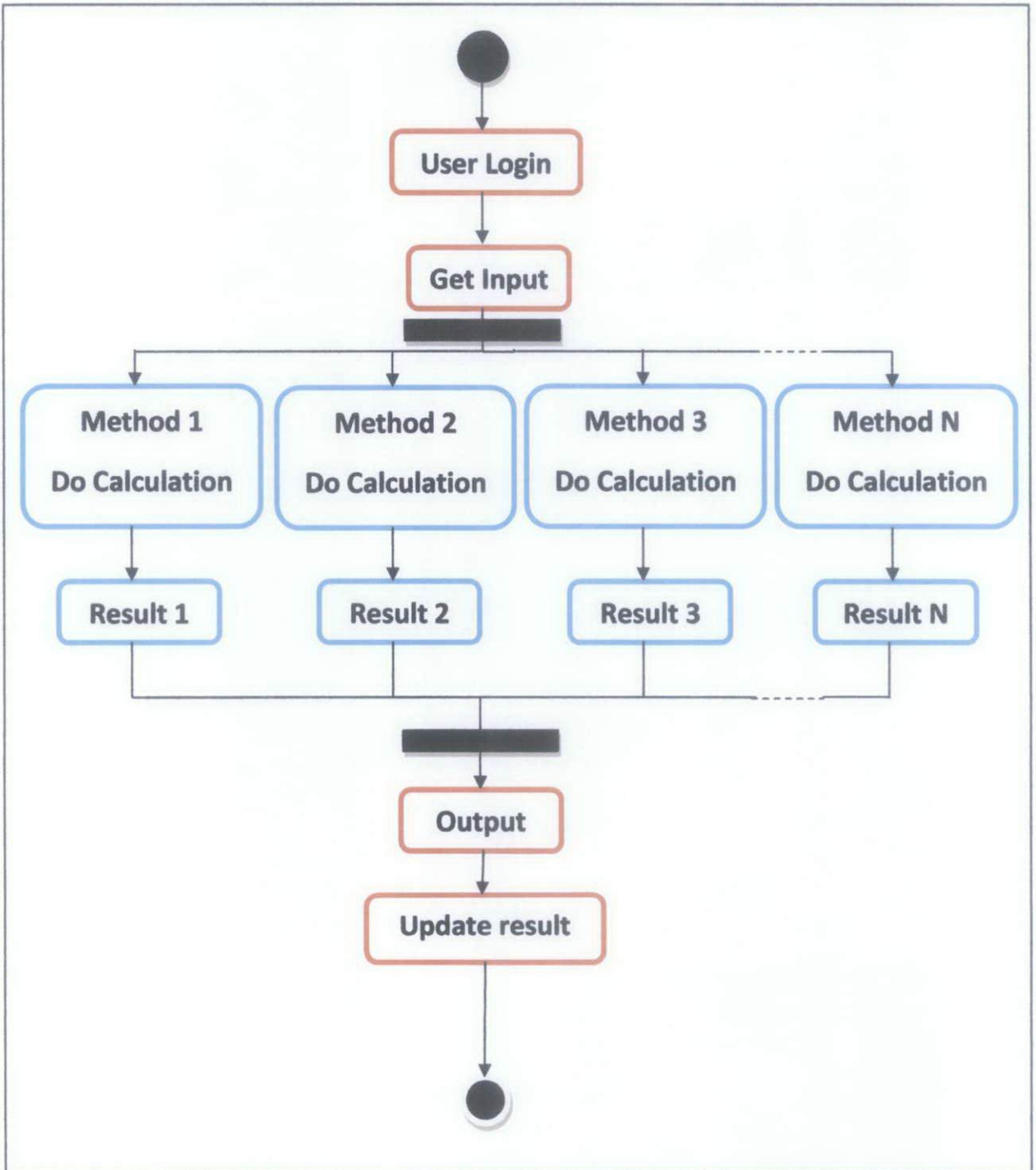
3.2 Activity diagram for the system

Figure 9: Activity diagram

Activity diagram above is the basic idea on how Healthy Lifestyle Management System will work. When user login to the system, the system will get input from the user. The inputs are the height, weight, body condition and user's daily working hour(s).

When the system gets all the input entered by the user, system will split each input to different method. Each method has different work or calculation. Method will calculate based on the input it gets to produce the result. All method does calculation at the same time. Purpose to make all method to do calculation at the same time is to reduce the time usage of the system to produce the result to the user.

Each result produced by each method will be combined and the main output will be produced. The output produce by the system is the suitable time for the user to do exercise and the types of exercise suitable for the user. The system then will update the result.

3.3 Tools

In order to make this project success, certain equipment was needed along the development process. Developing an android application required several software and hardware. Most of the main tools that used along this project development are used in the RAD process.

3.3.1 <u>System Development</u>

The first software use to develop this android application is eclipse. Eclipse is the open source software that uses to develop the android application. By using the java for android development, eclipse can help the programmer to develop the system and design the layout or interface of the application (using xml).
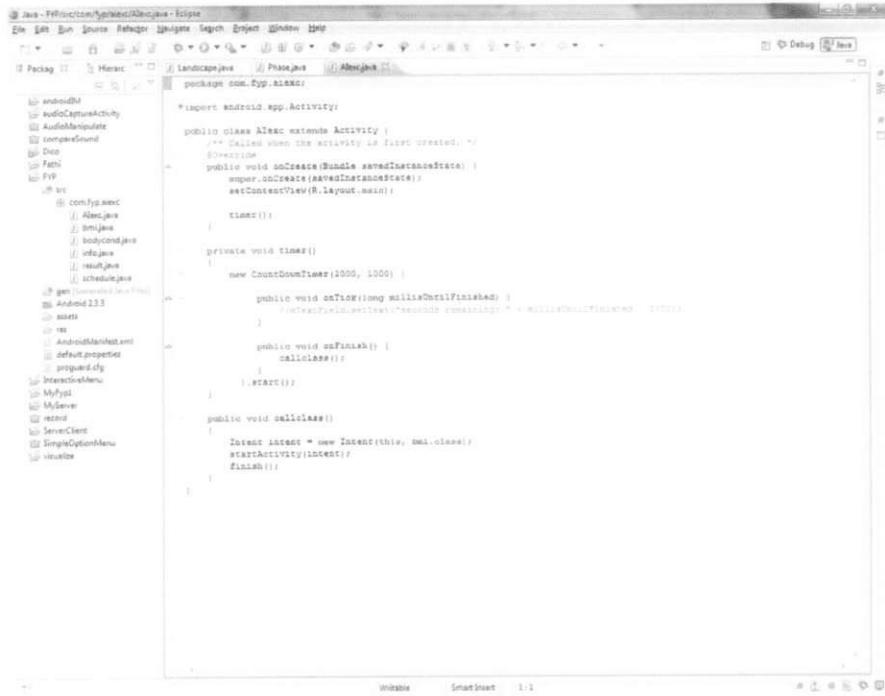
Figure 10: Eclipse use to develop the system

