Mobile Game Development for UTAR Kampar Campus Touring

BY

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A REPORT

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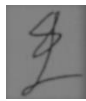
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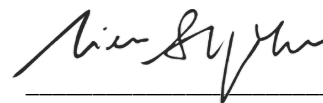
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ABSTRACT

Most of the campuses of renowned universities have their interesting attractions, and these attractions may also have good stories that are worth visitors exploring. For instance, there are quite many points of interest on UTAR Kampar campus. However, when visitors are visiting the campus, there lacks a good application that is able to introduce the backgrounds and stories of these campus attractions. Therefore, this project intends to use the concept of tourism gamification to attract visitors and promote UTAR Kampar campus with a gamified touring application. An Augmented Reality (AR) game will be developed to interact with the visitors while they are visiting UTAR Kampar campus in order to enhance their touring experience. Moreover, the game will also allow visitors to learn the stories of UTAR Kampar campus, and through playing with the quizzes in the game, the visitors can link the campus attractions together.

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LIST OF ABBREVIATIONS

UI   User Interface

CG   Computer Animation

AR   Augmented reality

VR   Virtual reality

Chapter 1: Introduction

1.1   Problem Statement and Motivation

Travelling around the world is a great way to learn about the history and culture of the region and to sample the local cuisine. But it's not just the famous sights that are worth visiting, such as Malacca. A good example of this is Kampar, where the early days of Campbell were so rich in tin that many people gathered together to form a town. As the tin mines began to dry up, people slowly left to find work in the big cities, especially the young people.

As most young people leave the countryside, the employed population decreases and the labor shortage leads to a reduction in productivity. Older people will also have to continue working because of their needs of pensions. For families, the ageing population will add to the burden of the family because retired or elderly people will have to rely on family members to take care of them, especially those with mobility problems. The labor force in hospitals and other facilities will also increase because the elder is prone to suffer from illnesses and facetious diseases. Therefore, they dependent on medical services so much.

In order to solve this problem, the promotion of local tourism can be used to attract young people back to work in the countryside, which can increase the employment opportunity to attract the workforce and improve the situation of the ageing population. But promote tourism in this area is a challenge. Usually, when people decide a place to travel, they search the internet and choose a place that has a famous historical site or a well-known tourist attraction.

However, most people do not search this kind of information and travel there. Or some people have a local tour for no purpose. In the end, some of them are likely to lose interest and become bored, and the area becomes a small, ordinary town in their memories. There are no unforgettable or memorable memories, so they would not recommend this place to their friends and family. The challenge of this project is to develop a tourism mobile game that can keep visitors interested, introduce them to stories behind the attractions, and allow them to gain good touring experience so that they can keep a long-lasting memory when they leave Kampar.

1.2   Objectives

The main Objectives to develop an AR mobile game of historic town exploration for Kampar tourism are:

- To develop a mobile game that has a good storyline to interact with the visitors on UTAR Kampar campus
- To introduce the interesting backgrounds and stories of the attractions of UTAR Kampar campus to visitors
- To enable the visitors to link the attractions on UTAR Kampar campus so that they can have a memorable overall touring experience

1.3   Project Scope

According to the papers reviewed in Section 2, in order to attract more foreign and domestic tourists to an area, touring game applications can be developed using the Augmented Reality (AR) and gamification technologies.

Due to the lack of time and manpower, this project will focus on UTAR Kampar campus to demonstrate that such a touring mobile game is possible to enhance the touring experience of visitors. That is, several attractions in UTAR Kampar campus will be selected to develop the AR tourism games, which can be implemented in other areas after it is proven to be feasible.

The aim is to promote the place to a wider audience, and through the use of AR games, visitors can learn about the history and stories of the place without being bored. It will also leave a lasting impression. When visitors arrive at the designated starting location, information about the place will be displayed to them and the next location will be recommended to them, allowing them to follow the story of the place.

The stories in the game are based on the history of the place or interesting stories, and the stories of multiple areas are linked together to form a complete story line, which visitors can follow in the order of the story. When the story ends, it means that the visitor has finished visiting the area.

