GPS-INTEGRATED MOBILE GAME ON HEALTHY LIFESTYLE

CHONG SING KHUAN

BORANG PENGESAHAN STATUS TESIS*

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Chong
(TANDATANGAN PENULIS)

(TANDATANGAN PENYELIA)

Alamat tetap: 411, Kuala Kuang,
31200 Chemor, Perak.

Nama Penyelia:
En Wan Sazli Nasaruddin
Bin Saifudin

Tarikh: 24 - 8 - 2016

Tarikh: 24/8/16

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GPS-INTEGRATED MOBILE GAME ON HEALTHY LIFESTYLE

CHONG SING KHUAN

This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Interactive Media)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2016

DECLARATION

I hereby declare that this project report entitled

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is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : Chong Date: 24-8-2016
(CHONG SING KHUAN)

I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Interactive Media) With Honours.

SUPERVISOR : Date: 24/8/16
(EN WAN SAZLI NASARUDDIN BIN SAIFUDIN)

DEDICATION

This project is dedicated to my beloved parents and family members and my supervisor. Thanks for giving support to me along the project development. I would also like to dedicate special thanks to my supervisor who guides me along the development of this final year project, En Wan Sazli Nasaruddin Bin Saifudin (UTeM).

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First and foremost, I want to express my sincere gratitude to my supervisor, En Wan Sazli Nasaruddin Bin Saifudin for providing me a lot of guidance and encouragement to complete this final year project. I get lots of useful information from every meeting. Thank you for being a so dedicated supervisor to help me along the development of this project.

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Lastly, I would like to thank my beloved family members, friends and relatives who motivated me whenever I encountered difficulties and felt upset. Their endless love and cares are no doubt be my mentally support to complete this final year project. The completion of this final year project may not possible without the involvement and guidance of so many people. Thank you so much.

ABSTRACT

GPS-Integrated Mobile Game on Healthy Lifestyle is a game concept is to integrate GPS technology in a casual runner game. Physical movement is one part of the gameplay in this game. Player is encouraged to move as much as they want in order to get score for each meter they walk. For the runner game, player has to maintain their caloric level by eating balanced diet.

This game is developed using Unity3D game engine and it consists a function that capture the location of the player (longitude and latitude) using GPS technology embedded in mobile devices. For the game environment, landmarks and buildings are modelled as the game objects to simulate the places in Malacca. All of the game objects are modelled by using Autodesk Maya 2015.

The game consists of 3 levels which player can skip to next level after reaching the end point. At the end of the each level, player is given a special mission which is walk to gain score. Player can choose to walk, skip using coins, and skip by deduction of score or else game is over. High score will be recorded as the achievement of the player.

ABSTRAK

Permianan mudah alih yang diintegrasikan dengan teknologi GPS berkaitan gaya hidup sihat ini membawa konsep yang ingin mengintegrasikan teknologi GPS dalam satu permainan mudah alih bergenre kasual. Pergerakan secara fizikal merupakan salah satu bahagian dalam permainan mudah alih ini. Pemain digalakkan berjalan sebanyak mungkin untuk mendapat skor ektra bagi setiap meter yang dicapai. Dalam dunia permainan, pemain mesti memastikan kadar kalori tidak melebihi tahap yang dihadkan dengan mengambil makanan yang seimbang.

Permainan ini dibanguankan dengan menggunakan applikasi yang bernama Unity3D. Permainan ini mengandungi fungsi yang mampu menangkap lokasi pemain berdasarkan latitud dan longitud dengan bantuan teknologi GPS yang sedia ada dalam peranti mudah alih. Bagi dunia permainan, bangunan ysng terkenal telah dijadikan model sebagai objek yang mensimulasikan tempat-tempat di Melaka. Semua objek ini dihasilkan melalui Autodesk Maya 2015.

Permainan ini mengandungi tiga datar. Pemain akan dibenarkan menukar level setelah melepasi titik akhir datar tersebut. Sebelu menamati datar tersebut, pemain perlu menyelesaikan satu misi khas iaitu pemain perlu berjalan untuk mendapat skor bagi melepasi datar tersebut. Pemain diberi pilihan untuk berjalan, menggunakan koin untuk skip datar atau skip dengan potongan skor ataupun menamatkan permainan. Markah tertinggi akan direkodkan sebagai pencapaian pemain.

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CHAPTER I

INTRODUCTION

1.1 Project Background

Recently, the popularity of mobile game is increased significantly. Based on the research that had done, mobile games player spend most of time on watching television, playing computer game and video game. This phenomenon shows that proposing a mobile game to promote healthy lifestyle is a good solution. But, playing game non-stopping may lead to poor health. Hence, mobile game that promotes healthly lifestyle is proposed to raise the awareness of player which indirectly deals with health-related issues.

The objectives for creating this mobile game are to encourage player to design gameplay that encourage player to has physical movement, to develop location based mobile game application using GPS technology. Besides, this mobile game also intends to measure the effectiveness uses of proposed GPS based mobile game.

This mobile game is created by using the game engine, Unity. This is a leveled runner game. This game implements the feature of GPS on counting the distance that player walked. If player able to clear a level, a special mission is popped out which allows player to gain extra score by physical walking. If player wan to stop, player can continue their runner game, else they may game over. This game will be based on the concept of healty lifestyle especially caloric control.

The expected outcomes are to convince the concept of healthy lifestyle to the player and raise their awareness to take good care of their body by using the mobile games that includes physical movement.

1.2 Problem Statements

Teenagers and young adults nowadays like to play games all day long whenever they have free time. They are lacking of exercise, even walking in daily life which is an unhealthy life style. They are too lazy to move or hardly to leave their eye sight away from mobile devices. They rather spend time on playing games instead of walking around or gaining more health-related knowledge. Besides, people like to consume many unhealthy food which contain high calories without concerning on own calories intake.

Even though many games are developed as the rapid development of mobile game industry, but most of them did not really beneficial to player because they are just for entertainment. Therefore, game that involves physical movement will be an alternative to encourage player to have some low intense exercise and play game at the same time. Game also should be a good media to deliver knowledge like healthy lifestyle to people.

1.3 Objectives

1. To design gameplay that encourage player to has physical movement

2. To develop location based mobile game application using GPS technology

3. To measure user acceptance on proposed GPS based mobile game

1.4 Project Scope

1.4.1 User Scope

The target users for this project are teenagers and young adults. The potential player of this game is set to the age group which consists large group of mobile devices user.

1.4.2 Application/Function Scope

This game is a casual game which is a 3D runner game. The theme of this game will be based on healthy lifestyle, basically deliver the knowledge about calories control. This game application will use GPS (longitude and latitude) to measure the walking distance of player.

1.4.3 Platform scope

The target platform for this mobile game will be iOS.

1.5 Project Significant

Educational game is no doubt a good medium that can deliver the knowledge to player in an effective way. Besides, it is in mobile version which is convenience to the public user. This game is beneficial to all the player who plays it in a proper manner. They can learn many things about healthy lifestyle especially calorie control.

1.6 Conclusion

Game based learning is a growing trend in education sector. When user are actively immersed with a game, their mind can experience the pleasure of playing the game. But, most of the players are addicted on playing games. This situation may lead to poor health due to the lacking of exercise. Since player are immersed in the game world, creating of a mobile game that combines persuasive technology to promote physical activity and healthy lifestyle may able to attract the attention of player.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

Chapter 2 will describe in details about the literature review regarding the game application that uses the approaches of game-based learning and why mobile game platform is chosen. This chapter also discuss about the integration of Global Positioning System (GPS) in game which is the main idea of this project.

Besides, this chapter will describe the methodology that is applied in this project. SCD Model is the methodology that has been selected to develop this project. Gantt chart and milestone for this project is included to describe the activities involve in each phase as a guide for whole development process.

2.2 Area of study

2.2.1 Benefits of game

In this era of digital technology, game is not the only entertainment but a media to deliver knowledge. Games can used to deliver knowledge on different aspects such as healthy lifestyle. Instead of using traditional way such as distribution of brochure, flyer and advertisement on digital media, game can be an interesting way to spread information. Hence, game plays an important role in delivering message to the player.

The use of digital gaming could bring good changes to player's learning considerably. Based on M.Bopp (2006), player may gain new knowledge about how to play. It is one of the purposes to create this project that expected player to learn the habit of controlling calories intake for healthy lifestyle. Besides, M.Bopp (2006) states that since players are expected to have learning abilities, there is growing expectation towards game as interactive environment and hence increase the complexity of game is one of the way to live up the game design. This project is trying to bring forth new idea of adding GPS feature in game development which is used to count the movement of player.

JP Gee (2004) states that game designers are encouraged to merge the knowledgeable elements into game because he believed that game technologies and principles are going to be widely used in different areas. Soon, there will be new markets and new possibilities for game development opened up in society. JP Gee strongly believed that game can bring meaningful experiences to player that potentially make them become smarter and thoughtful. Player can absorb information when they are immersed in the game environment.

People used to think of game is for fun while knowledge is gained through study. Games show this concept is wrong. Many games make use of good storyline or gameplay to impress the player for the purpose of delivering information to. Therefore, game is highly encouraged to be used as the media to deliver knowledge in any sector.

2.2.2 Mobile Game Application

2.2.2.1 Advantages

Currently, most of the people possess a smartphone and even some of them have more than one smart device like tablet and phablet. Due to the fast development of technology, smartphone is often connected to the Internet. This is an opportunity for internet-based application because the audience will be enormous when counting in global scale. As the growing of technology, smart devices become a must-have device but a console or a computer is not. Mobile game will be trend in game industry since the availability to mobile device highly increased.

There are some reasons to cause mobile games preferred by consumer. The easiest reason is the portability of mobile game. People possess a smart device with internet connection can easily download a game and start playing right away. In term of consumer-friendly, mobile game is better than computer game and video game. Downloading mobile game can be done within a minute, but it takes longer time when going out to buy Xbox game. Unlike console game, mobile game can be played anywhere whether you are in a toilet or a bus stop.

Moreover, there are huge collections of games are free-to-play available in different mobile app store. Compared to console game, mobile game is cheaper and not any less good. The categories of mobile game is an attractive point to make consumer stick to it. Many classic game like Game Boy game and cell phone game still can be found in app store. Besides, many new games with attractive interface and gameplay available in app store too.

As a result, people nowadays often treat their mobile device like a gaming device. Mobile devices enable people anytime and anywhere they like. It is no doubt that mobile game will take an important role in future game industry.

2.2.2.2 Platform

The mobile industry has generated a growing wave of games especially casual game. People like to spending time and money to play game on mobile devices. Based on the researches that have been done by Newzoo, a video game research firm, there was big increases of 43% on mobile game revenues in 2013. Newzoo also reports that Apple's App Store accounted about 50% of the revenues in 2014 and remains the biggest single platform in mobile industry while the second is Google's Play Store.

App Store and Play Store enables the developers to publish game easily instead of those closed platforms of Sony, Microsoft or Nintendo. The ecosystem of App Store and Play Store is indirectly encouraging the creation of more creative games. There are also design tools and emulators available such as Android Studio and Xcode for developers to create new game and test before publishing.

Besides, consumers tends to the App Store and Play Store because they can broadly select what to download and spend money on. There are big collections of games in different categories and some of them are free-to-play. Therefore, opened platform like App Store and Play Store is more acceptable for both developers and consumers.

2.2.3 GPS integrates with game

Game that utilizes GPS technology equipped wireless communications device will be a trend in future. This kind of game is interesting because it encourages the real-time playing which enables player to has real experience in virtual game.

Based on the researches, there are already GPS integrated games being proposed or created in foreign countries. i OPENER, a young dynamic organisation in Netherlands, has 'real-time racing' game, through integrating GPS data together with the cars' data and track data into a virtual console/online game. i OPENER is

convinced that GPS will play a pivotal role in the realisation of the integration of the real and virtual worlds.

In addition, Yasunori Tonooka, game creator in Japan, has created GPS Entertainment which is a scavenger-hunt style RPG game. Player has to seek clues in few locations in the city by walking around with GPS featured device. This GPS-based RPG game delivers the information about history and cultural background of each location to player as they unlock more story in game. This shows that game can contribute to other aspects like tourism promotion instead of only entertainment. GPS Entertainment is believed to be a completely new form of mobile entertainment that combines the virtual elements with the real world in a more fun and exciting way.

i OPENER and GPS Entertainment believed that GPS feature is an important element that should merge into game development to bring out brand new experience to player. Game in traditional way no longer satisfy player, so evolution is needed to make innovative and creative game. In this case, combination of real world and virtual game environment by using GPS feature will be one of the possibilities of innovation.

In July 2016, Pokémon Go is released in selected country. In this game, GPS feature is used to capture player's location which allows certain virtual monsters, Pokémon to appear in the same location as the player. This game also uses augmented reality technology to create a more realistic game environment by displaying the Pokémon to look like appear in real world through smartphone's camera. PokéStops and gyms are distributed based on the historical interest of the local sites. This game is believed increasing the visits of places because player has to get Pokéballs and items from PokéStops and gain coins from battle in gyms. Players indirectly increase their physical movement e.g. walk in daily life.

Unfortunately, there are complaints from different parties towards Pokémon Go. Players are too immersed in the game will ignore their own situation and location merely for catching Pokémon. For example, a Dutch company, ProRail complaints that some Pokémon Go players entered their railway tracks. As a result, Niantic later removed content from sensitive areas. Overall, Pokémon Go is a good innovation of game which is GPS-integrated game.

2.3 Facts and findings

2.3.1 Health Issue

As the popularity of smart devices increases, people nowadays like playing mobile game as one of the leisure activities. They love games because they are addicted to the excitements when gaming. Some people even hold their smart devices and play games non-stop for hours. Physical inactivity is a major cause of different diseases in this modern era. Lack of exercises may bring bad effects on people's health, such as obesity and muscular disorders, like carpal tunnel syndrome.

In addition, most of the teenagers and young adults do not practice healthy life. They do not like active activities but stick to the screen-based activity such as playing computer game, watching television and others. This is also one of the factor that leads to game addiction. Due to game addiction, they want eat food that is quick like cup noodles instead of eating healthy and balanced diets. In some cases, gamers will skip meals just because they do not want to spend the time on eating. Based on the research carried out by Canadian and Danish researchers, they found that overconsumption of food happens on teenagers after playing video games. Hence, eating irregularities are health problems that should be concerned in the efforts to raise the health awareness.

Moreover, teenagers and young adults nowadays is not concern about the food intake. They do not care about the daily calories intake and lack of knowledge in this aspect. This issue brings bad effects to health whether the caloric intake is too high or too low. Metabolism rate will drop dramatically if calorie intake is too low and causes muscle mass to reduce. On the other hand, eating too much of calories will cause stress to human body. High calories intake usually caused by eating high fats and high sugar food which also increases the risk of getting chronic diseases like diabetes.

In conclusion, healthy problems among this modern society become a serious issue that should not be ignored. People should be educated in a proper way to practice healthy lifestyle. People are encouraged to exercise frequently, have balanced meals and keep their calorie intake equal to calorie output.

2.3.2 Alternative in Game Evolution

It seems nostalgia to talk about those ancient mobile games like Snake and Space Impact in the age of Candy Crush saga and Angry Birds. The classic game is simple, yet people like simple game. Casual game is the most popular game regardless nations, gender and age. For example, the Pac-man with a simple gameplay is still popular even though it was created 30 years ago.

As technology has developed over the past decade, improvements such as Bluetooth, Wi-Fi and GPS have enriched the mechanic of game. Based on the researches that have been done, many game developers support the facts about GPS will be a trend in future game industry. Hence, it is an opportunity to develop some game that brings out new experience to player as they are also looking for creative game.

According to the health issues stated above, combination of game and player's physical movement will be one of the solution. It is impossible to stop all people from playing mobile games. Therefore, create a game to encourage people to exercise is an alternative to solve physical inactivity issues. Developer can create game that calls on GPS technology to detect player's movement and logs of visit in order to complete the game mission. It will be fun and interesting because GPS technology is not frequently used in game industry yet.