Along the development process, android phone is needed to perform the testing process. The android phone used in developing this application is using 2.3.3 SDK version (Gingerbread) or in other words, using the Gengerbread operating system of android. That mean, the development in eclipse will be setting to the 2.3.3 SDK version.

3.3.2 Interface design

The interface development was referred to many android application that is having the good interface design and easy to understand by the users. Software used to develop this android application are Adobe Illustrator and Adobe Photoshop. The interfaces that need to be design are the buttons for the application and some graphic picture to help user understand. Most of the button are design by using the symbol that easy for the user to understand and make the application look more simple.
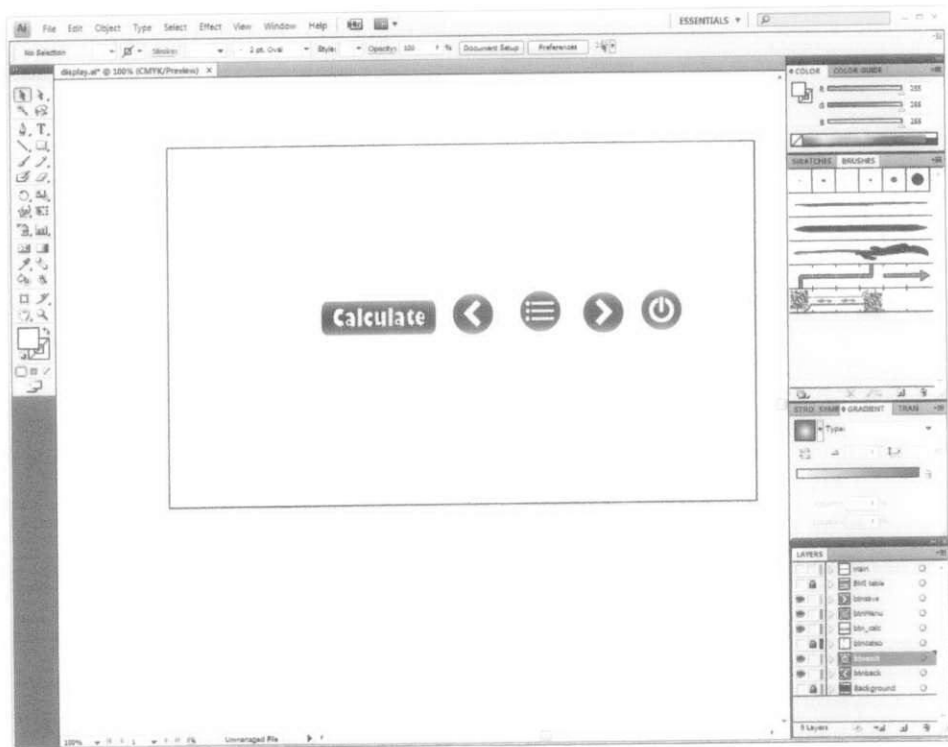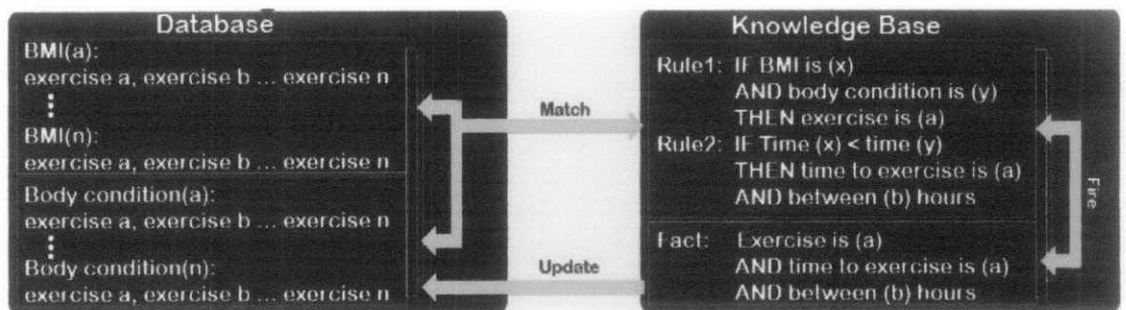

Figure 11: Adobe Illustrator use to design the interface

CHAPTER 4

RESULT AND DISCUSSION

4.1   Intelligent Algorithm

Rule-Based Algorithm

Figure 11: Rule-based algorithm

Healthy Lifestyle Management System will use rule-based algorithm to make the system intelligent. Rule-based algorithm has two main parts in the system which is database part and knowledge base. Database is consisting of the raw data and the knowledge base is where the system calculates the result. Each data inside the database will be compared and the result that matches using the rule inside the knowledge base will fire the final result. The result then will be updated into the database to make sure if the same data is compared again, the system don't have to do the calculation but just take the stored result.

By implementing this algorithm inside this system, the database side will store the data about the exercise that can be done based on the BMI and Body Condition. For example, for the table BMI, user that underweight can do several lists of exercises. Then for table body condition, user who is stress can do several lists of exercises.

Then using the algorithm, the system will match the data inside the database based on the user's input. For example, if the user is underweight and user choose stress in the body condition page, the algorithm will look at the database from table BMI and Body Condition which exercises is match for the underweight and stress user. Then the result will be calculated based on the rule inside the knowledge base.

Inside the knowledge base, the system has 2 rules. First rule is to determine what exercise is suitable and another one is to determine when and how long to exercise. These two rules will be combined and fired the result. Result that had been fired will be updated into the database so in the future, if the same input (underweight, stress and same value of working hour) is inserted by the user, the system will not doing the calculation but just getting the data from the database as the result.