Before visitors move on to the next point there is a game for visitors to play, which involves defeating enemies by answering questions about the story and history

of the area. The game is played by answering the correct answers to a specified number of questions before the bank of questions bank is exhausted.

The number of points awarded for passing the game depends on how long it takes to pass the game, the fewer the points, the more user get. A personalized electronic postcard is created when special achievements are completed, allowing users to collect different electronic postcards and share them with others.

1.4 Contributions

The project will use the benefits of gamification to attract visitors to the site and to enhance their experience during their visit. Storytelling will also make it easier for visitors to understand the place as they play the game and learn about the background of the place. It also leaves visitors with unforgettable memories that will make them want to visit again and recommend the same place to their family and friends.

1.5 Report Organization

This report is organized into 6 chapters. Chapter 1 Introduction, this chapter provides the project background, problem statements, objective, scope, proposed solution and report organization. Chapter 2 Literature Review, this chapter will focus on the literature review of "gamification" and "augmented reality", and also review existing applications which have similar concepts. Chapter 3 System Methodology, it discusses the whole system design of this project. Chapter 4 System design, this chapter will discuss more details about how to implement the system design. Chapter 5 System Implementation, this chapter will show the Implementation details such as hardware and software setup, how to operate the application and the facing issues. Chapter 6 System Evaluation and Discussion, in this chapter will show the testing result of the application and do the objectives evaluation. Chapter 7 Conclusion and Recommendation, this chapter brings the report and project to a wrap, and give the recommendation to improve future work

Chapter 2: Literature Review

2.1 Review Current Exiting Application

2.1.1 Pokémon GO

Pokémon GO is a famous game in the world. This is the AR mobile game based on location services. It is available on IOS and Android platforms since July 2016. This game can let the player to catch the Pokémon and train them (Figure2.1). After training, the player can bring his trained Pokémon to fight with other people to occupy the Dojo (The place for the player fighting).

This Pokémon game not like the common Pokémon game, it combines some real-world elements. This game will according the environment to provide different kinds of Pokémon. For instance, if the player the areas near water (Lakes, seas and rivers), then the water-based Pokémon will have more likely to appear than in other areas (Figure 2.2). When user want to hatching Pokémon eggs, the user requires to walk or move actual certainly distance (Figure 2.3). User also can go to some special location to take some items like Elf Ball (The item to catch Pokémon) (Figure2.4).

However, Pokémon GO include the many gamification elements. But it does not have enough tourism elements, and has no clear guide route or a description of the special attractions in the local.

Figure **Error! No text of specified style in document.**.1
Catch Pokémon

Figure **Error! No text of specified style in document.**.2
Near water area

Figure **Error! No text of specified style in document.**.3 Hatching page

Figure **Error! No text of specified style in document.**.4 Collection point

2.1.2 Questo

Questo is a city exploration game, it needs the user to go to tourist attractions or someplace to find out discover new places and stories. Questo needs the user to arrive at the attractions then can start the game. Otherwise, the game cannot start. Questo will let the user choose the route and guide them from there. Then the user can find the clues and try to solve the riddles, they need to discover the hidden symbols around the town. After, the user can explore popular and lesser-known spots. Also can understand some interesting fact and legends that just only the locals knew.

This game is very flexible, lets the user explore the area at your preferred speedy, and doesn't have to rely on a tour group to have a good travel experience. To date, these games have been used in over 100 cities. This game can download from the Google play store and it is free to download. But some games need to pay the money to unlock it that most expensive prices are up to RM 82.99. The user still can try the free game, if they like it they can buy more games to play.

The home page (Figure 2.5) will show the beautiful picture for the attraction and featured game, and give some simple information. Let user can know which place is more popular. As shown in Figure 2.6 to 2.8, that show the detail information about the game, such as description, roughly duration, highlights, map. Let the user can more easy to know the place in general. When user got the answer correct, they will get the point and get the story about the place where they are. And Questo will record the point and compare yourself with other players. As show in Figure 2.9, it has a leader board to show the ranking for the user.

However, the story is scattered. Each game in Questo are not have the relationship. When the user completes the game and they may not play the next game which are near them. Because there is not enough of an attraction for them.