Furthermore, in order to raise awareness of people to maintain proper calories intake, GBL will be a good solution for gamers. In an immersive environment like game, people able to learn more than a traditional way. The information delivered through a game is more impressive and easy to memorize. A game that focus on calorie intake will indirectly teach them about the importance of maintaining proper caloric level.

Evolution of game is needed as time goes on in order to attract more player. Game is a good medium for many purposes rather than only entertainment if the game is designed properly.

2.4 Existing system

There is a lot of mobile games available as long as people possess a smart device with internet connection. Two categories of game are selected from the market in order to analyse the requirement of GPS-based game and healthy lifestyle game.

2.4.1 GPS-based game

2.4.1.1 Geocaching

Geocaching is a scavenger hunt game that using GPS technology. There are million caches (treasures) hidden around the world to allow player to seek for them. Caches are in varies sizes from small like a battery to big like a car. Player's mission is to uncover those caches by downloading and following the coordinate of locations. After found one cache, player can take any content and replace them with their own. Then, player has to sign the paper and log the visit online.

Figure 2.1 Interface of Geocache

Figure 2.2 Example of cache

2.4.1.2 Waymarking

While Geocaching is a hunting game for containers, Waymarking is also a scavenger game but it is all about places. Player can discover many interesting places that they may not notice before. Waymarking calls on the smart device build-in GPS to pinpoint locations that player wants to tag it as a sign of visit and share to other waymarker. Player can upload photos and instructions along with their post. Waymarking helps player learn more about the places.

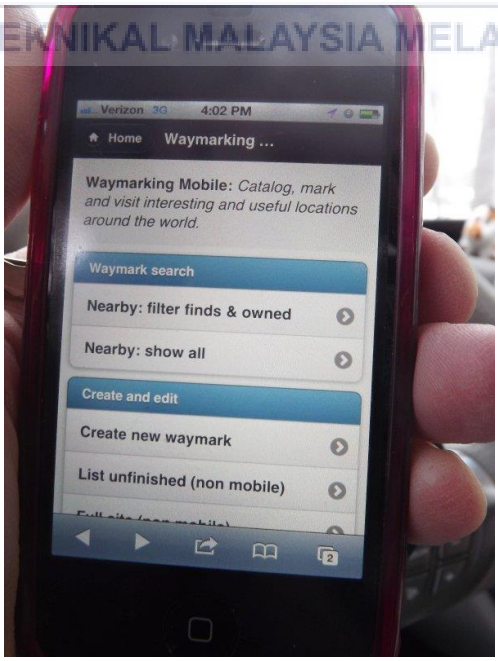


Figure 2.3 Interface of Waymarking

Figure 2.4 How to submit waymark

2.4.2 Healthy Lifestyle Game

2.4.2.1 Make a balanced plate

Make a balanced plate is a game that teach player to do food grouping into 5 main food categories which are fruits and vegetables, starchy food, milk and dairy food, high fat and sugar, and non-dairy source of protein. This game is trying to deliver the message on how to eat properly according to the proportional that is set with 5 different colours on the plate.

Figure 2.5 Food grouping

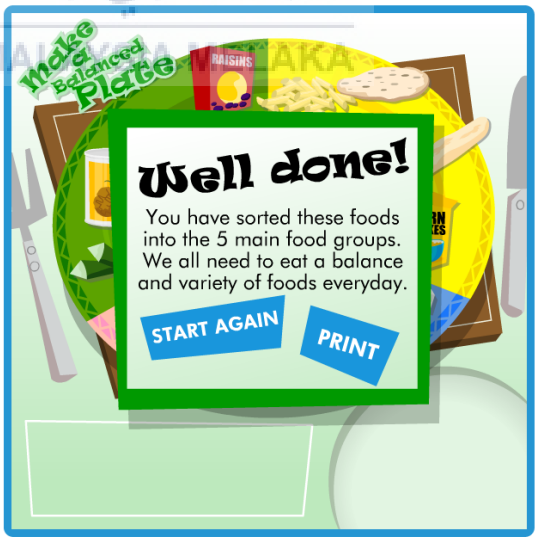


Figure 2.6 Display information

2.4.2.2 Energy Balance

Energy balance is a game that teach player how to balance the energy used daily by consuming right proportion of food. Player has to select food to eat and select activities for 4 time slots. The energy whether negative or positive at the overall game process. At the end, the plate chosen by player will be shown to compare with a eatwell plate.

Figure 2.7 Select food

Figure 2.8 Select activities

Figure 2.9 Comparison to eat well plate

2.4.3 Comparison Table

Game / Features	Geocaching	Waymarking	Make a balanced plate	Energy balance
Platform	Mobile apps	Mobile apps	Web apps	Web apps
Display	Hand-held	Hand-held	Hand-held	Hand-held
GPS-based	Yes	Yes	No	No
Promotes healthy habit	No	No	Yes	Yes
3D	Yes	No	No	No
Video	No	No	No	No
Audio	No	No	Yes	Yes

Table 2.1: Comparison among Existing System

2.5 Project Methodology

For this project, Sazli Content Development (SCD) model will be used as the project methodology. A list of hardware and software that is required for this project has been recorded down. It describes the activities in every stage for the selected approach. The project requirements states all the software and hardware needed to successfully bring this application into the real world.

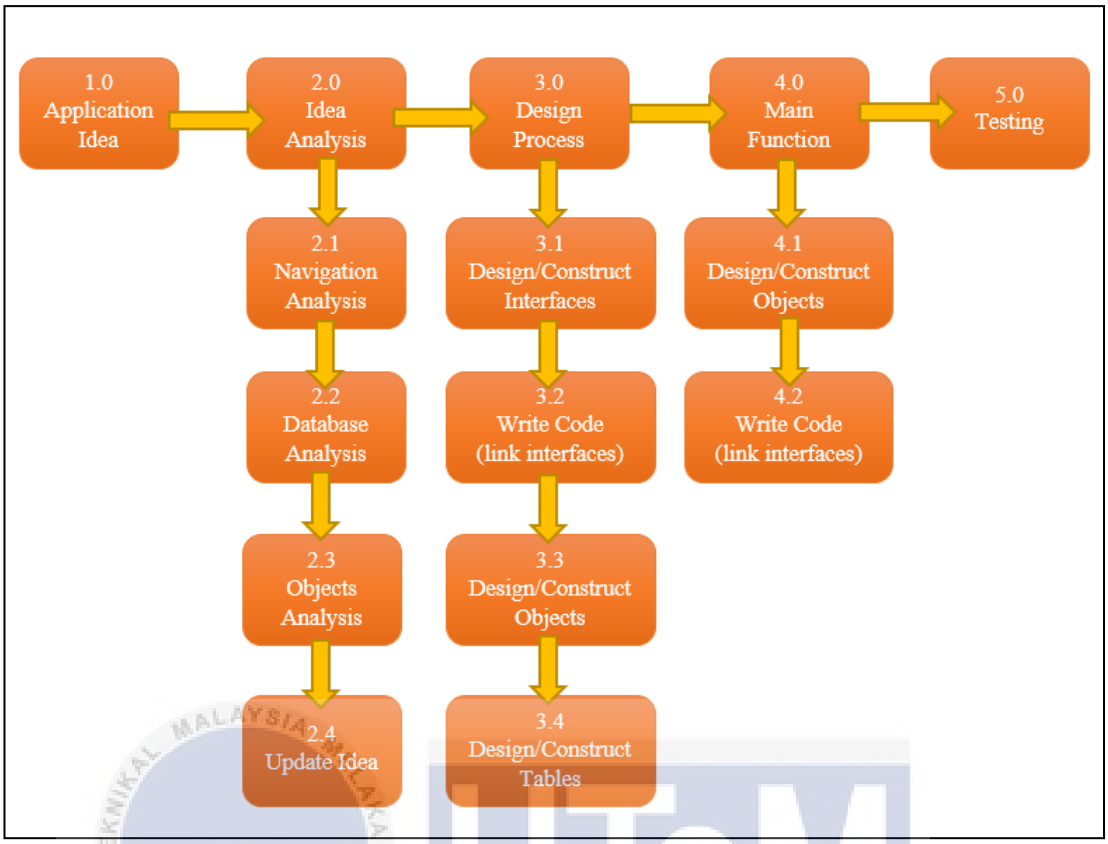


Figure 2.10 Sazli Content Development Model

2.5.1 Application Idea

In phase 1.0, data gathering is carried out to make all the ideas work. Firstly, select a game type is acceptable by target audiences such as runner game. Think about a game play that can deliver the information on calories control. This game will integrate with GPS technology as well.

2.5.2 Idea Analysis

In phase 2.0, start drawing the game flow to redefine the ideas in phase 1.0. Start analysing the navigation and database used for the game. Modify the game mechanics to make the game more user-friendly. Visualise the game interface by sketching for the ease of modification. Then, list out all the objects that are needed the game interface and game environment such as buttons, game character, calories bar

and etc. Researches are carried out to find ideas or reference for objects design. Select suitable reference and start designing the game objects. In this project, landmarks in Malacca will be used for the game environment.

2.5.3 Design Process

In phase 3.0, start modelling all the game objects by using Autodesk Maya 2015. Then, create images such as logo, interface layout, button that used in game environment. After modelling, apply texture to all the 3D objects. For the game character, rigging is done after texturing.

2.5.4 Main Function

In phase 4.0, all objects are ready to use. Then, start create the game environment of the game. Start setting the game environment and creating the game scene like main menu, game scene and special mission scene. Animate the character to make able to run in game environment. Then, start coding to set up the rules and interactivity of the game. Write the code for GPS scene to make it able to count the distance walked by the player.

2.5.5 Testing

In testing phase, pre-publish game will undergo several test to minimize the occurring of error. First, export the game based on iOS platform. By using Xcode, developer able to emulate the application either in computer or smart devices. Then, emulate the game in smart devices to ensure the GPS feature is functioning. Test other feature such as buttons and links. Records the flaw, fix it and test again. After testing done by developer, the game is tested by random player. Feedbacks are recorded and modification is done when necessary. Lastly, game is played by target user and feedbacks are collected.

2.6 Project Requirement

The requirement of the application will be described in terms of functional requirement, software requirements and hardware requirements.

2.6.1 Software Requirement

The software used to develop this project are listed in table below:

Table 2.3: Software Requirements

Software	**Uses**
• Autodesk Maya 2015	• Create game character and game objects
• Adobe Photoshop CS6	• Edit image • Compose image • UI design
• Adobe Illustrator CS6	• UI design
• Unity3D	• Game development
• Xcode	• iOS application emulator
• Microsoft Word 2010	• Prepare documentation

2.6.2 Hardware Requirement

The hardware used for game development are listed in table below:

Table 2.3: Hardware Requirements

Hardware	Specifications
Laptop	Intel Core i7 Processor 8GB RAM NVidia GeForce 950m 1TB HDD
IPhone 6 Plus	iOS 9.3.2

2.6 Conclusion

The findings show that mobile game is a good medium as GBL. However, developer must design the game carefully in order to achieve the objectives. GPS technology can be a good element to combine real life with game environment. People are expected to accept the integration of game with GPS technology since the traditional way is no longer fulfil their satisfaction. Since the healthy issues increased, the game that add in physical movement as part of the game play will be an alternative way to reduce diseases caused by the lack of exercises.

CHAPTER III

ANALYSIS

3.0 Introduction

Chapter 3 describes the study of the problems, user requirement and system requirement. The collected data has to undergo processing in order to produce useful information. Analysis process is important to keep the project being built in the way that fulfil system requirement and user satisfaction.

3.1 Current Scenario Analysis

Current scenario analysis will explain the current system and the feedback of user to that particular application. The product will add in the feature that is not included in the existing system.

Nowadays, people like to use smart devices for entertainment. Mostly people prefer mobile game instead of computer game. Casual game is the most acceptable genre among player regardless gender and age. Endless runner game is one of the popular mobile game. It is simple but it can bring excitement to player when playing it. Hence, 3D runner game is selected as the gameplay of this application. The game will similar to games like Temple Run, Minion Rush, Subway Surfer and etc.

Attractive game is good but it also leads to game addiction issue. Health issues like eating irregularities and physical inactivity are caused by game addiction. Hence, in order to raise awareness among people, health care information can be merged into game. There are many mobile games created to teach people on how to maintain healthy lifestyle but less of these games involves physical movement of player into game environment directly.

Based on the research being done, there are few problem statements found which are people spend too much time on playing mobile game, lack of exercise to maintain healthy lifestyle and lack of knowledge on calories control. To solve these problems in one solution, create a game with a popular gameplay that involves physical movement and deliver knowledge on calories control is an alternative.

3.1.1 Existing System

Recently, mobile games is used for multiple purpose and not only for entertainment. Game can be used in various fields. It is exciting and attractive way of delivering message to the audience. Due to the popularity of 3D technology, game industry nowadays highly use 3D elements for innovation. 3D game also bring new experience to user that is hardly presented by 2D game.

Existing game which related to healthy lifestyle are “Energy Balance” and “Make a balanced plate”. “Geocaching” and “Waymarking” is the game application that related to GPS technology.

3.2 Requirement Analysis

Requirement analysis of this project describe the project requirement, software requirement and hardware requirement in this project. In project requirement, the limitations of the project is analysed. Hence, the project can be specified in a scope that is cost-effective and fulfil the objectives of this game application.

3.2.1 Project Requirement

3.2.1.1 Need Analysis

Health issues in this modern era is important and should not be look down on. But addiction of mobile game is one of the factor that cause unhealthy lifestyle like imbalanced diet and physical inactive. It is impossible to block the people away from playing game. Hence, create a game that promotes healthy lifestyle will be an alternative to solve this problem. In order to make a game looks interesting, GPS technology will be used in this game to detect the distance walked by player. Besides, player will learn the calorie value of food and able to categorize them as high calorie or low calorie.

3.2.1.2 User Analysis

Daily calorie intake from diet for each person varies due to the factors such as age, gender, height and weight and level of physical activity. Table below shows the estimated calories needs for different gender, age and level of activity which is done by Institute of Medicine Dietary Reference Intakes in 2002. Since the largest group of mobile games players are teenager and young adults, therefore the rules of the game will be set based on the age group from 14 to 30 years old. The value of 2400 is used as the reference for the calorie bar in the game.

Gender	Age (years)	Sedentary[b]	Moderately Active[c]	Active[d]
Child	2-3	1,000	1,000-1,400	1,000-1,400
Female	4-8	1,200	1,400-1,600	1,400-1,800
	9-13	1,600	1,600-2,000	1,800-2,200
	14-18	1,800	2,000	2,400
	19-30	2,000	2,000-2,200	2,400
	31-50	1,800	2,000	2,200
	51+	1,600	1,800	2,000-2,200
Male	4-8	1,400	1,400-1,600	1,600-2,000
	9-13	1,800	1,800-2,200	2,000-2,600
	14-18	2,200	2,400-2,800	2,800-3,200
	19-30	2,400	2,600-2,800	3,000
	31-50	2,200	2,400-2,600	2,800-3,000
	51+	2,000	2,200-2,400	2,400-2,800

Figure 3.1 Caloric Intake Based on Gender, Age and Level of Activity

3.2.1.3 Technical Analysis

The devices used in this project development is Unity3D. The game objects is created by using Autodesk Maya 2015 and exported as assets for the game environment. During the data transferred from Maya to Unity3D, texture problems may occur due to the loss of material files. The game application will be tested on iOS device by exporting it using Xcode. GPS technology is applied in this game. The device will detect the movement of the player so player can experience the combination of virtual game with real life. Unfortunately, the GPS technology may not detect the distance of player walked precisely since the movement of player is very small in global scale.

3.2.1.4 Resource Analysis

Research on Internet sources is carried out in order to ensure the calorie value of food set accurately in the game. The maximum and the minimum caloric intake also set according to the analysis of searching through different dietary-related information.