<u>Example rule-based algorithm for BMI</u>

IF   Underweight

THEN   Indoor exercise (Squats, bench press, dead-lift, weight lifting, military press, pulls - ups, push-ups)

OR   Walking

OR   Biking

OR   Swimming

AND   Three to five times a week and reachable goals for duration

AND   Exercise at a moderate to brisk pace

Example rule-based algorithm for Body Condition

IF   Asthma

THEN   Play sport

OR   Swimming

OR   Biking

OR   Walking

AND   Sports that have intermittent periods of exertion

Example rule-based algorithm for Working Hour

IF   (Morning > Afternoon & Morning > Evening & Afternoon >
            Evening)

THEN   Exercise = "Evening"

AND   Maximum exercise hours = 6 – Evening

4. 2 Research about exercises

Flexibility Exercise

Flexibility exercise is the exercise that targets all the major muscle groups.
Stretching is one of the major types of flexibility exercise. Stretching should
form a fundamental part of any exercise program. Before we start the main
exercise program, we should do the flexibility exercise first because this exercise
can protect us from the injury and reduce the muscle tears. There are many types
of stretches. Many coaches now favor dynamic stretches over static stretches as
part of the warm up.

Benefits of flexibility exercise:

By doing the flexibility exercise, we can enhance movement around the court or field with greater ease and dexterity. Some other benefits may include an increase in body awareness and a promotion of relaxation in the muscle groups stretched - both of which may have positive implications for skill acquisition and performance.

Types of stretching:

- Dynamic flexibility -- the ability to perform dynamic movements within the full range of motion in the joint. Common examples include twisting from side to side or kicking an imaginary ball. Dynamic flexibility is generally more sport-specific than other forms of mobility.
- Static Active flexibility -- this refers to the ability to stretch an antagonist muscle using only the tension in the agonist muscle. An example is holding one leg out in front of you as high as possible. The hamstring (antagonist) is being stretched while the quadriceps and hip flexors (agonists) are holding the leg up.
- Static Passive flexibility -- the ability to hold a stretch using body weight or some other external force. Using the example above, holding your leg out in front of you and resting it on a chair. The quadriceps is not required to hold the extended position.

<u>Aerobic exercise</u>

Aerobic exercise is the activity that you can sustain for more than just a few minutes while your heart, lungs, and muscles work overtime. By doing the regular aerobic exercise, the body will get better at using oxygen and burning fat.

Example of aerobic exercise:

Dancing, swimming, water aerobics, biking, walking, hiking, climbing steps (two at a time for a more vigorous workout), low-impact dance classes, kick-boxing, all the cardio machines at the gum (treadmill, elliptical, bike, rower, x-c skiing, stair-climber), and many other activities are all examples of types of aerobic or cardio activities

Benefits of aerobic exercise:

- Reduction the risk of developing the colon cancer breast cancer and lung cancer.
- Perform aerobic exercise five days a week, for 30-35 minutes for six week reduce fatigue in woman being treated for cancer.
- Exercise may increase bone density or at least slow the rate of decrease in both men and women.
- Active children have greater bone density than sedentary children and that this may help prevent fractures later in life.
- Reduce the depression.
- It was a study of more than 3,000 individuals at high risk for diabetes who lost 12-15 pounds and walked 150 minutes per week (five 30-minute walks per day) for three years. They reduced their risk of diabetes by 58%.
- Prevent the heart disease.
- Obesity and weight control

Anaerobic exercise

Anaerobic exercise is the exercise without oxygen. Anaerobic exercise refers to anaerobic muscle respiration and not respiration as a whole. The muscle still receives oxygen, just an insufficient supply to meet the demands of the activity.

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Examples of anaerobic exercise:

Football, Basketball, Rugby, Hockey and Soccer are all examples of anaerobic sports. An anaerobic sport is anything activity requiring brief spurts of high intensity activity.

Benefits of anaerobic exercise:

- Anaerobic exercise helps prevent cardiovascular disease, obesity, low back pain, arthritis, type 2 diabetes and certain types of cancer.
- Builds and maintains lean muscle mass.
- Increases bone strength and density.
- Reduces body fat
- Reshapes the body and improves appearance.
- Build muscle to protect joints.
- increase your energy and be healthy
- Increases Sports Performance
- Lowers Blood Sugar
- Recaptures Youth
- Improves Your Appearance

4. 3   Research about BMI

Underweight (18.5 or less)

Exercise type:

1. Indoor exercise (Squats, bench press, dead-lift, weight lifting, military press, pulls-ups, push ups)
2. Walking or biking at a moderate to brisk pace
3. Recreational swimming
4. **Playing team sports that don't require a lot of running (such as volleyball or baseball on a large team)**

Exercise information:

1. Avoid exercise that will cause you to burn a high number of calories.
2. Focus on exercise that builds muscle.
3. Do compounding exercise (exercise that focus on more than one isolated movement) to build muscle.
4. You want the weight you gain to be muscle, rather than just fat. Increasing your caloric intake alone can help you increase body fat, but what you want is an even distribution of healthy fat and mostly muscle, and weight lifting and other strength training exercises can help you achieve this.
5. Start by setting easily reachable goals, then slowly work up to doing longer and harder repetitions. Aim to exercise three to five times a week to set a routine and improve chances of reaching your goals.

Normal weight (18.5 - 25)

Exercise type:

1. Jumping rope (Speed jump, Crossovers and Double Jumps)
2. Weight lifting (5 to 10 minutes)
3. Swimming
4. Bicycling, indoors and out

Exercise information:

1. Do aerobic exercise at least three times a week for a minimum of 20 minutes.
2. Improve fitness with obtainable goal.
3. Get cardiovascular exercise

Overweight or Obese (25 and above)

Exercise type:

1. Sit down exercise (raises, leg lifts, and bends and leans)
2. swimming and pool fitness
3. Walking

Exercise information:

1. For those who are severely overweight, their bodies are already stressed, their blood pressure is already raised, they are already fatigued, their joints already strained
2. Gym represents a safe, controlled environment; even budget gyms have quality equipment designed with heavy people in mind
3. Do the exercise that can reduce the chances of injury and serious strain.