Figure **Error! No text of specified style in document.**.3 Home page

Figure **Error! No text of specified style in document.**.4 Game Information
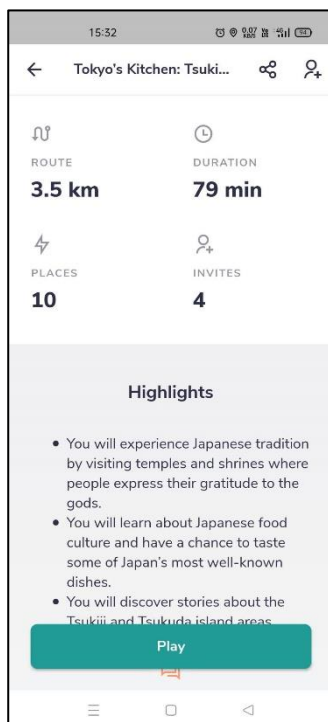
Figure **Error! No text of specified style in document.**.7 Game Information
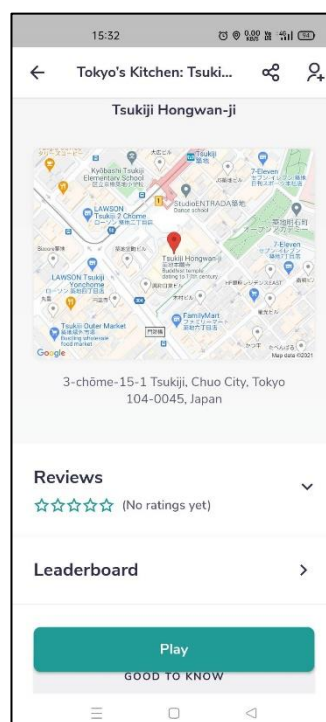
Figure **Error! No text of specified style in document.**.8 Game Information
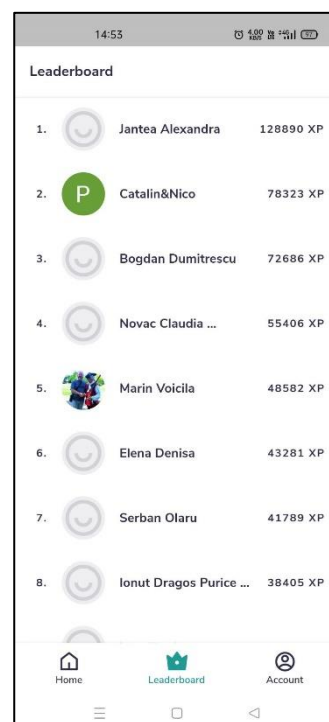
Figure **Error! No text of specified style in document.**.9 Leader board

2.1.3 XTVT-Travel Malaysia

XTVT-Travel Malaysia is a common travel application, the user can use this application to find places to go to visit and travel Malaysia. This application can let user to plan their favourite activities, flexibility and the ability to travel without a tour guide. User can search for places he wants to visit and the app will categorize it. Such as food, beach, diving, climbing and caving (Figure 2.10). This app will provide the nearby attractions based on the user's current location, also allows user to use map navigation (Figure 2.11), making it easy for beginner to get to their destination. When user try to find the place they want to go, they can find the nearby hotels and B&BS through the accommodation button (Figure 2.11). In the same page the user also can look the description, photo, operation hours, website and address of the place.

As shown in Figure 2.12, the application provides the featured experience for the user who do not know where can go or do not know the area well. XTVT also provides links to purchase tickets and is an alliance partners of travel providers and suppliers. The aim is to provide convenience and enhance the travel experience.