3.2.1.5 Requirement Gathering

The genre of the games to be developed is action game which is 3D runner game. The proposed gameplay will be divided into two tasks. Task 1 is player has to control the caloric level by eating food. Game is over if the avatar's caloric intake is over or less than the limit. After a certain time, task 2 will be popped up as special mission. For task 2, player has to walk physically for certain distance in order to continue task 1. Player can skip by using coins collected along the journey. Then, user will get back to task 1 until the avatar reach the endpoint.

3.2.2. Software Requirement

To develop a GPS-based mobile game application, the following software will be used for the respective function:

Software	Usage
Autodesk Maya 2015	This is a powerful tools to create 3D objects. The game objects like tree, houses, and buildings are modelled using this software. The game character is modelled, textured and rigged in Maya too.
Unity3D	This is the software that used to set the rules and interactivity by coding. It makes use of the assets imported from Maya to build the game environment. There are also an asset store available for the developer to upload or download sources.
Xcode	This is the tool that used to emulate game in computer or export the game application to mobile device.
Adobe Photoshop CS6	Photoshop is used for editing and composing image. The image is used as texture for the game objects or as the skin for the interface objects.
Adobe Illustrator CS6	Illustrator is used to create some original artworks. Most of the interface elements in this game is created by tracing and modify the sources downloaded from Internet.
Microsoft Word 2010	Microsoft is mostly used to do the documentation of the project.

3.2.3 Hardware Requirement

For this game application, hardware that required is listed as below:

Hardware	Specification	Purpose
Laptop	Processor :Intel(R) Core(TM) i7-4720HQ CPU @ 2.60GHz RAM : 8.00 GB System type :64-bit Graphic Card : NVidia GeForce 950m Windows : Windows 10	Laptop is used to develop the game, create the game interface and do the documentation of the project.
IPhone 6Plus	iOS Version : 9.3.2 Capacity : 64 GB	IPhone is used to test the end-product to ensure the UI design fits in mobile platform.

3.2.4 Other Requirement

In the development process, Mac computer is needed for the use of Xcode. Multimedia Lab 3 with iMac will be used for testing of this game application.

3.3 Project Schedule and Millstones

Project management is scheduled according to the SCD Model. The activities are planned and given a period to complete the task. If one of the activities is not completed on time or completed earlier than expected, developer can adjust the time to catch up the progress or avoid wasting of idle time.

Milestones records the products that has to be passed up on a particular time. It is important because the submission of product means that goals are achieved. Gantt chart and milestones of this project will be attached as Appendix A.

3.4 Conclusion

In Chapter 3, analysis of project requirement is carried out. All the software requirement and hardware requirement will be specified. All the limitations will be declared to set a scope to keep the project on right track.

CHAPTER IV

DESIGN

4.1 Introduction

Chapter 4 will explain the design phase in “the big picture” format. The system architecture of this game application will be shown by using diagram to display the entities and the interconnection between them. Besides, the preliminary design which contains storyboard design and user interface design is described in details.

This chapter also covers the design of user interface such as navigation design, input design, output design and metaphor. The game interface is visualised from single game object to whole game environment. The interaction of player with this application is clearly shown in this chapter.

4.2 System Architecture

"Smart Jack" is a mobile game application that need GPS technology as additional feature. This is a 3D runner game that avatar will run and player control the avatar to switch left or right lane. GPS feature will be used in this mobile application hence a smart devices with build in GPS is needed to play this game. Figure 4.1 described the system architecture of this project.

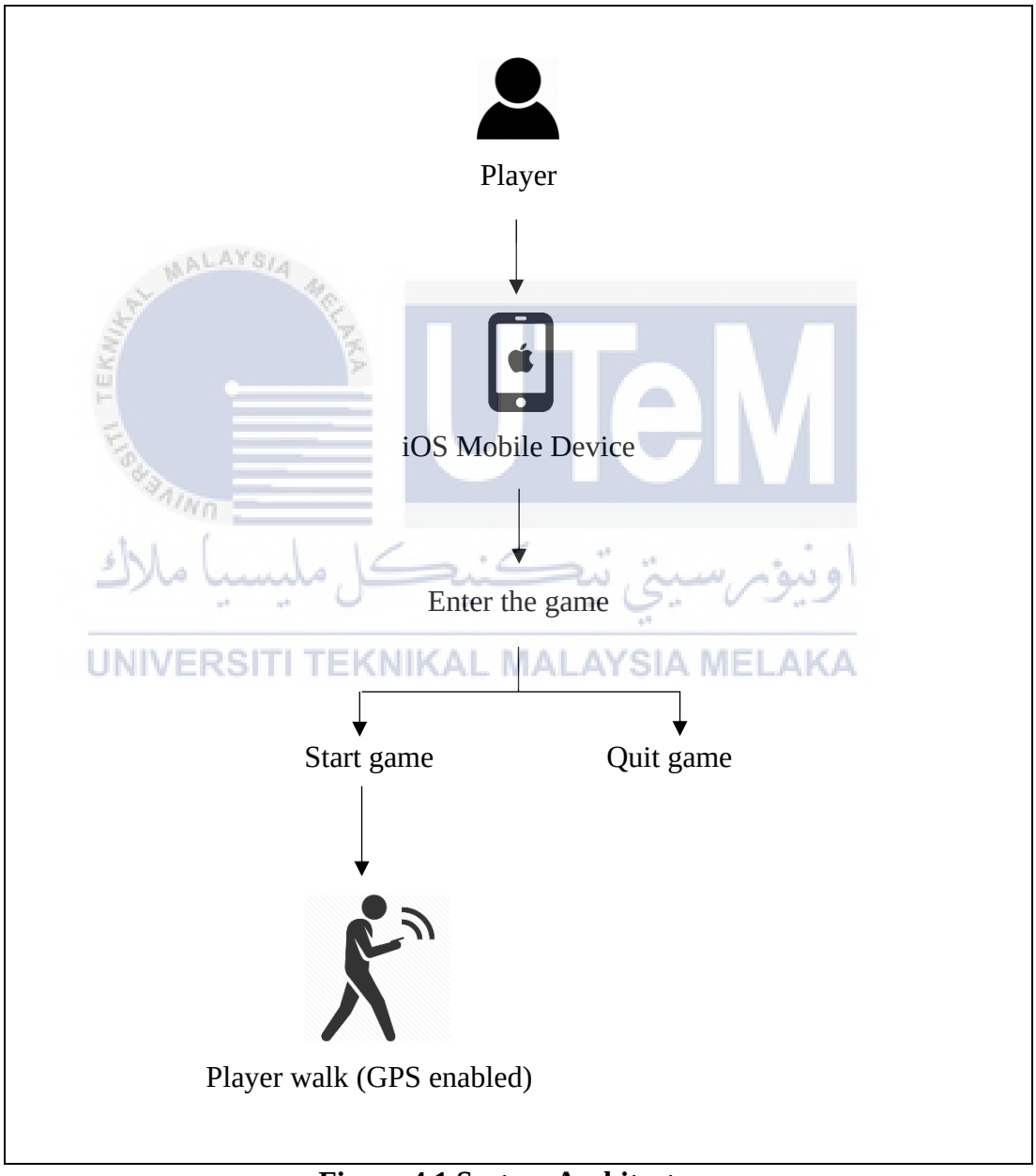


Figure 4.1 System Architecture

4.3 Preliminary Design

4.3.1. Game Flow board Design

In storyboard design, the connection between the interfaces will be explained. This game is developed for mobile platform and the display layout is set in portrait. Figure 4.2 shows how the game flow.

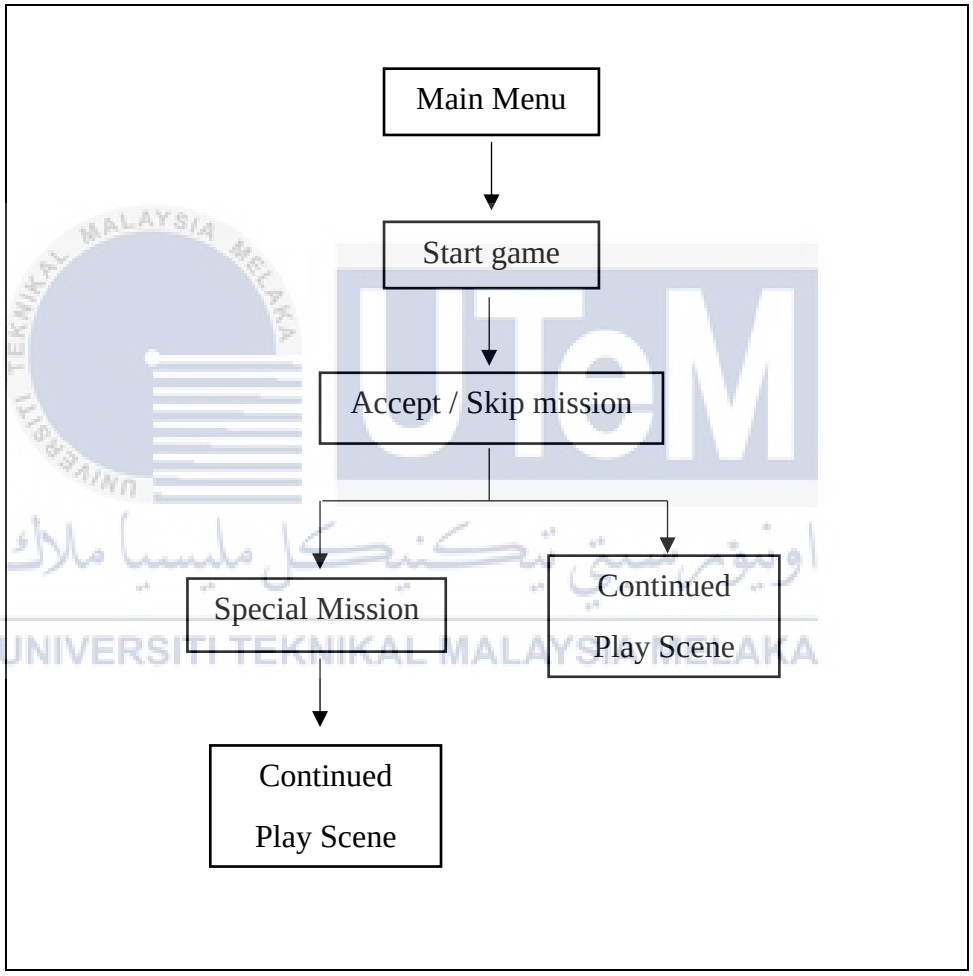
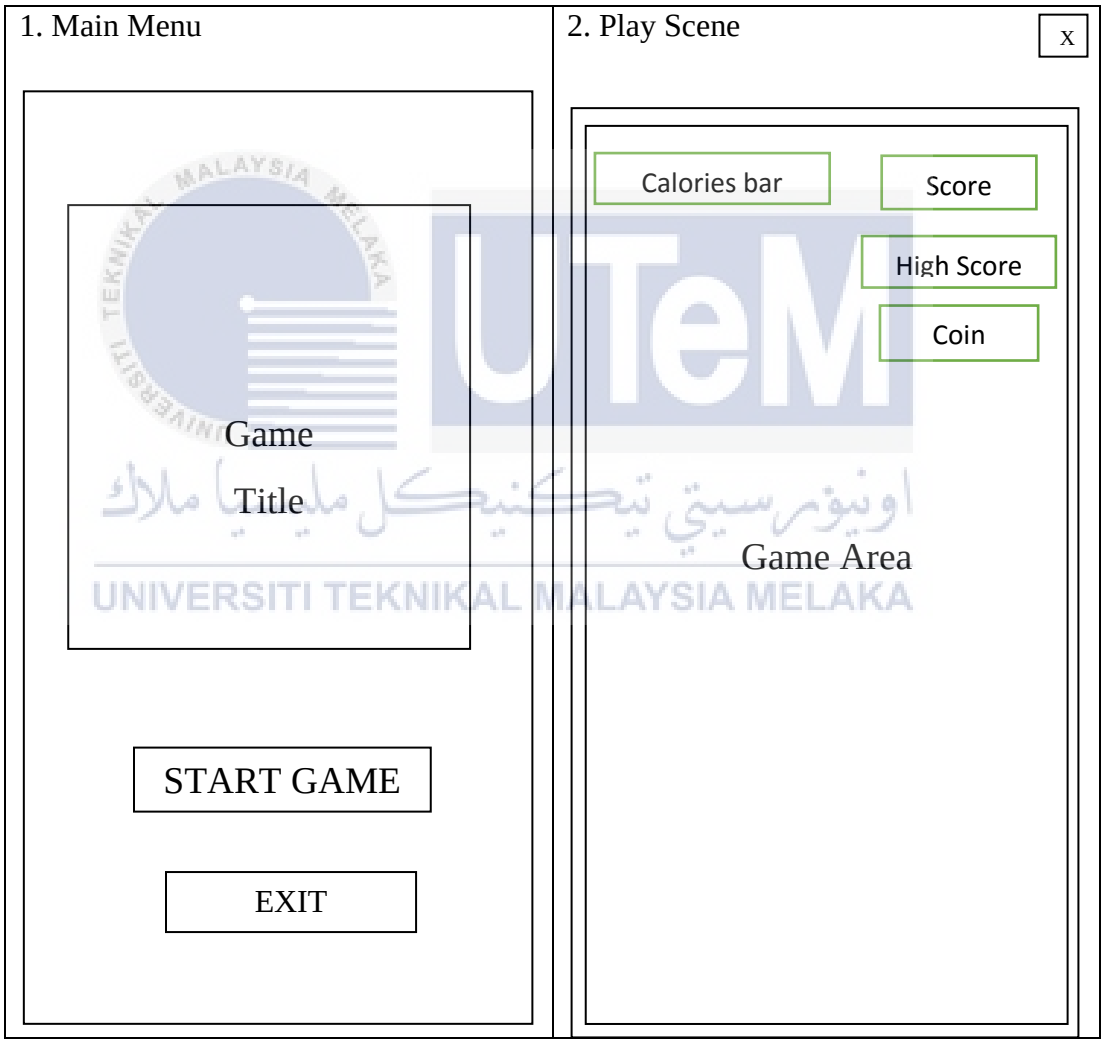


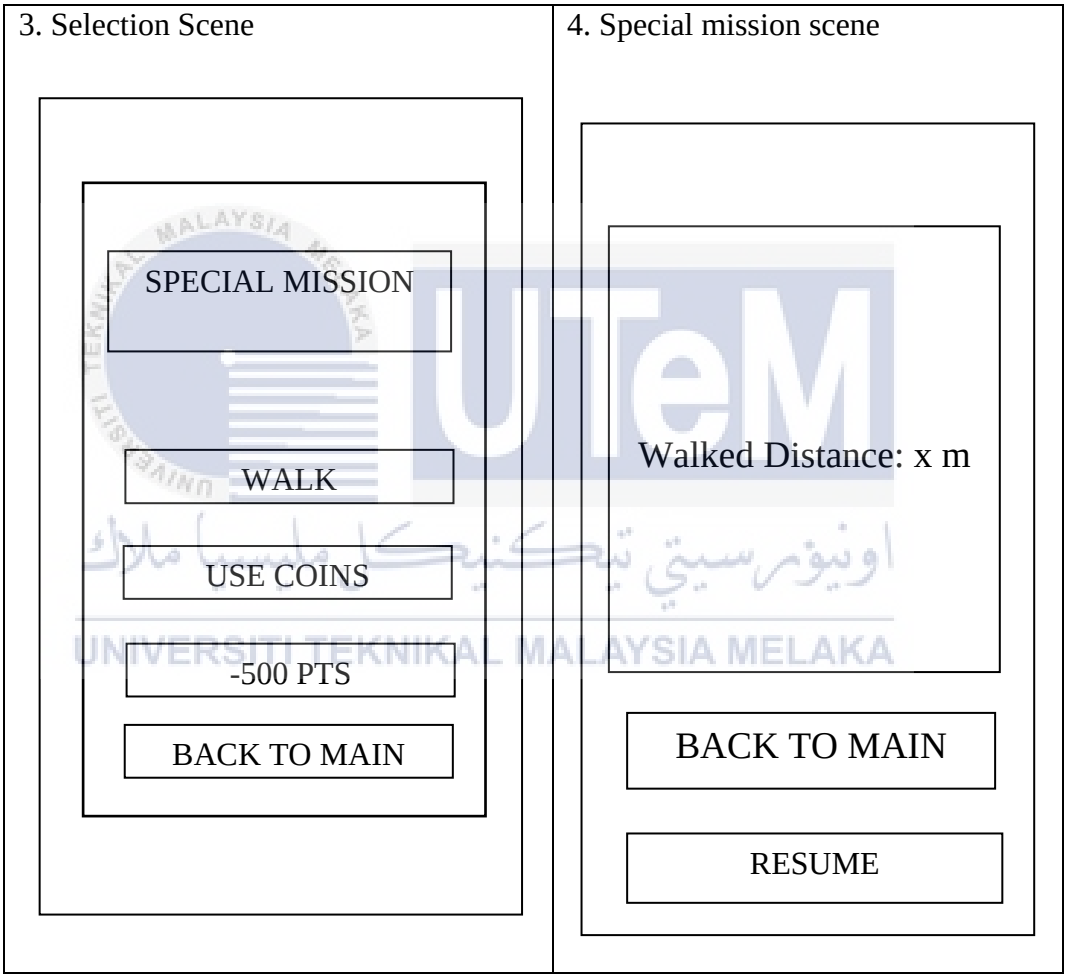
Figure 4.2 Game Flowboard

The main menu is the main page of the game and player want to stop during game also leads to main page. There will be 2 buttons in main page which is START and EXIT. START will bring player to play scene while EXIT is used to quit game.