4. 30 minutes every day for walking exercise by maintaining the four mile per hour speed. These can help to burn fat.

5. Start slowly. Pushing yourself to reach unrealistic goals can set you up for failure.

6. Plan your week based on the amount of exercise you can realistically complete

7. Find places to exercise where you won't see people you know, if you are embarrassed about your size.

4. 4   Research about Body Condition

List of desease:

1. Osteoporosis (thinning of bone tissue and loss of bone density over time)
2. Arthritis (inflammation of one or more joints)
3. Asthma
4. Hypertension
5. Gastric
6. Fever
7. Stress

Osteoporosis:

Exercise type:

1. Running, jumping or skipping
2. Walking or jogging
3. Dancing
4. Tennis, netball or volleyball
5. Lifting weights

Exercise information:

1. Short, intense bursts of exercise (e.g. 15 minutes lifting weights or very brisk walking).

2. 2 short exercise sessions (20 minutes) separated by 8 hours is better for bone, than one long session

3. Start slowly and progress gradually

4. Activities that promote muscle strength, balance and co-ordination, help to prevent falls. Pilates, gentle yoga and Tai Chi are all good activities to help prevent falls.

Asthma:

Exercise type:

1. Activities that involve short, intermittent periods of exertion (volleyball, gymnastics and baseball)

2. Swimming, which is a strong endurance sport, is generally well tolerated

3. Outdoor and indoor biking, aerobics, walking, or running on a treadmill.

Exercise information:

1. Four to five times per week for at least 30 minutes.

2. If begin to experience asthma symptoms during exercise, stop and repeat pre-exercise inhaled medication (quick relief medication like albuterol). If symptoms completely go away, may restart the exercise. If symptoms return, stop the activity, repeat quick relief medication and call health care provider for further advice.

Hypertension:

Exercise type:

1. Endurance activities (walking, swimming, cycling and low-impact aerobics)
2. Stretching or the slow lengthening of the muscles
3. Cardiovascular or aerobic exercise (jogging, jumping rope, bicycling)
4. Strengthening exercises (weight lifting)

Exercise information:

1. Exercises that include an intense isometric component that can cause extreme and adverse fluctuations in blood pressure should be avoided.
2. Exercise five to six times per week depending on initial fitness level.
3. Duration should be in the range of 30 to 60 minutes per session
4. People with lower levels of fitness should start with shorter durations.

Fever:

Exercise type:

1. Stop exercising altogether if you have a fever with aching muscles
2. If decide to take a walk or go for a swim, keep workout brief and don't overexert.

Exercise information:

1. During exercise, heart has to pump blood to muscles to supply them with oxygen. It also must pump blood from muscles to skin where the heat is dissipated. When a fever, heart have has to work harder to get rid of extra heat.
2. Exercise can increase body temperature.

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<u>Stress:</u>

Exercise type:

1. Any form of exercise, from aerobics to weightlifting, can act as a stress reliever.

Exercise information:

1. Regular exercise can increase self-confidence and lower the symptoms associated with mild depression and anxiety. Exercise also can improve your sleep, which is often disrupted by stress, depression and anxiety.

4.5   Research about Working Hour

<u>Morning</u>:

1. Raised heart rate and metabolism to burn more calories.

2. Improve mental acuity.

3. Air pollution is lowest.

<u>Noon:</u>

1. Exercise at lunch and break time.

2. Body temperature and hormone levels are higher than first thing in morning.
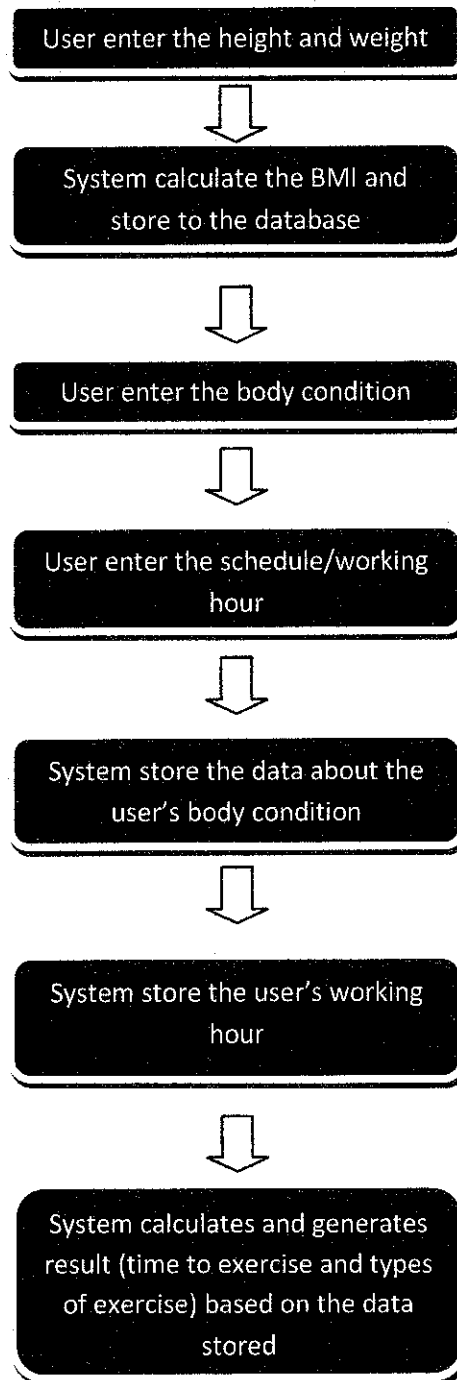
3. Improves blood flow to the brain.

Afternoon:

1. Best time to exercise both endurance and building muscle.

2. Body temperature and hormone level peak at 6 p.m.

3. Muscles are warm and flexible.

Evening:

1. Muscles are warm and flexible.

2. Perceived exertion is low.

3. Stress relief after a day at work.

4.6   System flow


Figure 12: System flow

Based on the research that had been done, all the data about the BMI, body condition and working hour will be stored to the system as the knowledge. This data will become the input for the system to calculate the final result which is exercise suggestion, time to do exercise and how long for the user to do exercise. The algorithm is designed before implementing the algorithm inside the system. With all the collected data, the system flow is designed.