However, it is very convenient function for the travel, in the travel experience can be enhanced by applying gamification. It also can enhance the visitor's impression of the destination and create special memories.
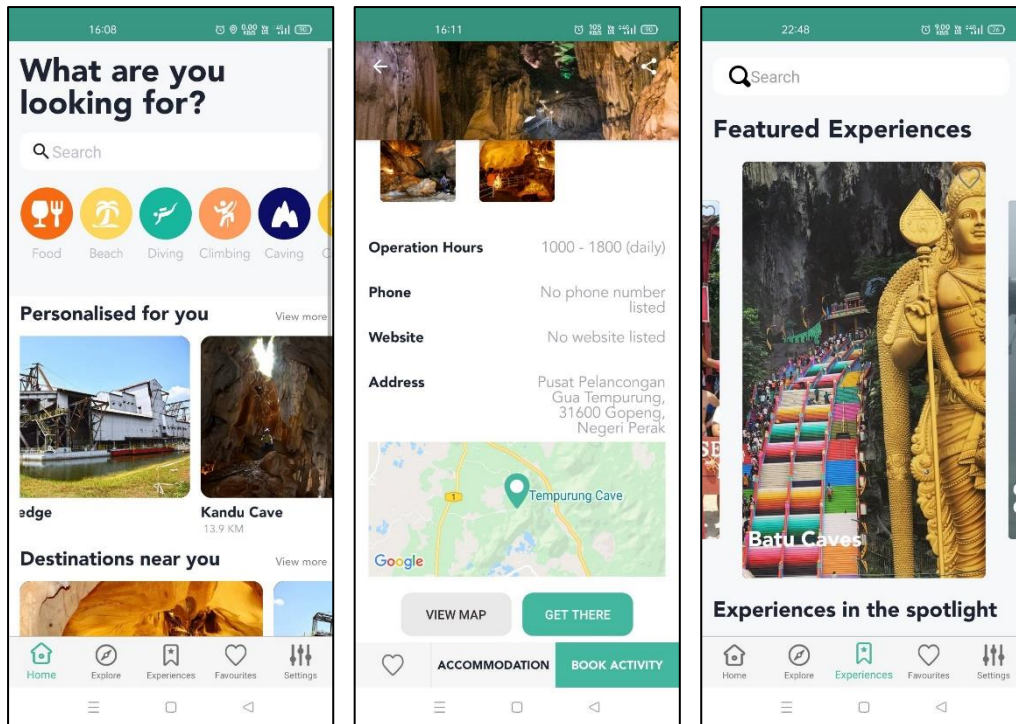
Figure **Error! No text of specified style in document.**.10 Figure **Error! No text of specified style in document.**.11 Figure **Error! No text of specified style in document.**.12

Home page   Attraction detail   Featured page

2.2 The introduction of gamification: A review paper about the applied gamification in the smartphone applications

This conference paper by Toth and Tovolgyi reviewed about the impact of gamification [1], how it would changed and drive user behaviour. Gamification was defined as the use of game design elements in a non-game environment, and many companies were now using gamification to attract users. Gamification was made up of the following components:

Loyalty

It is used to identify the level of engagement of users, to determine how active they are and whether they are loyal users.

Points

It is used to give users judgment and feedback for completing levels or achieving certain achievements, which can also be seen as rewards.

Leader boards

Like a competition ranking, the goal is to get to the top of the leader board, taking advantage of the fact that people want to be at the top to stimulate participation.

Badges

It is a way of showing status or honor to the user, telling others what they have achieved, so that when other users see it they will have the desire to achieve the same badge.

Avatar

This is a representation of the game user's character in the game world. It may be a picture or a 3D model.

Levels

It remains a challenge during the game and allows the player to continue to learn new skills, usually the higher the level symbolizes the stronger the player is.

Process bar

This is a system that gives the user an easy way to see his progress, to check the gap to the next level or to look back at previous records.

These different elements can have different effects, so it is important to choose what works for each game mode or environment.

The ability to change user behaviour is one of the capabilities of gamification, enhancing the motivation of users to want to play or use the application, which was divided into extrinsic and intrinsic motivations. Extrinsic motivations included money, points, badges, leader boards, process bar and avatar. Intrinsic motivations included instant feedbacks, group quests, Easter eggs and wonderful story.

Proper use of gamification could increase the user's motivation and willingness to participate, but if it was not applied to the right system it could have many negative effects, such as too many external rewards, the aesthetics of the game was not in match

with the story, there was no point in playing the game and because the low level of usability so difficult to apply the gamified system.