Then play scene is the scene that player can play around. In game process, the objects shown includes text field (score and coin amounts show in text), calories bar, background and random spawn of collectibles (coin and different kinds of food). There will be a setting icon on the top right corner, so player can pause and stop the game anytime.



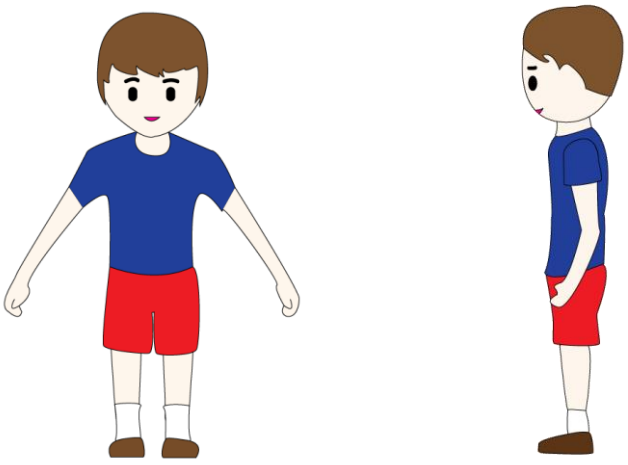
After reaching the end point, selection scene will pop up. Player has 3 choices which are WALK, USE COINS, -500 PTS and BACK TO MAIN. If player select WALK, the special mission scene will be displayed. In special mission scene, the walked distance is shown. Player can stop and quit to main anytime by clicking on the BACK TO MAIN button. The RESUME will only visible when target distance is achieved. If player choose USE COINS in selection scene, coins will deduce and player can resume the game. If player choose -500 PTS, score will deduce and player can resume the game.



In game over scene, the elements is shown such as “GAME OVER” text, Score and BACK TO MAIN button. The health care tips is displayed to show different message according to the calorie level. Player can press BACK TO MAIN and restart the game.

- **Character Design**

  The character in this game is named Jack. A teenager that represents the target user of this game.



4.4. User Interface Design

4.4.1 Navigation Design

A navigation design is important because it is related to the user-friendly characteristic of an application. A smooth flow of system enable player to navigate it easily and avoid the irritation of player caused by complexity of application. The figure 4.3 shows the navigation chart of this project.

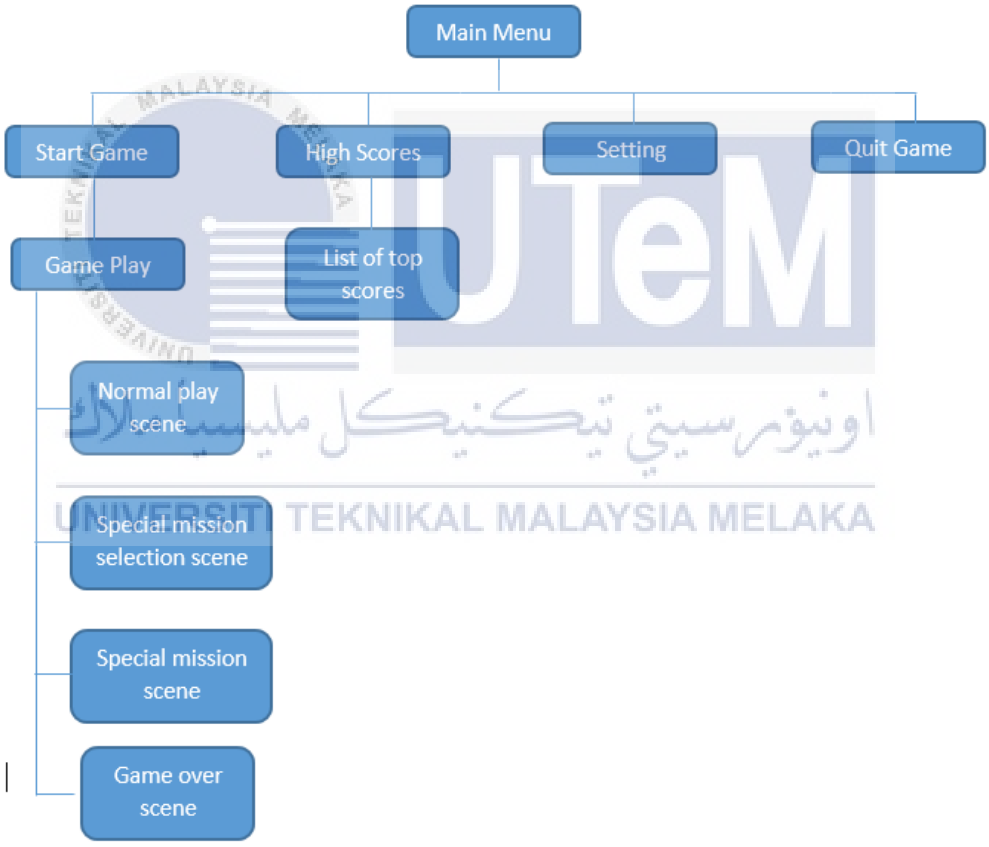


Figure 4.3 Navigation Chart

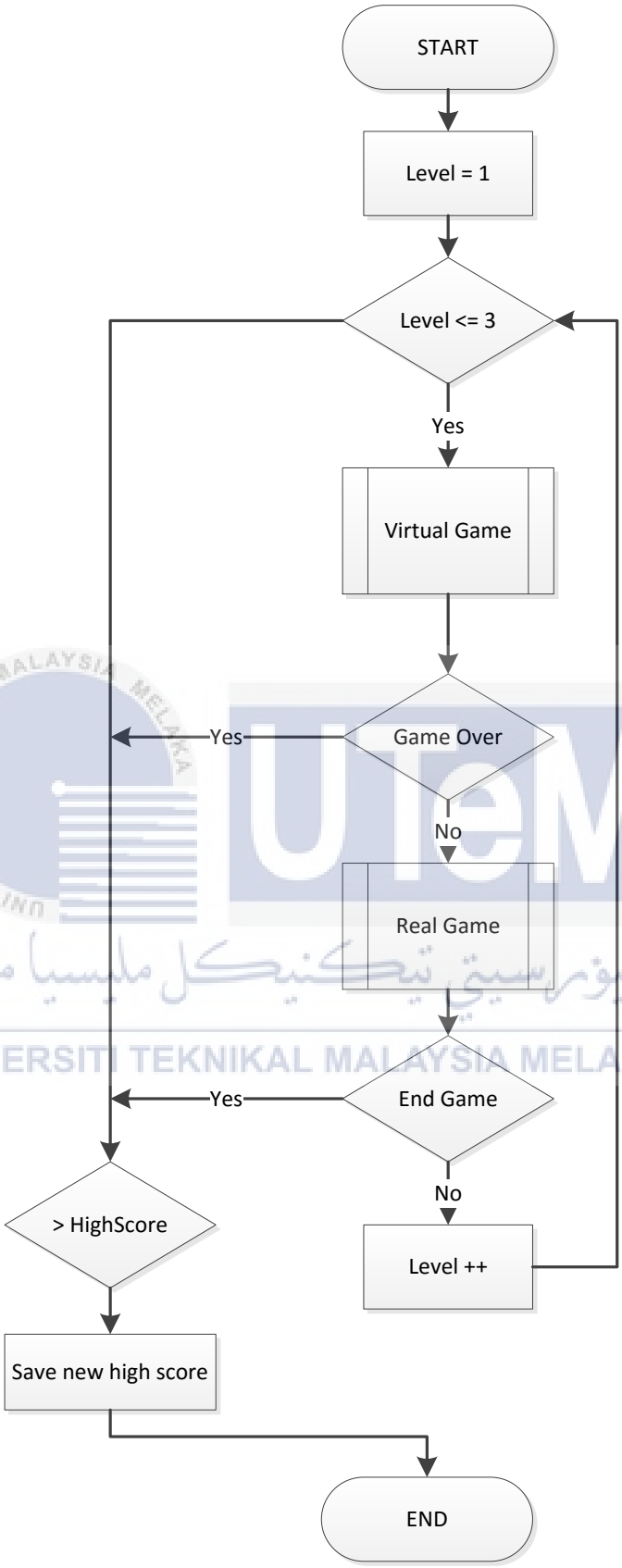


Figure 4.4 Navigation Flow of Entire Game

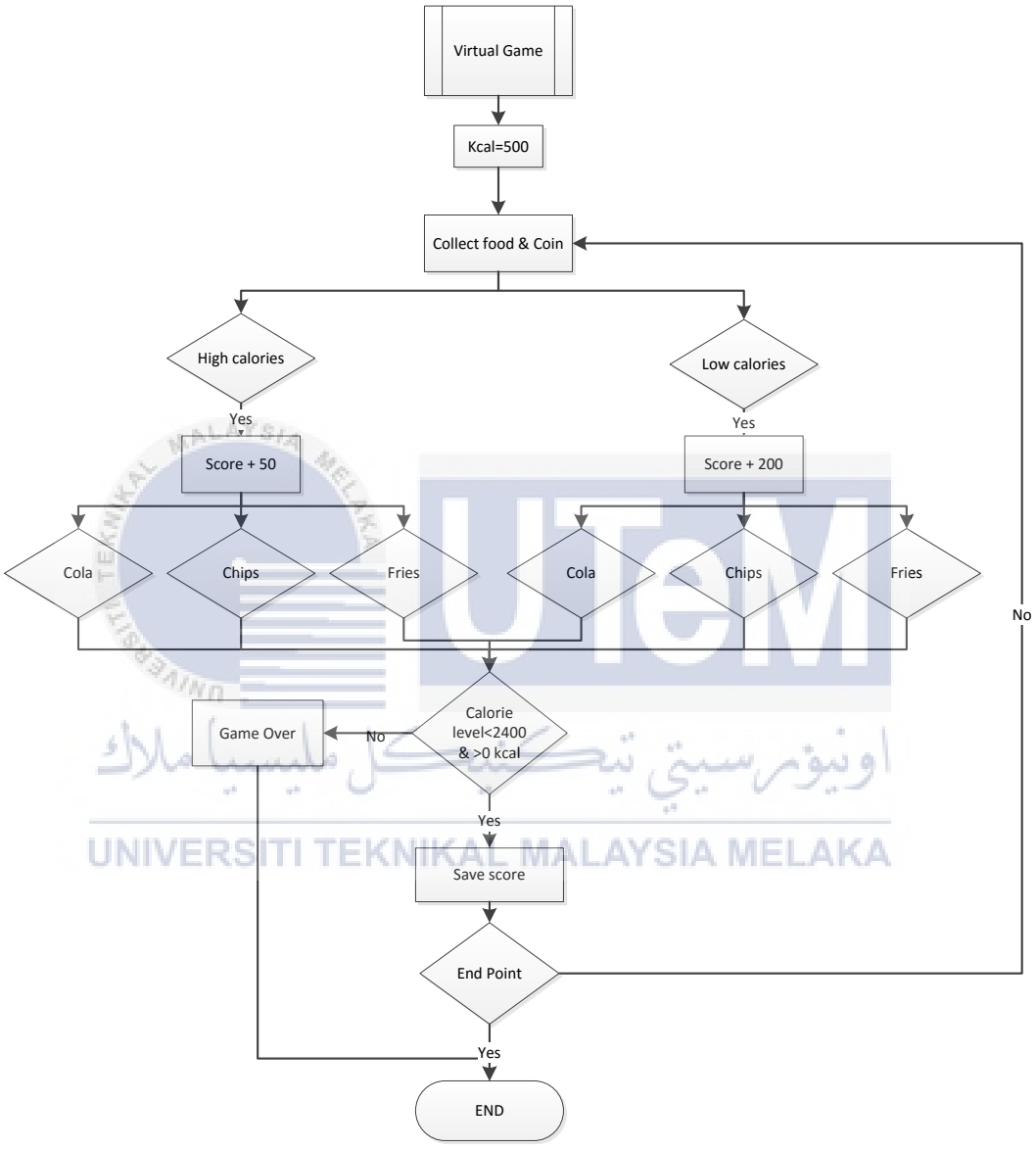


Figure 4.5 Flow of Runner Game

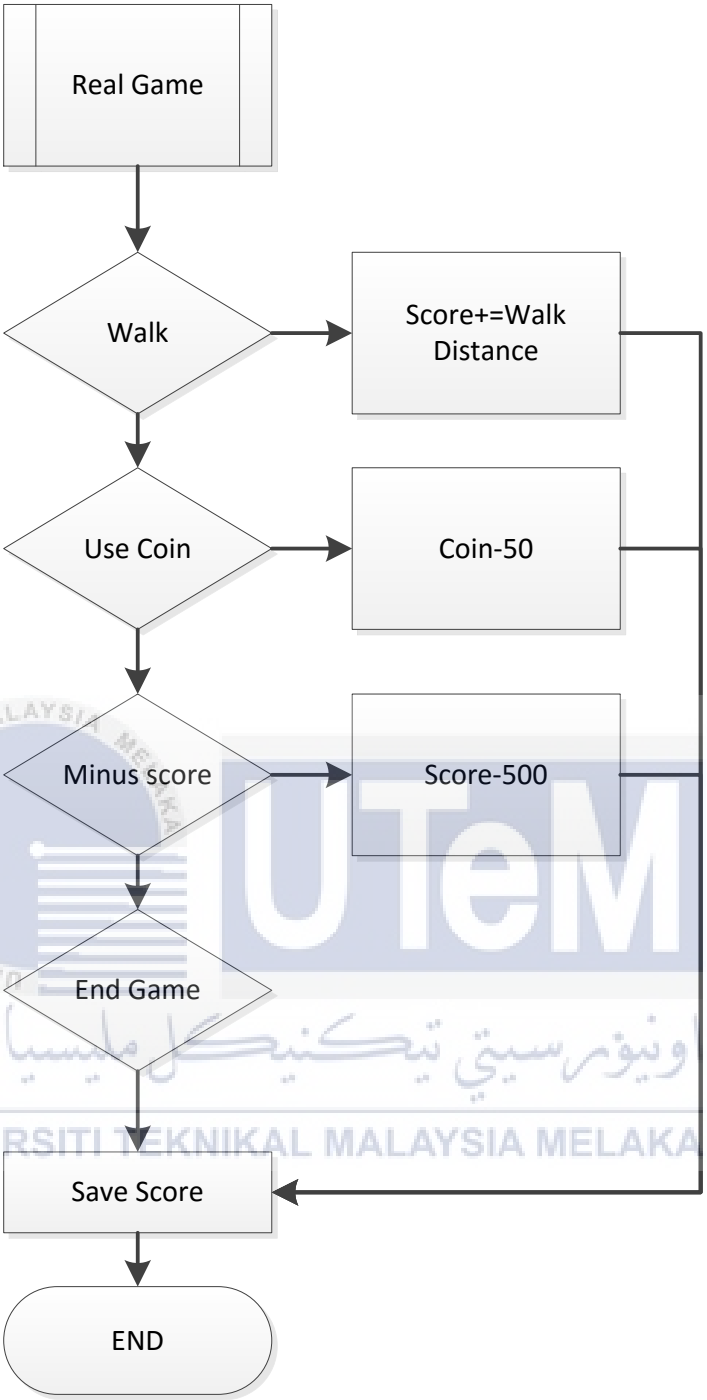


Figure 4.6 Flow of Physical Walk Game

4.4.2 Input Design

The input of this game application will be from mobile devices. The input data will be get from the player's swiping the screen left and right. The codes will be written to divide the screen 2 parts, which is left and right to detect the swiping is to left or right.