4.7 Prototype Overview

By following the system flow, prototype was developed. This prototype was developed by using the idea of implementing the rule-based algorithm in this system. there are several step for the user to key in the input before the system generate the output/result.

First, user need to enter the weight and height. System will calculate the user's BMI and determine either user is underweight, normal or overweight. When the BMI was calculated, the result will be hold by the system and user will redirect to the second page which is to enter the user's current body condition.

When the user had chosen the body condition, system will redirect user to the next page where the user need to enter the working hour. There are 3 columns of data to be inserted based on morning, afternoon and evening. When user clicked at the "next" button, the system will produce the output about the suggestion exercise. If user clicks at one of the exercise, extra information will be show to the user.
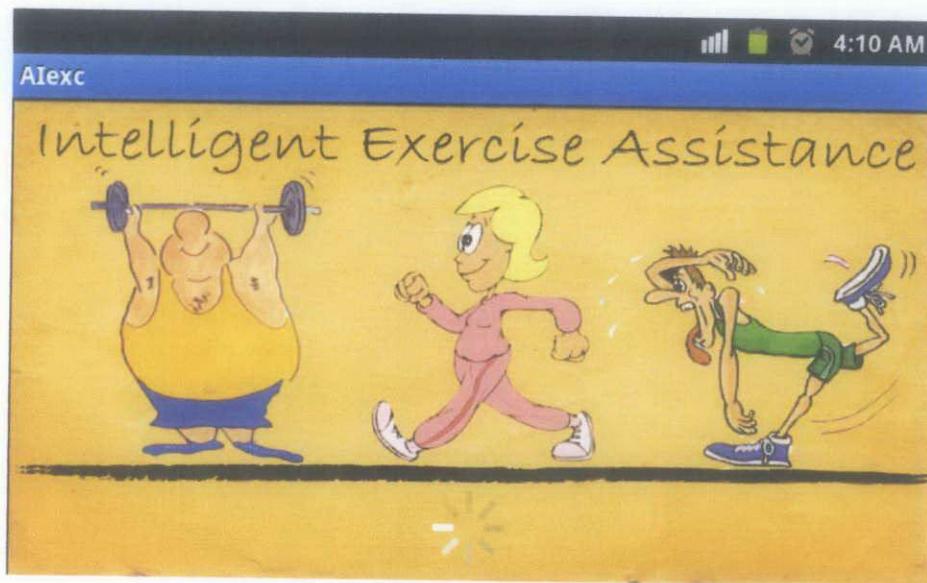
To be clearer on how this intelligent system work one scenario of the user condition can be used. For example, if user weight is 62 Kg, and his height is 172 Cm, the system auto will calculate the input and produce the output which is the BMI. For this case, the BMI is 20.96 which is normal weight. When user clicked "next" button, the value of BMI will be pass to the next class (page) which is body condition page.
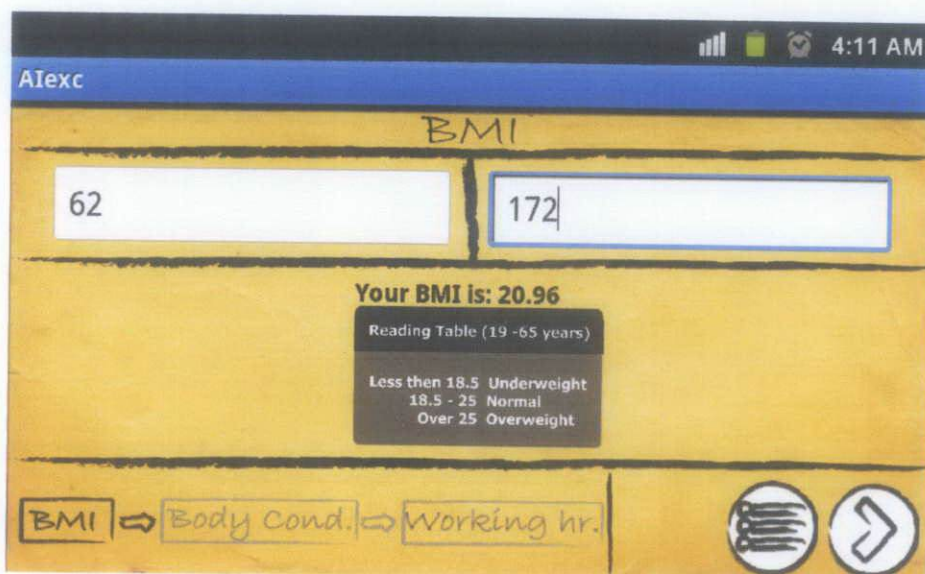

In "body condition" page, user can choose what is their condition either good, stress, fever and others. After user click at one of the condition, the system will redirect to