4.4.3 Metaphors

The game environment of the game is designed by using the landmarks of Malacca. For level 1, the landmarks are Botanical garden, Zoo Melaka, Mini Malaysia, Mamee factory, Pantai hospital Kings Hotel. For level 2 and 3, the landmarks will be referred from Kings Hotel onwards until Hatten Hotel.

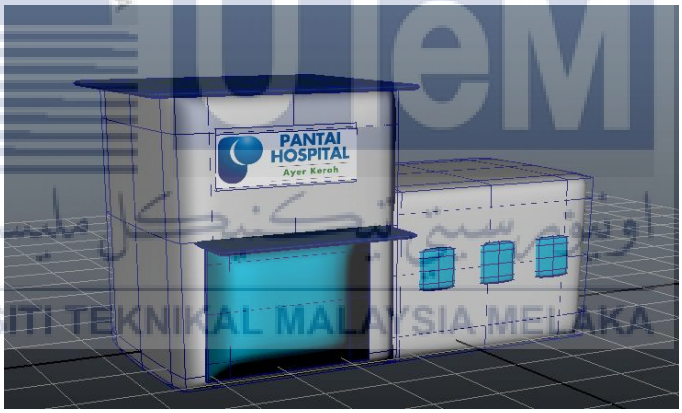


Figure 4.6 Pantai Hospital

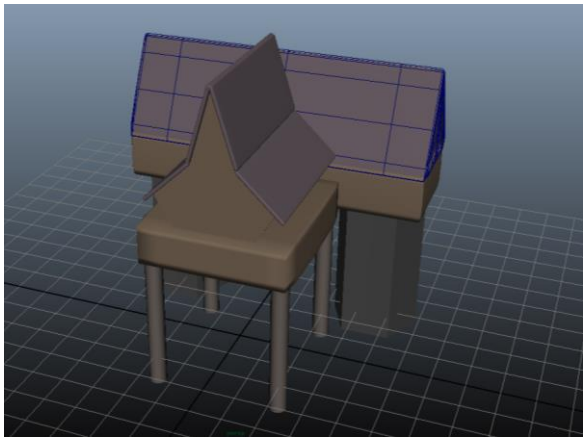


Figure 4.7 Mini Malaysia

Figure 4.8 Kings Hotel

Figure 4.9 Botanical Garden

4.5 Conclusion

In this chapter, the design of the project is discussed from system architecture to storyboard design. The system is designed according to the preliminary design which has visualize the system by sketching. Then, interface design is also described to show the navigation of interface. The flow and needs in this project is described clearly for developer to implement properly for the next phase.

CHAPTER V

IMPLEMENTATION

5.1 Introduction

Implementation is a phase that converts the frameworks created in design phase into the development of end product. This phase is the process of combining all the multimedia elements, creating the interactivity between interfaces and produce a final output.

In this chapter, the production of multimedia elements are described in details. The technique used in particular software to create multimedia elements is explained. The configuration management in the project

5.2 Media Creation

Multimedia elements is crucial for the development of an application. All the elements are created by using proper tool or software in order to create good quality product. The elements used in this game project are text, graphic and animation. Then, the elements are integrated in a game environment and lastly audio is inserted.

5.2.1 Production of text

The font used in creation of game title is simple and look friendly. All the text used in buttons and display message is using the font Arial. It is simple and acceptable by all age group of player.

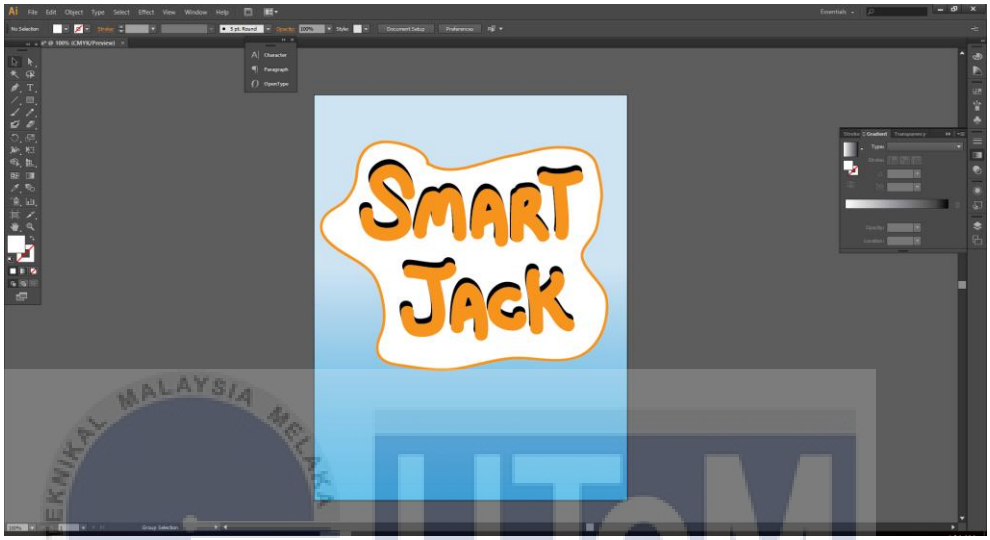


Figure 5.1: Design game title by using Adobe Illustrator CS6

5.2.2 Production of Graphic

The production of graphic in this game application is mainly starting from sketching and referencing pictures from online sources. After analysis, a finalized design is decided. Then, start modelling the objects with the reference pictures as guide. After finish modelling, add texture to the objects where necessary. Figure shows the 3D model production flow.

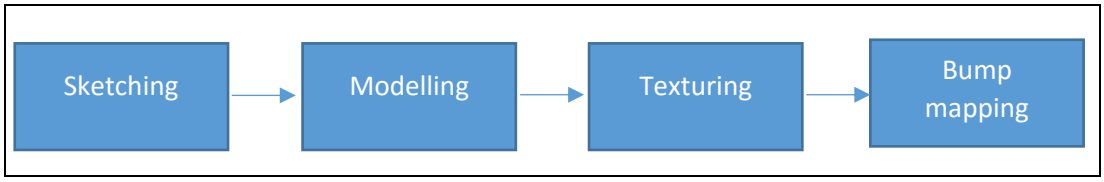


Figure 5.2 3D model production flow

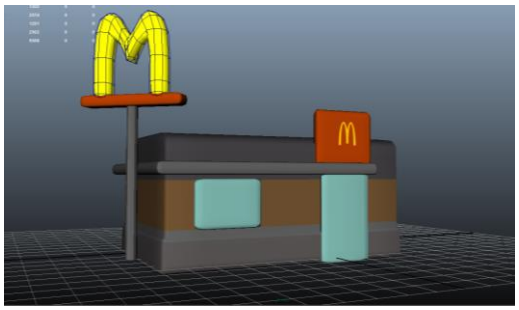


Figure 5.3 Reference image **Figure 5.4 3D model**

Figure 5.5: Character modelling by using Autodesk Maya 2015

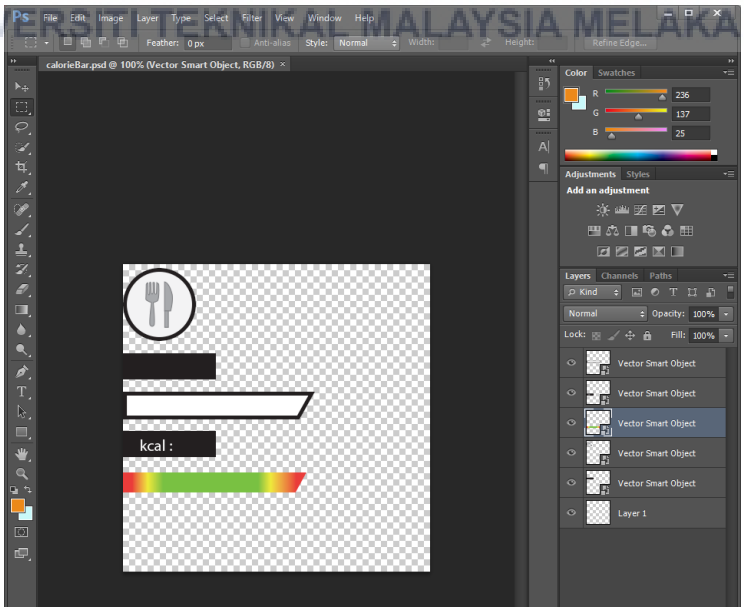


Figure 5.6: Create calorie bar (Unity3D sprite) by using Adobe Photoshop CS6

5.2.3 Production of Animation

Animation is the process to make the character move. In this project, the character has to run all the time from the starting until end of the game. First of all, the character model is rigged with human IK available in Autodesk Maya. After arranging the joint properly in the character body, use geodesic voxel method to bind skin. This method will auto adjust the space between the skin and the skeleton to avoid unnatural body shape when the character is animated. Then export the complete model to Unity3D as asset. The character is set as humanoid and apply running motion data to it. By using animator, set the repeating movement to enable the character runs for the whole game process.

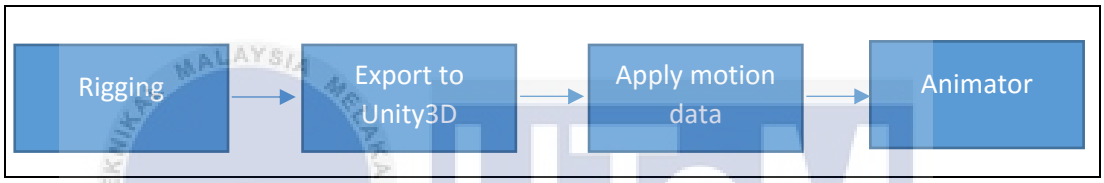


Figure 5.7 Animation Production Flow

5.3 Media Integration

Media integration is the process to combine all multimedia elements into the game environment including text, graphic, 3D objects and the animated character. The buildings, hills, cloud are used to decorate the game environment while food are dropped randomly on the road. The interface objects like buttons, icons, calories bar are also positioned properly on canvas in order to fit the screen size. The interactivity between the scenes is created by using coding.

Figure 5.8 Game environment

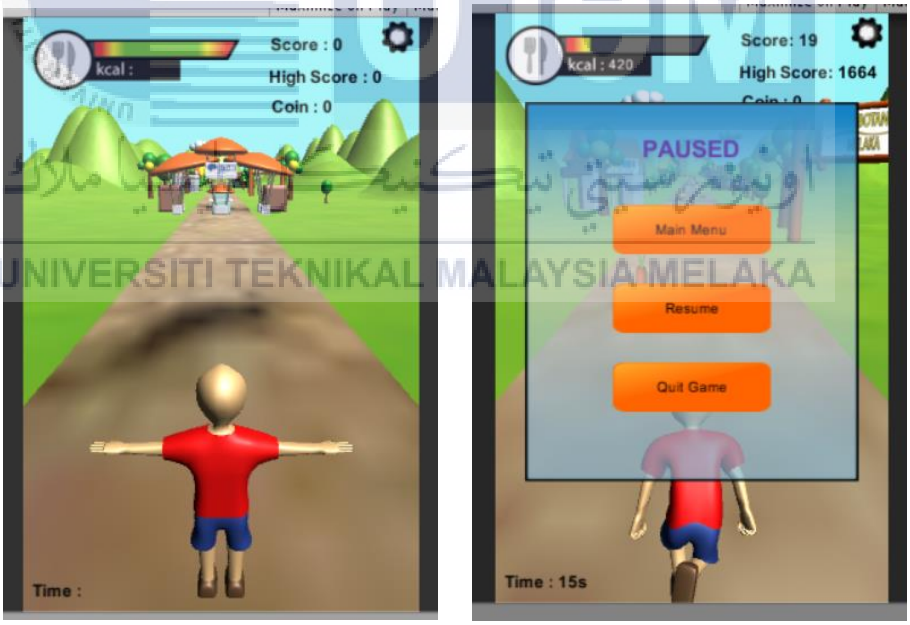


Figure 5.9 Example of interface design

5.4 Product Configuration Management

In order to build a mobile game successfully, a few of software have to be used and the format must be selected appropriately.

5.4.1 Software Developments Environment setup

5.4.1.1 Unity3D

Unity3D is a powerful software that enables developer to use the build in mechanics and physics principle to create game easily. The game object can be coded to undergo many functions. Unity3D can use the models exported from 3D Max, Autodesk Maya, Blender and other 3D modelling software. The hierarchy is to place the game objects to be displayed on the particular scene while the inspector is used to add in features for game objects such as collider, material, scripts, and etc.

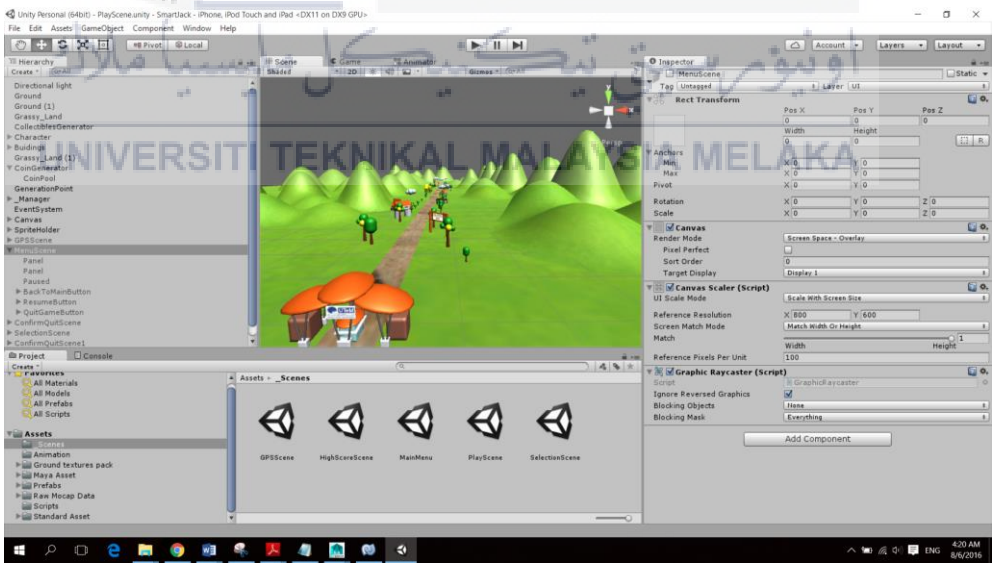


Figure 5.10 Default workspace of Unity3D

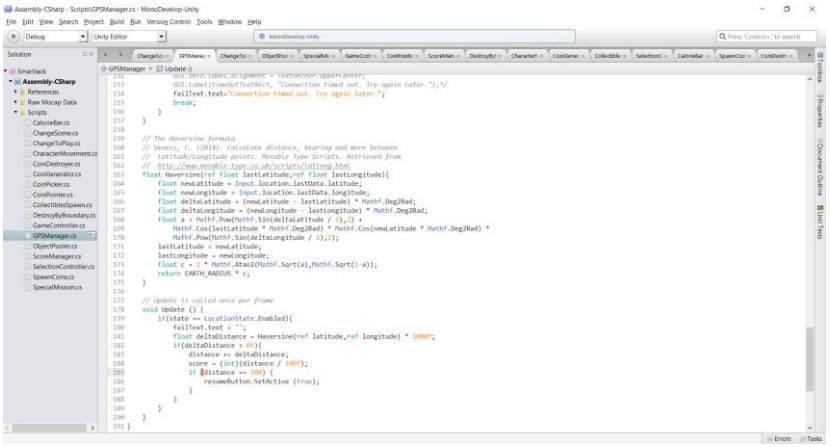


Figure 5.11 Code environment of Unity3D

5.4.1.2 Xcode

XCode is a tools that used to develop iOS mobile application. In this case, Xcode I used to build a mobile application to IPhone. First, open the project build from Unity3D and adjust the setting properly. Then, connect the device with the computer. Start building the game and data will transfer to the phone after finishing build. The application is able to open in mobile phone. Besides, Xcode also allow user to emulate the game in computer.

5.5 Conclusion

In conclusion, this chapter records the details in the implementation process. The analysis in Chapter 3 and design in Chapter 4 is useful as guideline during the implementation phase. For the following chapter, the application will be tested and do improvement according to the feedback of respondent.

CHAPTER VI

TESTING AND EVALUATION

6.1. Introduction

This chapter will describe the testing process of this project. This process is carried out to verify that whether the objectives are achieved. Valuable recommendation and modification can be suggested by respondent for the future development of this project. A test plan is carefully conducted to check whether the project fulfil the requirement stated and how much is the user acceptance. Lastly, the testing result will be analysed and reviewed in two aspects which are user acceptance and functionality.

6.2 Test Plan

The test plan will describe the user involved, test environment and test schedule that are needed to conduct the testing process. A well-organized test plan can help a developer save time and human resources on the project. This test plan will explain how the testing process is carried out in details. The test will be separated into 2 parts which are Functionality Test and User Acceptance Test.

6.2.1 Test User

There are two groups of test user that participate in this testing phase. The test user is selected according to the test requirement respectively.

6.2.1.1 Functionality Test

Functionality test is carried out to help the developer site. Test user selected should has fair knowledge of information technology. They are familiar with the technology used in developing this game. They can give justified feedback on the technical part such as navigation and structure of the project. Their feedback can be used to improve the quality of the product. Therefore, 5 students from Bachelor of Computer Science (Interactive Media) are the test users in this project.

6.2.1.2 User Acceptance Test

The test user for user acceptance test is the target user of this project which are teenager and young adult. People aged from 13 years old to 30 years old can be the test user. Questionnaires is given to test user after playing the game. Test user is randomly selected from diploma students and degree students of University Teknikal Malaysia Melaka (UTeM). 25 students are selected to try this game and give their opinions on the interface design and user experience. Data collected from test user can be used as future improvement of project.

6.2.2 Test Environment

In order to test the GPS function in this project, developer walks around the Universiti Teknikal Malaysia Melaka (UTeM) which near to the lab for game development, Multimedia Lab 3.Besides, the functionality test was carried out in the computer lab of UTeM. One set of questionnaire is given to each test user and interview session is done simultaneously during the testing process. On the other hand, user acceptance test was carried in places around UTeM such as FTMK lobby, library,

Pusat Persatuan Pelajar. Students required to play the game and walk for some distance which is part of the gameplay of this project. Therefore, outdoor environment is more suitable as the test environment.

Table 6.1 Hardware Requirements

Hardware	Description
Mobile phone	Specifications: Support iOS 9.3 GPS function well
MacBook	Export the iOS game from computer to mobile device

Table 6.2 Software Requirements

Hardware	Description
XCode	Export the iOS game from computer to mobile device

6.2.3. Test Schedule

Test schedule is used to ensure the testing process can be carried out by following the time and places.

Table 6.3 Test Schedule

Test description	Functionality test	User acceptance test
Number of test users	5	25
Date	8th August 2016	9th August 2016 – 10th August 2016
Time	3:00 p.m. – 3.30 p.m.	2.45 p.m. – 4.00 p.m.

6.3 Test Strategy

Test strategy describes the method of test used to evaluate the project. Test strategy also ensures that the achievement of the objectives can be evaluated properly on the target test user. At the end of the development process, developer undergoes unit testing to test the GPS feature in the game. For this project, functionality test and user acceptance test are carried out to test the technical and user acceptance aspects.

6.3.1 Functionality Test

Five students from Bachelor of Computer Science (Interactive Media) give comment after played the game. They are required to give feedback for many aspects such as navigation and GPS feature.

6.3.2 User Acceptance Test

Test user is chosen randomly at the places that is frequently passing by. They are required to play the game and choose a way to move to next level. For those who want to walk and get points, they have to walk until they choose to move to next level. Lastly, they are given a questionnaire to provide feedback on user experience and suggestion about the game.

6.4 Test Implementation

6.4.1 Test Description

The testing process that consists of functionality and user acceptance test are carried out in the duration of three days. After played the game, test user should give their comment and recommendation in the questionnaire. For test user of user

acceptance test, more than one round of playing is carried out because they have to know the calorie of food in questionnaire. Data collected from the test user will be analysed and the result will be presented in charts form. The suggestion also will be noted as the future implementation for better quality of project.

6.4.2 Test Data

For functionality test, the test data is collected in scale form as listed in table below. During the test session, user's comments and recommendation will be recorded. For user acceptance test, same scale form will be used for a few questions. Moreover, user acceptance test user has to answer some multiple choices question where answer can be get through the game session. The result of the questionnaire was then calculate and analysed in different charts. Data is also collected in the form of video to record the gaming process of the test user.

Table 6.4 User level of Satisfaction

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6.5 Test Results and Analysis

After analysing the data collected from the test, every question will display the level of satisfaction and how much do the test user support in particular situation. Hence, developer can know about the strength and weakness of the product. This helps the developer easy to find out the problems and deal with it. Besides, the developer can check whether the product meets the objectives stated.The test result will be summarized into 3 output (mean, mode and median).

i. Mean – average of a set of data values
ii. Mode – values that appears the most
iii. Median – middle value of a set of data values

6.5.1 Functionality Test

6.5.1.1 Graphic and colour

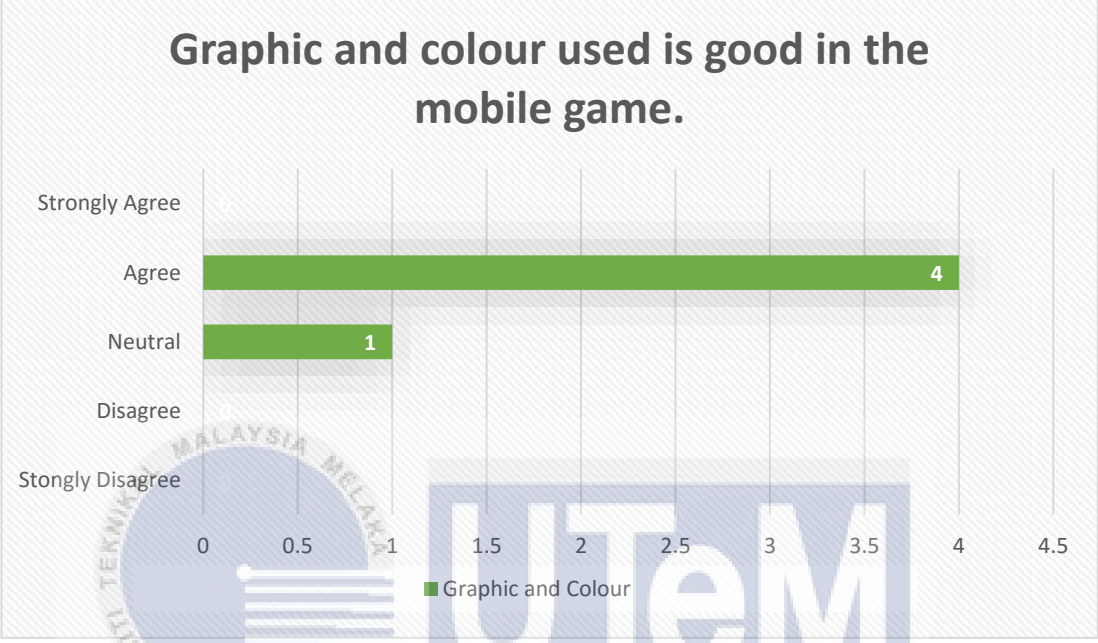


Figure 6.1 Level of satisfaction on graphics and colour

Figure 6.5 shows that 4 test users are satisfied on the graphics on colour used in the mobile game while 1 test users remain neutral. The mean value is 3.8 which is slightly above the average standard. This shows that the graphics and choose of colour should be modified to give good impression to the user.

6.5.1.2 Navigation

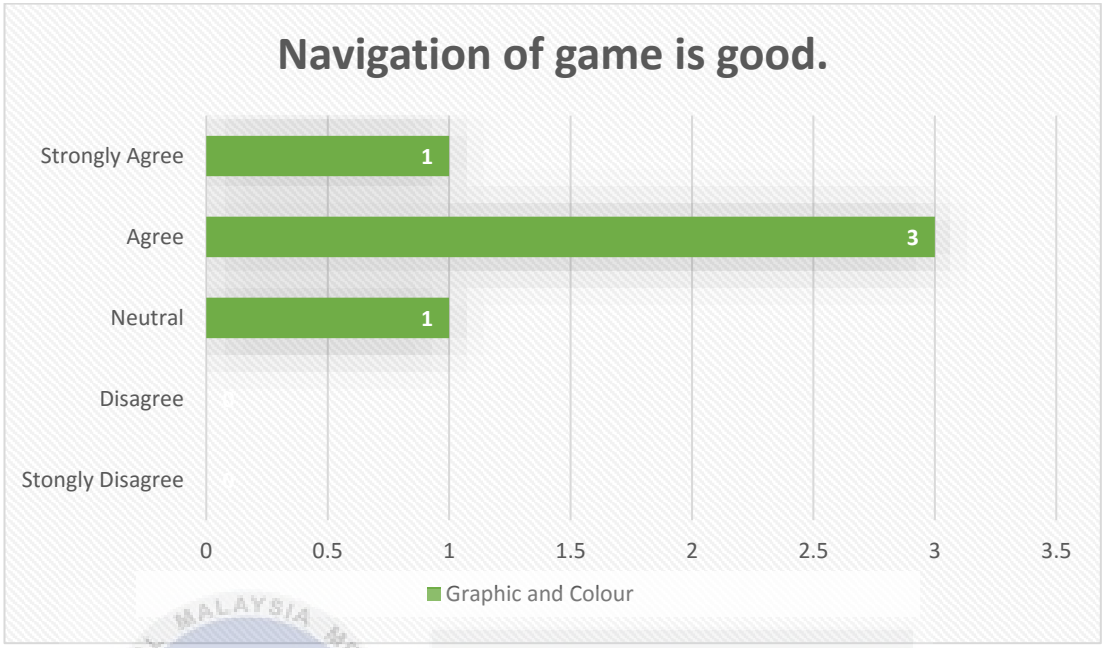


Figure 6.2 Level of satisfaction on navigation

Figure 6.5 shows that 3 test users are satisfied on the navigation of mobile game while another 2 test users remain neutral and feel very satisfied respectively. The mean value is 4.0 which shows that users are satisfy with the navigation of the game. Anyway, the navigation should be improved to achieve higher level of satisfaction.

6.5.1.3 Interface Design

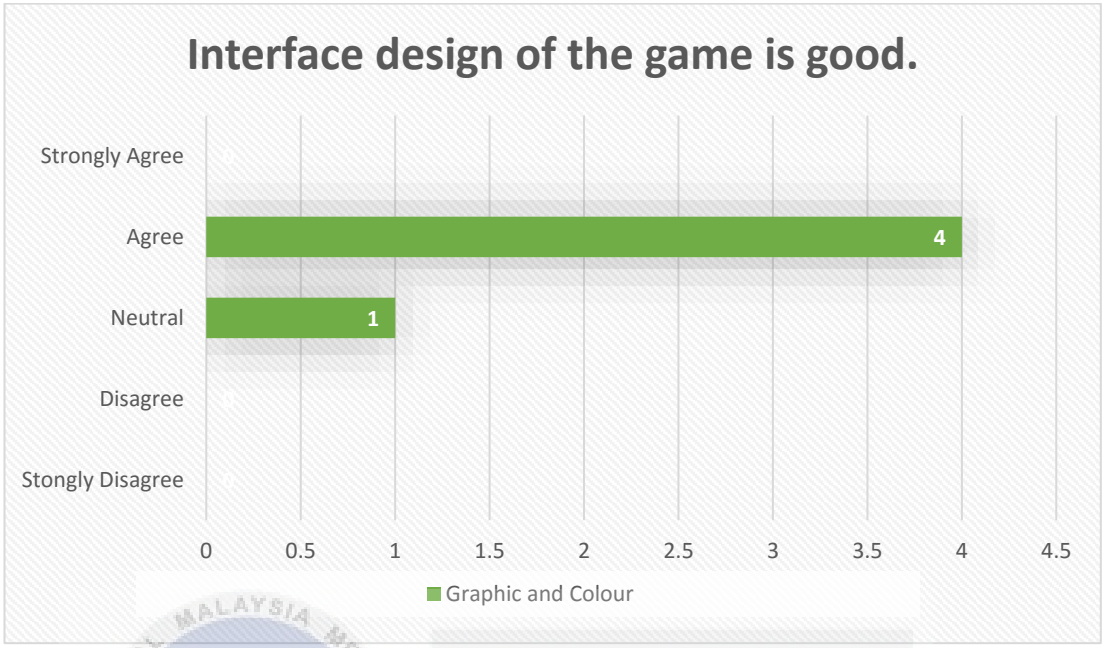


Figure 6.3 Level of satisfaction on interface design

Figure 6.7 shows that 4 test users are satisfied on the interface design of the mobile game while 1 test users remain neutral. The mean value is 3.8 which is slightly below the good satisfaction level. This shows that the interface design should be modified to make the interface more attractive.

6.5.1.4. Font Style and Size

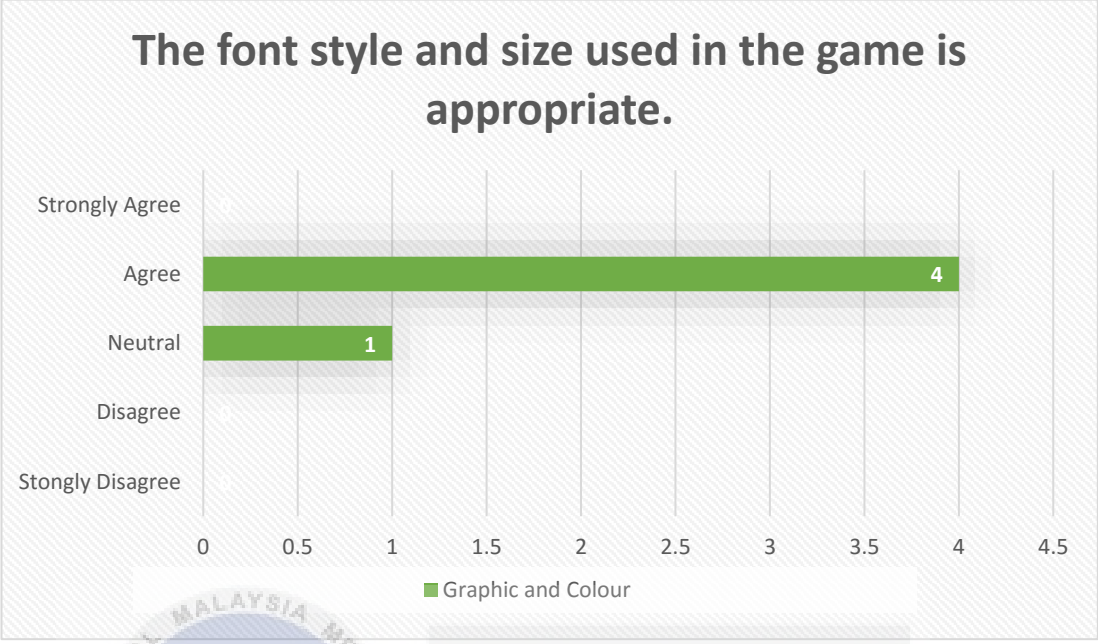


Figure 6.4 Level of satisfaction on font style and size

Figure 6.5 shows that 4 test users are satisfied on the navigation of mobile game. Only 1 test user feels normal level of satisfaction. The mean value is 3.8 which shows that users are satisfy with the font style and size used in the game.