other class (page) which is "working hour" class. At the same time, the system will pass the value of user's BMI and body condition. From the earlier example, the user BMI is normal weight and user choose stress as his body condition. So the system will pass the BMI which is normal weight and the body condition is stress to the next class.
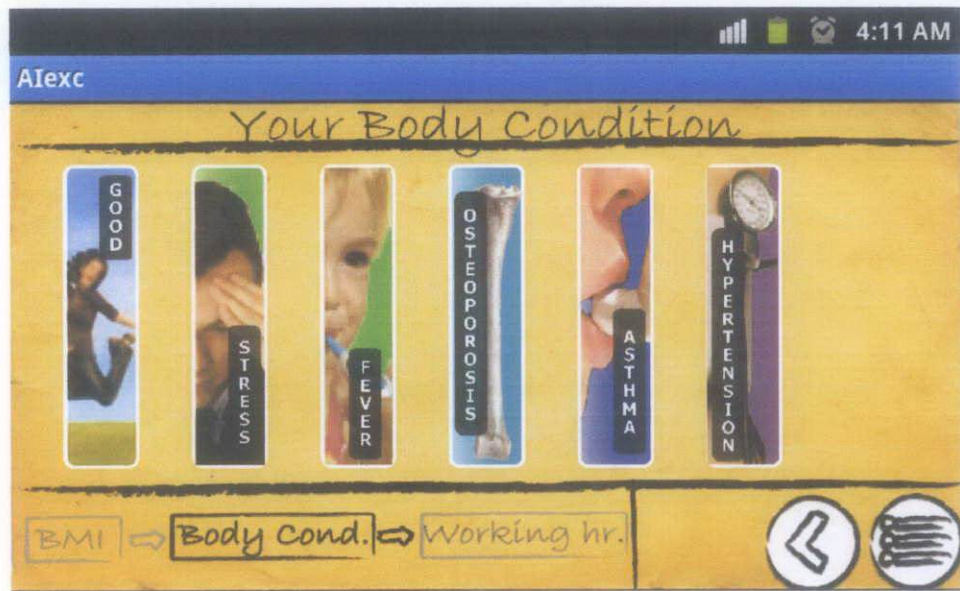
In the "working hour" page, user needs to enter the working duration or the class duration for morning, afternoon and evening. Purpose to enter this input is, to calculate the suitable time for user to exercise. For example, if user having 3 hours class at morning, 5 hours at afternoon and 1 hour at evening, the system will auto calculate what time is suitable for the user to do exercise, and between how many hour(s) during that free time to do exercise. Then the system will pass the BMI which is Normal, the body condition which is stress and the suitable time and duration to the next class (page) which is "exercise suggestion" class (page).
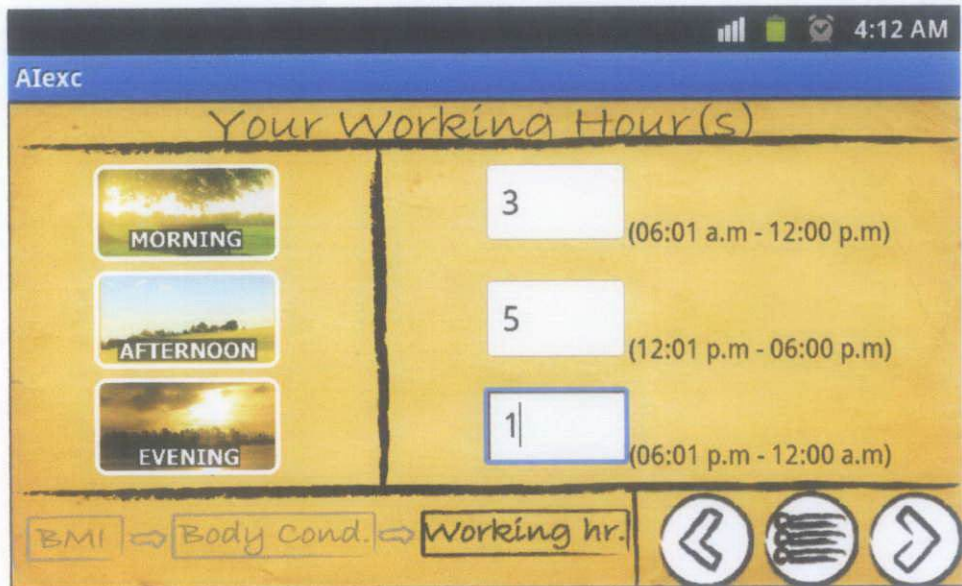
Before the system enter the "exercise suggestion" page, the system will calculate the result (types of exercise, time to exercise and between how many hour(s) to exercise) using rule-based algorithm. For example, system will look at the data about what types of exercise are suitable for normal weight, suitable exercise for stress and compare two of these data. The exercises that match will become the suitable types of exercise for the user. This page will show the list of exercises for the user.
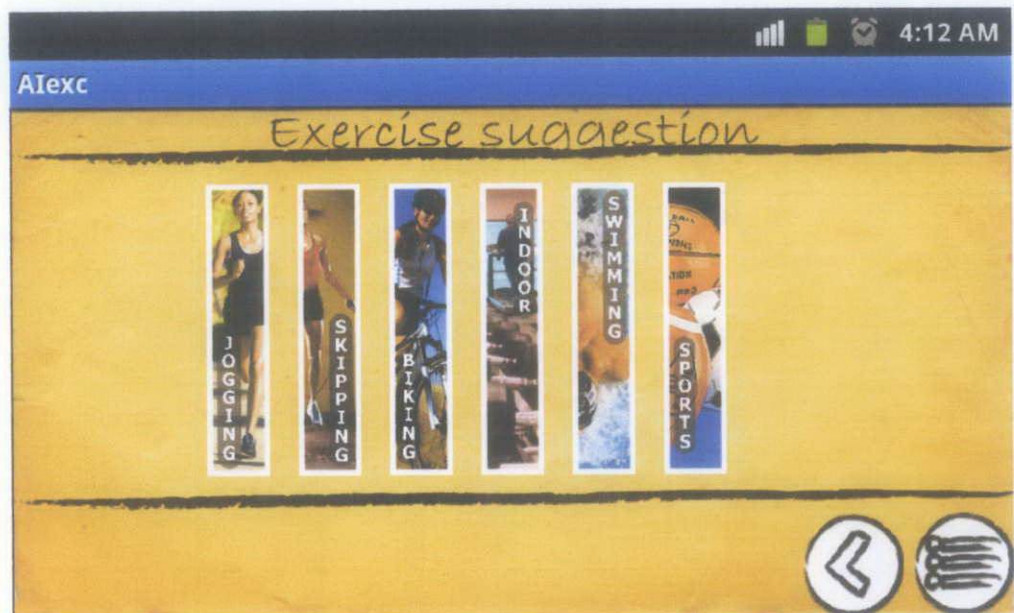
When user click at the one of the exercise button, system will redirect user to the "info" page where user can know what is his body condition, the body condition, types of exercise, time to exercise, between how many hour(s) free time to exercise and info about the exercise that the user choose. The if the user click at "next" button, the page that show the weekly exercise schedule for the user will appear.
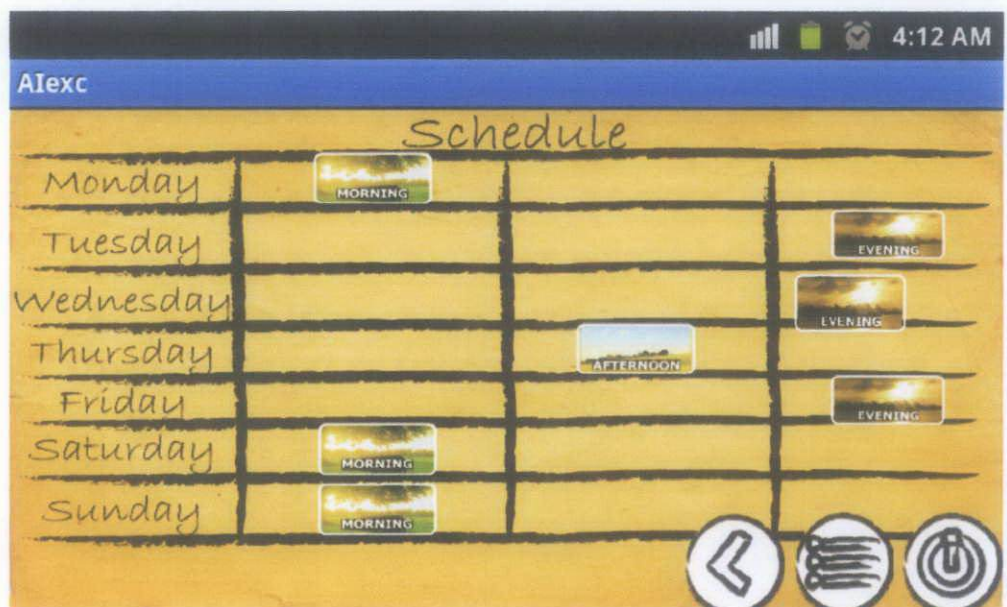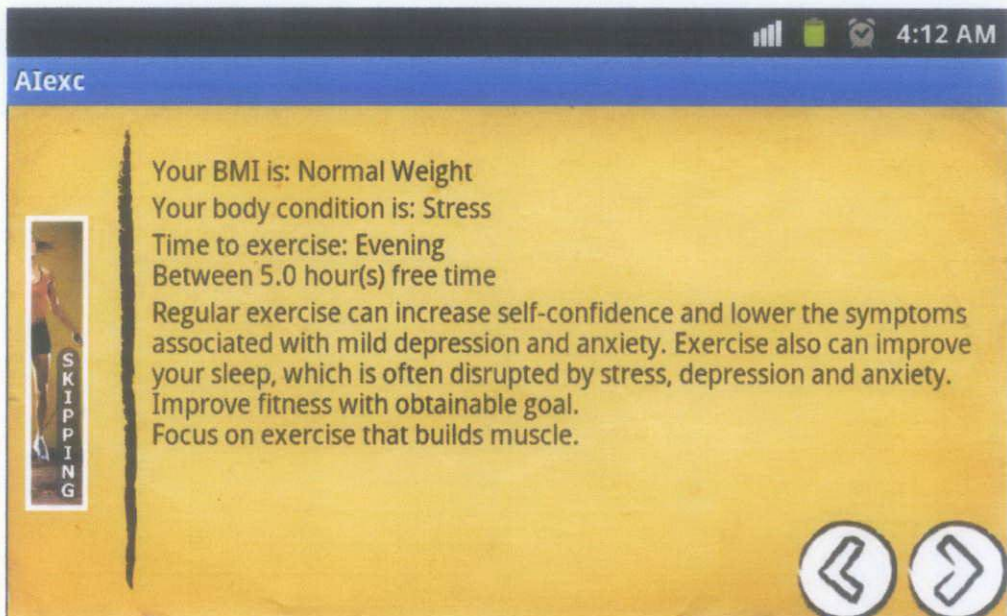
CHAPTER 5
CONCLUSION