6.5.1.5 Audio

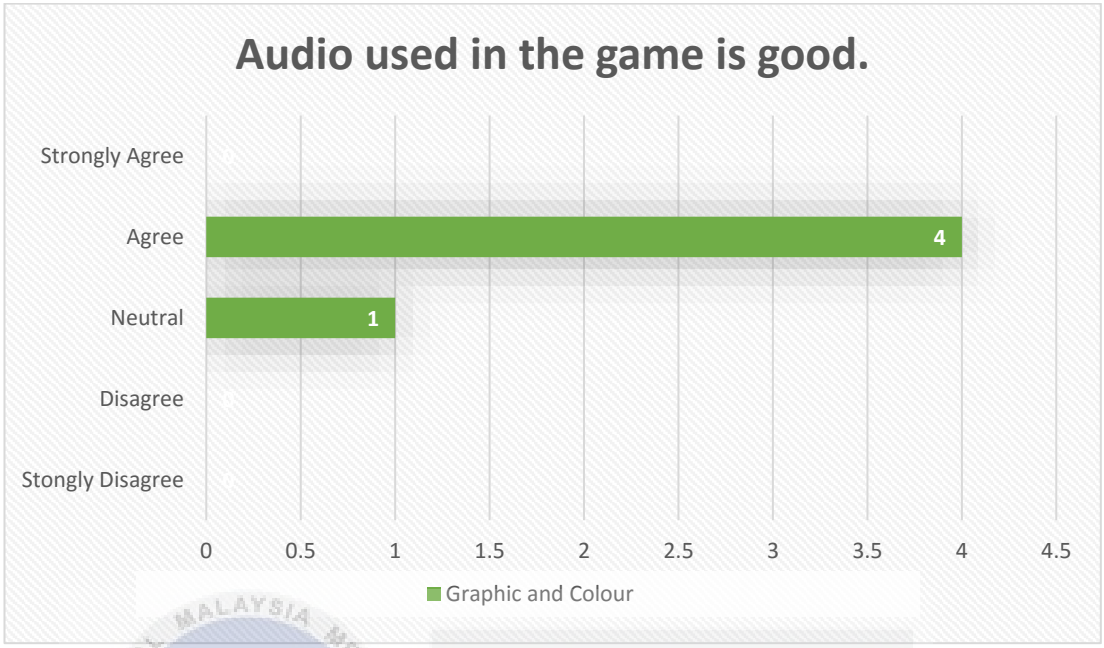


Figure 6.5 Level of satisfaction on interface design

Figure 6.7 shows that 4 test users are satisfied on the audio used in the mobile game while 1 test user remains neutral. The mean value is 3.8 which is slightly below the good satisfaction level. This shows that the audio should be changed to bring user into a more immersive situation.

6.5.1.6 Summary

The summary of result output from technical test which is done by 5 test users is shown in the table below.

Table 6.5 Functionality Test Result

	Mean	Mode	Median
Q1	3.8	4	4
Q2	4.0	4	4
Q3	3.8	4	4
Q4	3.8	4	4
Q5	3.8	4	4

6.5.2 User Acceptance Test

6.5.2.1 Time spent on mobile games

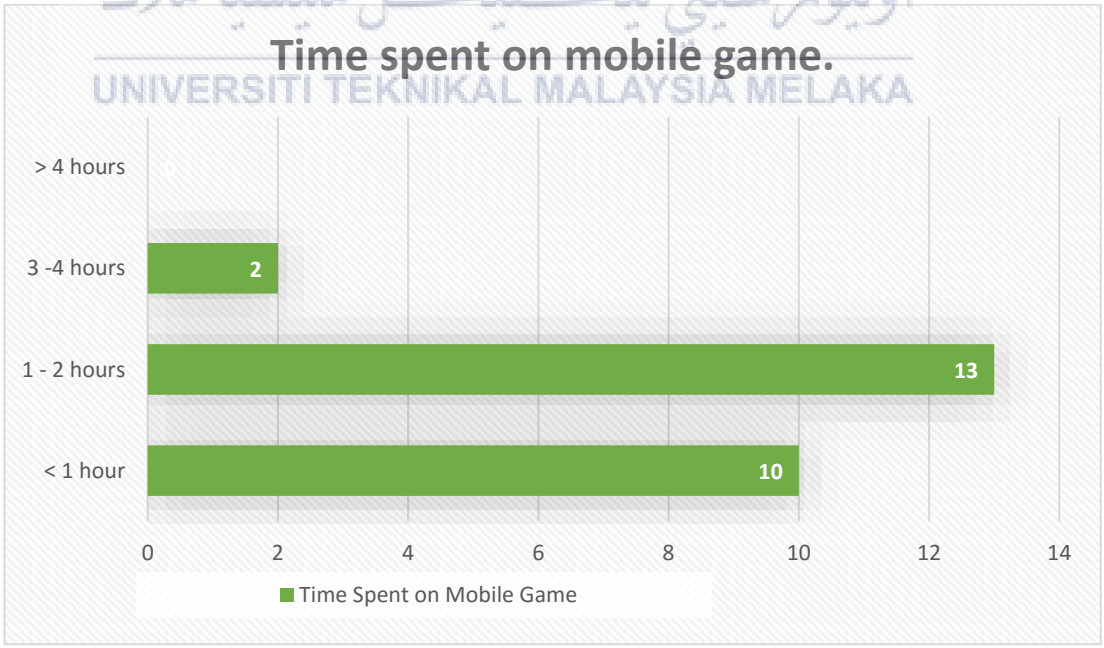


Figure 6.6 Time spent on mobile game

25 young adults are selected as test user who plays the important role in evaluation of this project. Figure 6.5 shows 15 test users are spending more than 1hour on mobile game. This shows that mobile games gain high popularity among the teenager and young adult.

6.5.2.2 Health Issue

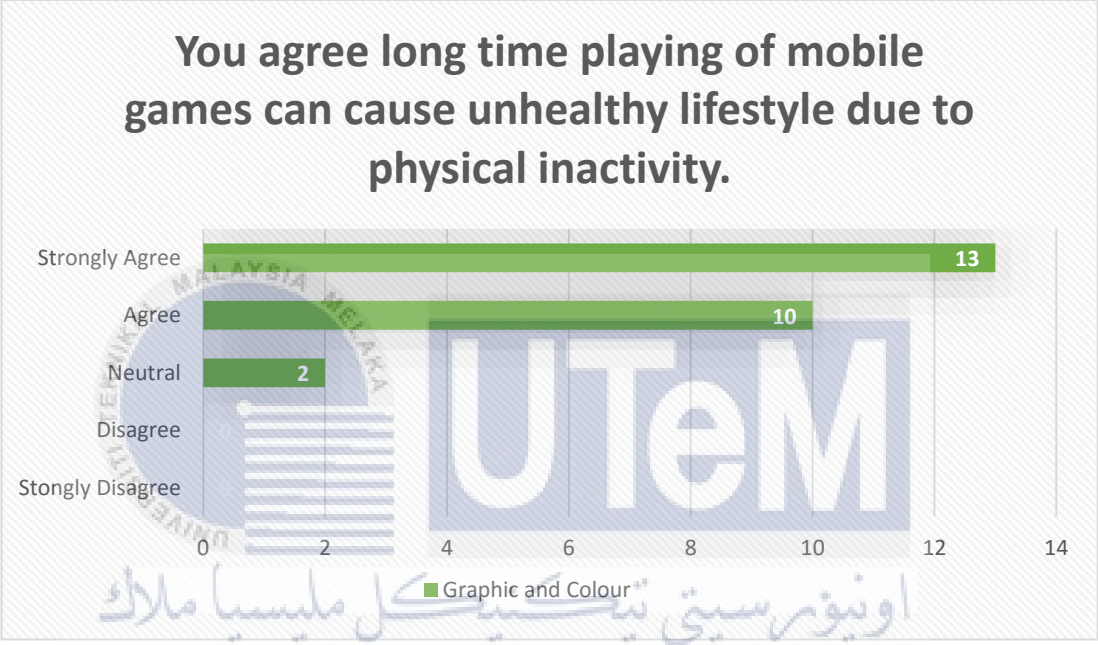


Figure 6.7 Level of concern on heath related issue

Figure 6.7 shows that 13 test users strongly agree and 10 test users agree that long time playing of mobile games can cause unhealthy lifestyle due to physical inactivity. This shows that creates a mobile game which integrates body movement is an alternative to solve the health issues regarding physical inactivity.

Figure 6.8 Willingness to stop playing game

Figure 6.7 shows that 10 test users have no comment while 8 test users agree and 7 test users disagree that they are able to reduce time on playing game for healthy purpose. This shows that most of the test users have no idea whether they able to reduce time spent on mobile game. As a result, there are 7 test users cannot control themselves to stop playing game.

6.5.2.3 Game Involves Physical Movement

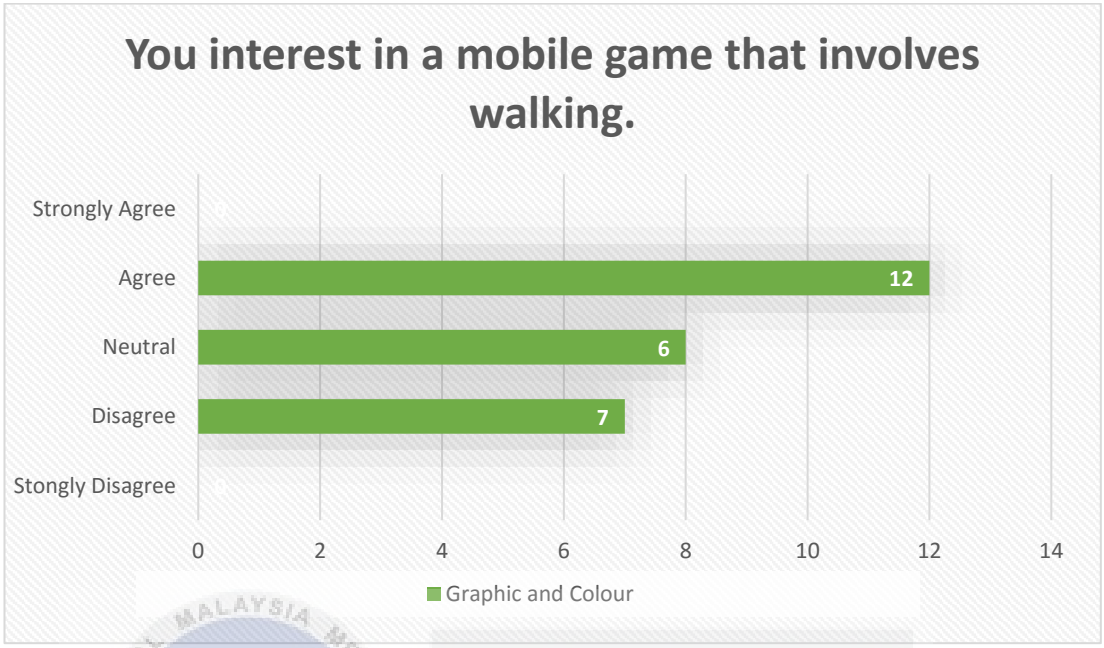


Figure 6.9 Level of interest on mobile game that involves walking

Figure 6.7 shows that 12 test users and 7 test users interest and not interest in a mobile game that involves walking respectively. This shows that mobile games can be developed since it was mostly acceptable by teenagers and young adults. There are 6 test user remain neutral, so an attractive gameplay may able to increase their interest to that particular game.

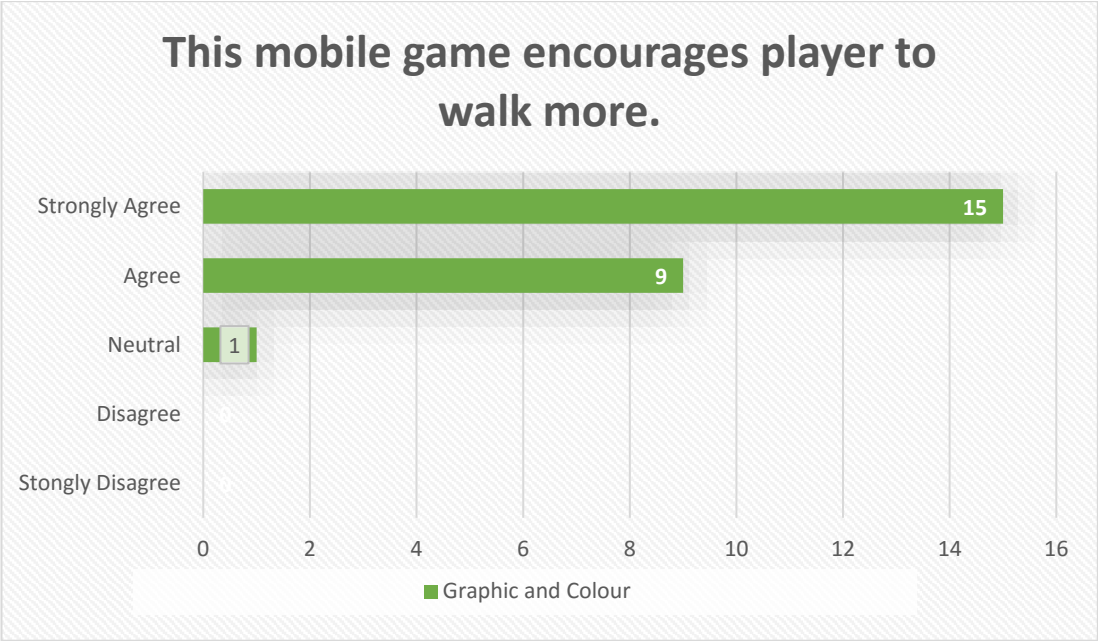


Figure 6.10 Level of agree on mobile game can encourage more physical movement

Figure 6.7 shows that 15 test users and 9 test users strongly agree and agree that this mobile game encourages player to walk more respectively. This shows that this mobile game consists of the gameplay that can solve physical inactivity problem of mobile player recently. There are 1 test user remain neutral and no test user disagrees about this statement.