This project highlights the intelligent software call Healthy Lifestyle Management System that will focus on the user among the university student. This software is capable to generate three main outputs which are:

a) Suitable time for exercise

b) Duration for exercise

c) Types of exercise

There are many inputs that will be considered in order to generate the schedule and types of exercise. The system need to know the age of the user, the user schedule, user's body condition, BMI and others. This input will be get either from the user or from the agent inside the system.

The most important part of this project is to develop the algorithm for each agent/method. To make this system is intelligent; AI is implementing into these system. The interface design and the architecture of this system must be strong to make sure this system can be operating without or with less error.

By implementing the RAD methodology, this project will produce many prototypes and each time the prototype finish will be demonstrate to the users and get feedback from the users.

This application can be enhance in the future by providing more data about exercise inside the database, more body condition to be choose by the user and more effective information for the user to gain knowledge about the exercise and healthy lifestyle.

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APPENDICES

Apendix 1: Code to calculate BMI and to determine either the user is underweight, normal or overweight:

```java
//function to calculate the bmi
public void calculate()
{
    try
    {
        EditText h = (EditText) (findViewById(R.id.txtHeight));
        EditText w = (EditText) (findViewById(R.id.txtWeight));
        double height = Double.parseDouble(h.getText().toString());
        double weight = Double.parseDouble(w.getText().toString());
        height = height/100;
        BMI = weight / (height * height) ;

        //limit to 2 decimal point only.
        BMI = (double) Math.round(BMI*100)/100;

        TextView result = (TextView) (findViewById(R.id.txtBmi));
        result.setText("Your BMI is: " + BMI);

        Log.d("Get weight and height","weight = " + weight +" Height= " + height + " BMI = " + BMI);
        checkcond(BMI);

    }
    catch(Exception e)
    {
        Toast.makeText(getApplicationContext(), e.getMessage(), Toast.LENGTH_LONG).show();
    }
}

//function to declare the bmi condition of the user (overweight, normal or underweight)
public void checkcond(double bmi)
{
    if (bmi < 18.5)
    {
        bmiCondition = "Underweight";
        ((TextView)findViewById(R.id.txtBmi)).setVisibility(1);
        ((ImageView)findViewById(R.id.btnBmiSave)).setVisibility(1);
        ((ImageView)findViewById(R.id.imgtblebmi)).setVisibility(1);
        ((ImageView)findViewById(R.id.btnCalc)).setVisibility(View.GONE);
    }
    else if (bmi >= 18.5 && bmi < 25)
    {
        bmiCondition = "Normal Weight";
        ((TextView)findViewById(R.id.txtBmi)).setVisibility(1);
        ((ImageView)findViewById(R.id.btnBmiSave)).setVisibility(1);
        ((ImageView)findViewById(R.id.imgtblebmi)).setVisibility(1);
        ((ImageView)findViewById(R.id.btnCalc)).setVisibility(View.GONE);
    }
    else if (bmi >= 25)
    {
        bmiCondition = "Overweight";
        ((TextView)findViewById(R.id.txtBmi)).setVisibility(1);
        ((ImageView)findViewById(R.id.btnBmiSave)).setVisibility(1);
        ((ImageView)findViewById(R.id.imgtblebmi)).setVisibility(1);
        ((ImageView)findViewById(R.id.btnCalc)).setVisibility(View.GONE);
    }
    Log.d("Get Condition" , bmiCondition);
}
```
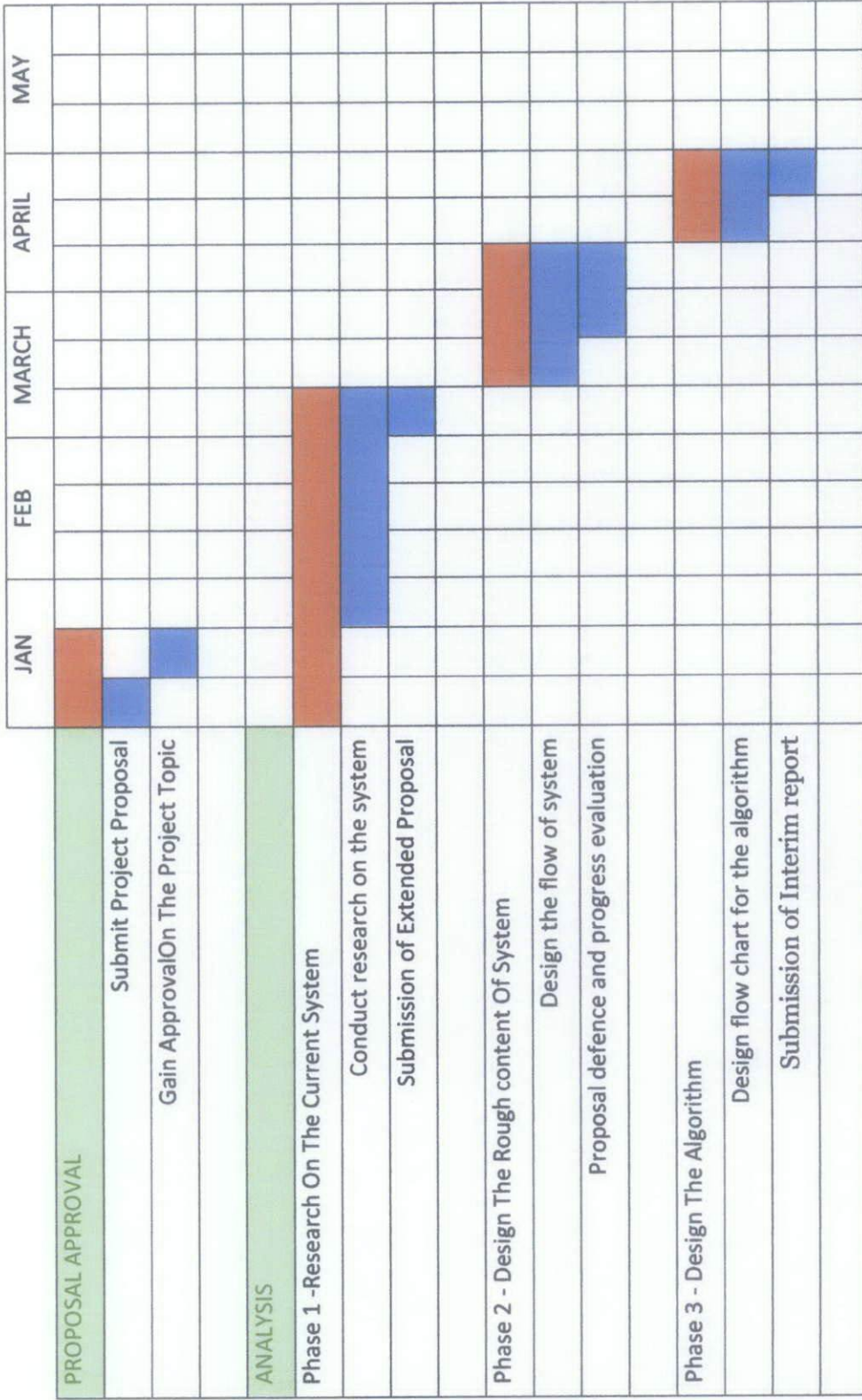
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Apendix 2: Code to calculate suitable time and duration to do exercise:

```java
//function to calculate the sitable time for exercise
  public void calculate()
  {
      try
      {
          if (morn > noon && morn > evn && noon > evn){
              exc = "Evening";
              hrs = 6 - evn;
          }
          else if (morn > noon && morn > evn && evn > noon){
              exc = "Afternoon";
              hrs = 6 - noon;
          }
          else if (noon > morn && noon > evn && morn > evn){
              exc = "Evening";
              hrs = 6 - evn;
          }
          else if (noon > morn && noon > evn && evn > morn){
              exc = "Morning";
              hrs = 6 - morn;
          }
          else if (evn > morn && evn > noon && morn > noon){
              exc = "Afternoon";
              hrs = 6 - noon;
          }
          else if (evn > morn && evn > noon && noon > morn){
              exc = "Morning";
              hrs = 6 - morn;
          }
          else if (morn == noon && noon > evn){
              exc = "Evening";
              hrs = 6 - evn;
          }
          else if (morn == noon && evn > noon){
              exc = "Morning";
              hrs = 6 - morn;
          }
          else if (morn == evn && evn > noon){
              exc = "Afternoon";
              hrs = 6 - noon;
          }
          else if (morn == evn && noon > evn){
              exc = "Evening";
              hrs = 6 - evn;
          }
```

Apendix 3 : Gantt Chart on Final Year Project 1

Apendix 4 : Gantt Chart on Final Year Project 2

No	Activities	September		October				November				December			
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
1	Presentation and Interview with selected parties	■	■	■	■	■	■								
2	Progress Report							■							
3	Programming and Prototyping							■	■	■	■				
4	Pre-EDX											■			
5	Dissertation												■		
6	Viva Presentation													■	
7	Final Dissertation														■
8	Submit Technical Report														

■ Done	■ Progressing	■ To be done

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