6.5.2.4 GPS Feature

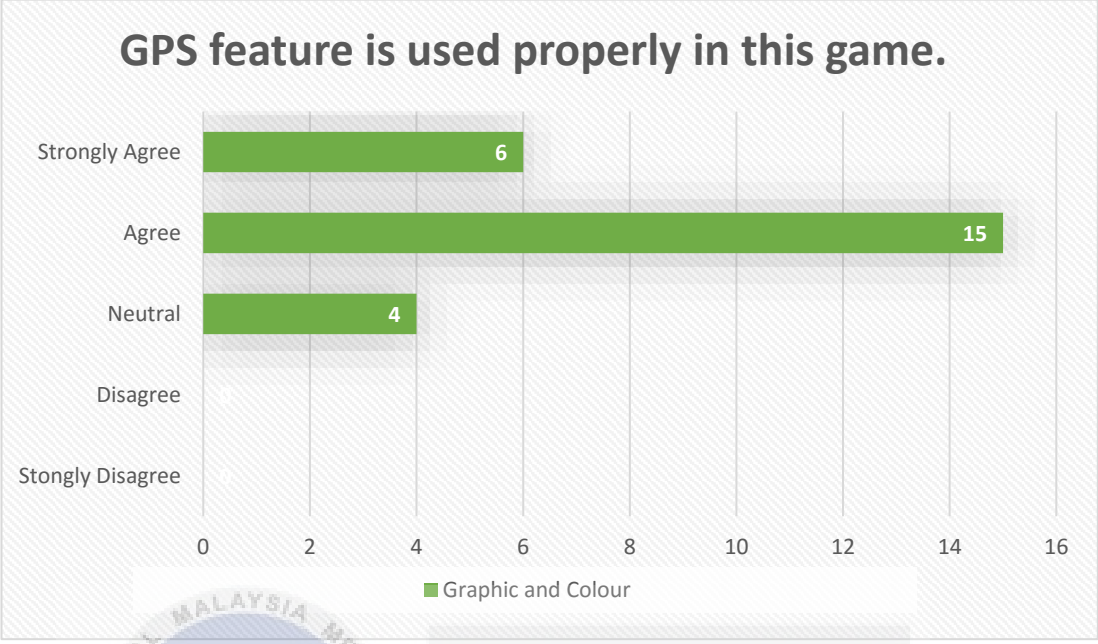


Figure 6.11 Level of satisfaction on GPS feature

Figure 6.7 shows that 15 test users agree that the GPS feature is used properly in this game. There are also 6 test users that strongly agree and 4 test users got no idea on the GPS function in this game. This shows that most of the test users satisfy with the GPS feature in this mobile game.

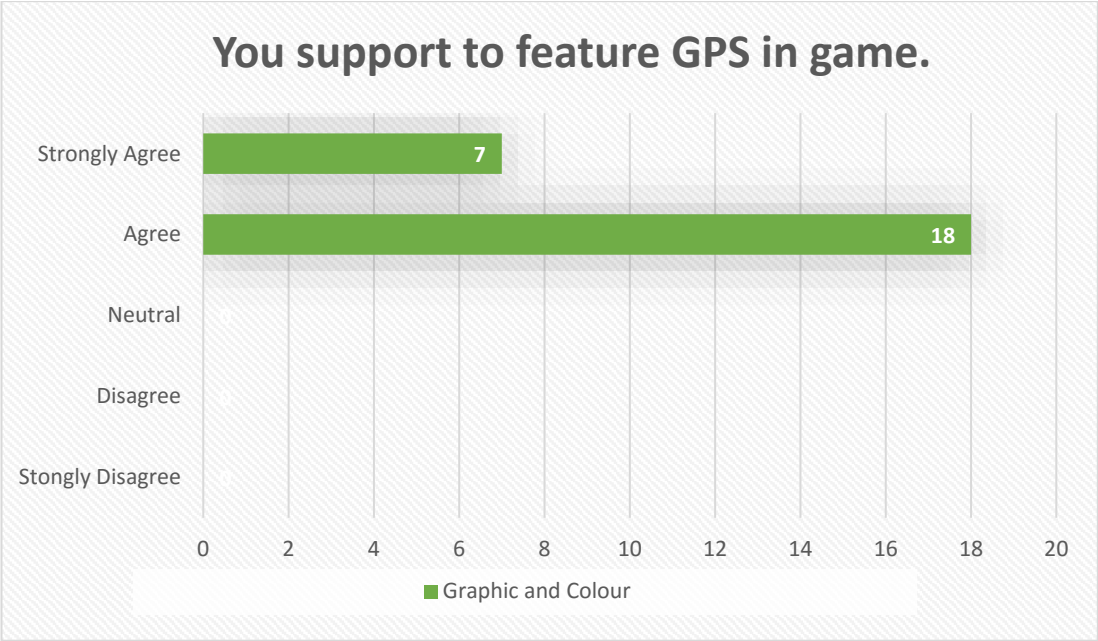


Figure 6.12 Level of support on the use of GPS

Figure 6.7 shows that 18 test users and 7 test users strongly support and support to use GPS feature in game respectively. All of the test users agree to feature GPS in game. This shows that GPS feature is highly accepted in developing mobile game.

6.5.1.5 Summary

The summary of result output from user acceptance test which is done by 25 test users is shown in the table below.

Table 6.6 User Acceptance Test Result

	Mean	Mode	Median
Q2	4.44	5	5
Q3	3.04	3	3
Q4	3.20	4	3
Q5	4.56	5	5
Q6	4.08	4	4
Q7	4.28	4	4

6.6 Analysis Testing

6.6.1 Functionality Test

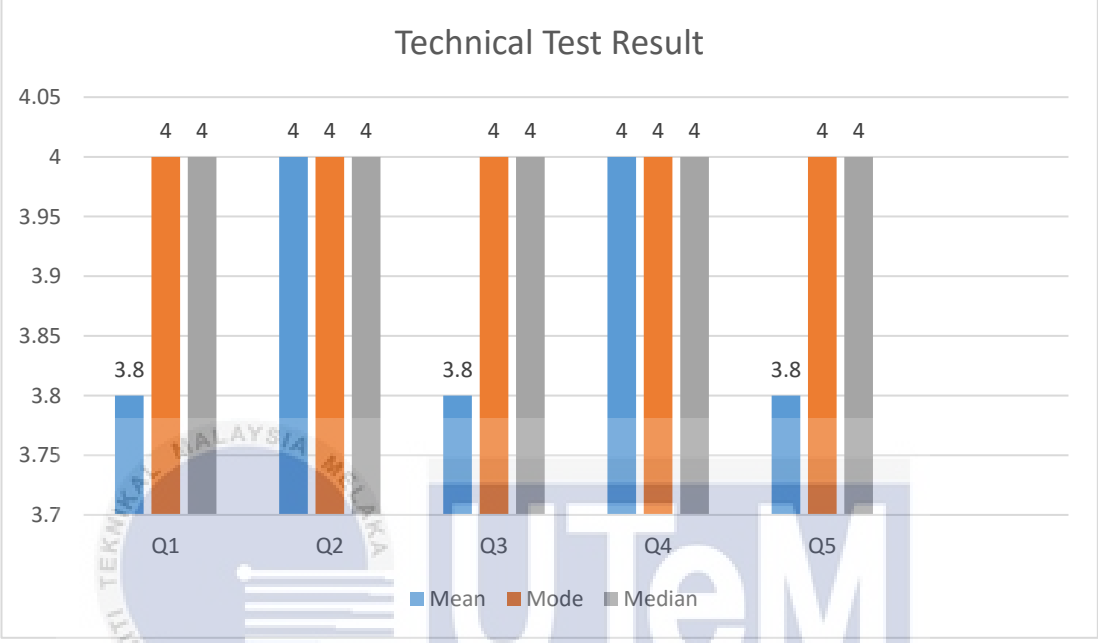


Figure 6.13 Rate on Functionality Test

Based on Figure 6.12, it can be concluded that the technical part of this mobile game is slight above the average value which is 3. The use of graphic and colour (Q1), navigation (Q2), interface design (Q3), font style and size (Q4) and audio (Q5) has the mean value that is more than 3. Overall, test users satisfied with the technical part of the mobile game but improvements are needed to increase the product quality especially for those aspects that is less than 4.

6.6.2 User Acceptance Test

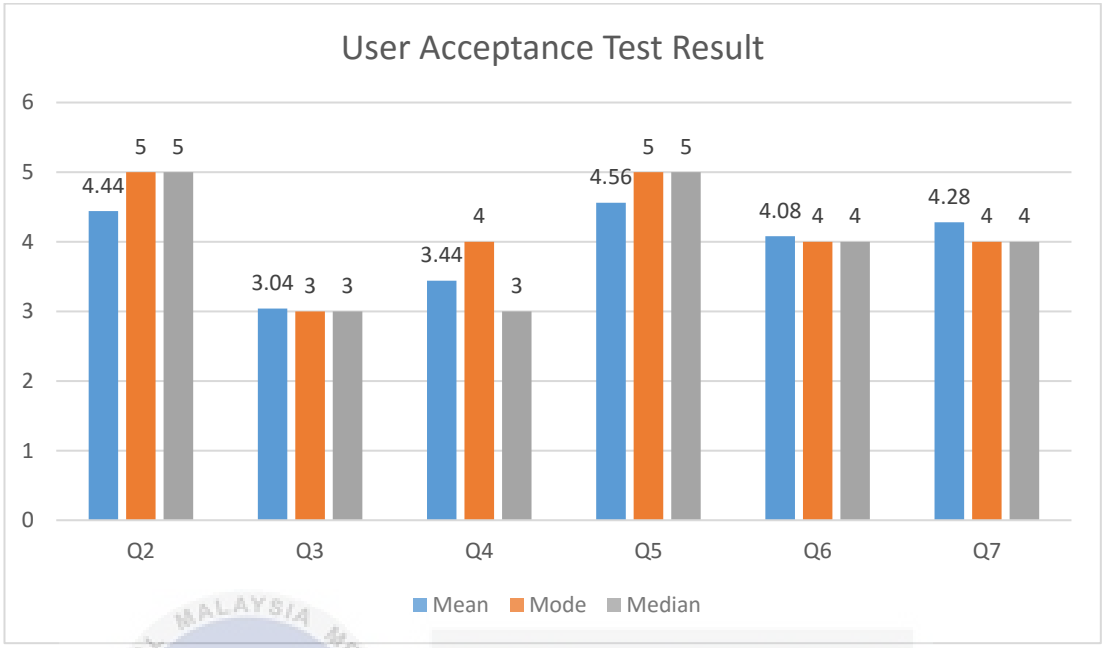


Figure 6.14 Rate on User Acceptance Test

The user acceptance test results show that young adults nowadays play mobile games at least 1 to 2 hours daily. This shows that the high popularity of mobile game among is age group. All of them strongly agree that long time playing of mobile game can contribute health issue like physical inactivity based on the result of Q2. Besides, there are some of the players show neutral data to walk during game. For the result of user acceptance test, most of the user shows their support on the game that involves walking that featured with GPS technology based on the result from Q4 to Q7. Test users give the value over 3 has proved their support on this game.

6.7 Conclusion

The results shows that this GPS integrated mobile game is a success and a good solution to encourage people to walk. The test users gave good and valuable feedback towards the idea of integration between GPS technology and game. High percentage of test users gave the good scale level of satisfaction to the game. They manage to play and control the game if they follow the instructions before starting the game. The results of test conclude that this game has fulfilled the requirements and achieved the objectives. The overall conclusion of the project will be discussed in next chapter.

CHAPTER VII

CONCLUSION

7.1 Observation on Weakness and Strengths

After analysing the data in testing phase, some strengths and weaknesses are discovered regarding this project.

7.1.1 Observation on Strengths

Based on the observation obtained, there are few strengths can be identified in this project. Firstly, GPS integrated game is an interesting way to increase the popularity of a game. The popularity of the GPS integrated game is highly increasing due to the launch of Pokemon Go recently. Most of the GPS-integrated game is more to role playing game or hunting game. Hence, casual game can follow the trend and integrate the GPS technology as part of the game play.

Besides, this game is believed that to increase user physical movement of player. Even though player can skip the walking mission, but player are encouraged to walk by giving extra score for every meter they walk. In the increasing of player, the physical inactivity issue among young adults can be reduced indirectly. Knowledge about caloric also included in this game to guide target player to maintain proper caloric level.

7.1.2 Observation on Weakness

One of the main weaknesses is the game design. The game is a levelled game which consists of only 3 levels. The game will be ended very fast if player skip walking mission. Besides, the track of runner game is straight where player can only swipe to left or right. It may be boring after few times of trying on a same game.

The GPS feature in the game may not precisely accurate therefore the tracking distance may varies from the actual distance walked. The GPS technology will increase the power consumption of the mobile devices. Player may run out of battery if they open it for long time. This game unable to detect whether a player is riding a vehicle. Hence, this is one of the weakness as player still able to get score even though they do not have any physical movement.

7.2 Propositions for Improvement

The propositions for improvement in this project is to enhance the game in different aspects. Firstly, increase the game levels to make the game more challenging or possibly change the game into endless runner game. Besides, the game can integrate the social site to enable player to compete with their own friends. Player can share their high score to the social site to show off their achievement.

Moreover, speed track should be included in this game to avoid player skip walking but gaining score. The accuracy of location of player during the game should be good to avoid player irritation. Hence, the function of the GPS in counting the distance should be refined to increase the accuracy.

Lastly, safe power mode should be added to the game to reduce power consumption. For example, the screen can auto turn off after certain minutes in walking scene without touching on screen.

7.3 Project Contribution

GPS integrated game is rarely discovered by user due to less popularity of GPS technology in game industry before launching of Pokemon Go. The creation of this game is one of the way to support the use GPS technology. Most of the GPS-integrated game is more to role playing game or hunting game. Casual game can follow the trend and integrate the GPS technology as part of the game play too as long as the gameplay is well-planned.

In addition, this game can reduce health-related issue because the player has to move during gaming session. Players are encouraged to walk by giving extra score for every meter they walk although player can skip the walking mission. In the increasing of player, the physical inactivity issue among young adults can be reduced indirectly. Knowledge about caloric also included in this game to guide target player to maintain proper caloric level.

7.4 Conclusion

Every project has its weakness and strength. The limitations can be listed out to make sure that the project always be enhanced but not out of the scope. Further improvement also will be stated to increase the quality of the project in future. Overall, the project has developed successfully and achieved the objectives. The game is believed to increase player physical movement (walking) if player not skip the walking mission. GPS technology is working in the game to calculate the distance walked. If the popularity of GPS-based game increases, it is no doubt that player physical movement can increase indirectly.

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APPENDIX A

PROJECT MILESTONE

APPENDIX A: PROJECT MILESTONE

Task	*Week*															
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Proposal PSM : Submission & Presentation																
Proposal assessment and verification																
Chapter 1 Proposal Correction/Improvement																
Chapter 1																
Chapter 1 & Chapter 2																
Chapter 2																
Chapter 2 & Chapter 3																
Project Demo & Chapter 3 & Chapter 4																
Project Demo & Chapter 4																
Project Demo & Chapter 4																
Project Demo																
Project Demo & PSM Report																
Project Demo & PSM Report																
Presentation Schedule																
Project Demo & PSM Report																
Final Presentation																

APPENDIX B

QUESTIONNAIRE

APPENDIX B: QUESTIONNAIRE

This form is used as feedback for the final year project entitled GPS-Integrated Mobile Game on Healthy Lifestyle.

Please tick (/) on the following questions.

Gender : □ Male □ Female

Age : □ 10- 20 □ 21 - 30 □ 31-40 □ 41 & above

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

Part A (User Acceptance)

1. How many hours you spend on mobile game daily?
   □ Less than 1 hour □ 1-2 hours □ 3-4hours □ More than 4 hours

2.	You agree long time playing of mobile games can cause unhealthy lifestyle due to physical inactivity.	1	2	3	4	5
3.	You able to reduce time on playing game for healthy purpose.	1	2	3	4	5
4.	You interest in a mobile game that involves walking.	1	2	3	4	5
5.	This mobile game encourages player to walk more.	1	2	3	4	5
6.	GPS feature is used properly in this game.	1	2	3	4	5
7.	You support to feature GPS in game.	1	2	3	4	5

8. How many calories is an orange?

□ 30 □ 45 □ 77 □ 63

9. How many calories is a can of Coca-Cola?

□ 70 □ 182 □ 220 □ 157

10. How many calories does a normal young adult need daily?

□ 2000 - 2400kcal □ 1000 - 1300kcal

□ 2600 - 3000kcal □ 1500 - 1800kcal

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

Part B (Functionality)

1.	3D game is more attractive than 2D game.	1	2	3	4	5
2.	The graphic and colour used is good in the mobile game.	1	2	3	4	5
3.	The navigation of the game is good.	1	2	3	4	5
4.	The interface design of the game is good.	1	2	3	4	5
5.	The font style and size used in the game is appropriate.	1	2	3	4	5
6.	Audio used in this game is suitable.	1	2	3	4	5

APPENDIX C

TURNITIN REPORT