2.3 Research on Gamification-based Tourism Experience Design for Cultural Sustainability

This Research paper by ZHANG Duo-duo and LUO Peng-ri reviewed about applying the idea of gamification to tourism [2], observing the impact of gamification on tourists and local residents, and achieving sustainable results through gamification.

They used the Dynamic model of tourism experience, which consists of seven stages:

Orientation (O) - Attractiveness of the tourism resource.

Attachment (A) - Promotion and marketing of the destination.

Visiting (V) - The experience of visiting a destination.

Evaluation (E) - The visitor's own comparison and evaluation of previous experiences.

Storing (S) - Purchasing local products, developing new social relationships and gaining spiritual enjoyment.

Reflection (R) - the recurrence of the characteristics and memories of the destination.

Enrichment (EN) - The more stages visitor's go through, the more intense the experience will be.
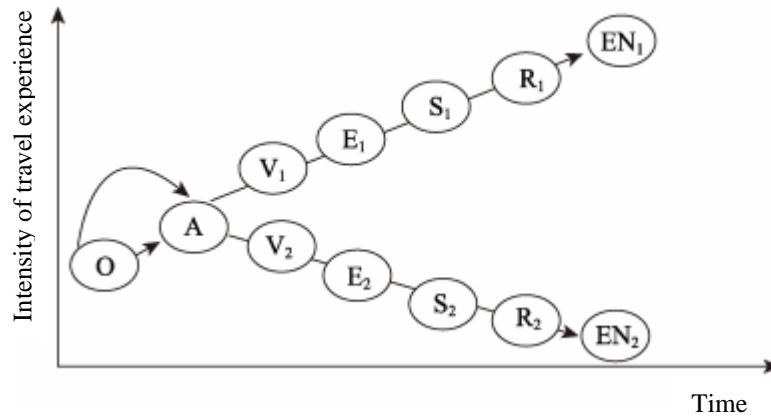
Figure **Error! No text of specified style in document.**.13 Dynamic model of tourism experience [2]

The experience could be optimized and managed by adjusting the controllable factors at these points. As the experience was cumulative, the experience of one stage would influence the experience of the next. For developers, Visiting (V), Evaluation (E), Storing (S) and Enrichment (EN). Those were the most effective stage of adjustment for developers.

Although gamification was not the same as game design, there were still some game design methods that could be applied to the design of gamification by referring to game design methods.

MDA was one of the most fundamental and important game design methods. It consisted of Mechanics, Dynamics and Aesthetics. Mechanics referred to the rules of the game and was the basis of interaction in the game. Dynamics referred to the player's interaction with the game. Aesthetics referred to the player's experience of the game, including the outcome of the interaction, emotions and feedback. Gamification was a method of optimizing the experience and was being used in a variety of areas because it enhanced user engagement, interaction, loyalty and immersion.

The article mentioned the problems of poorly developed tourist attractions, the lack of access to local customs and the lack of equal appreciation of local culture by tourists due to cultural differences. To address these issues, they made the change in four stages with gamification.

Attachment (A) - used multiple objectives and task to attract visitors.

Visiting (V) - used a different model of travel, such as adventure and treasure hunting.

Evaluation (E) - set tasks and rewards visitors when they completed it.

Storing (S) - used AR technology to feature local features in the game.

So, we can know these factors are flexible and can be adjusted in different ways depending on the environment.

2.4 Use of Augmented Reality and Gamification techniques in tourism

The review paper by Mesároš et al. reviewed about the Combining Augmented Reality and Gamification techniques [3]. The applications could be created of the AR tourism industry.

AR is a technology that has been used in many places, including the arts, business, travel, education, music, games and more. AR can create an interface that allowed user to see virtual parts of the physical world through a screen. Ronald Azuma in 1996 pointed out the three key features of AR technologies: it combines the real and the virtual world, it is interactive and registered in a 3D environment.

Originally the device used for VR applications, AR applications have been taken over by mobile phones. Although using a mobile phone to experience AR applications reduces the degree of user's immersion. However, it is much easier for users to use AR applications. AR can be used in virtual reconstructions, so that people can see things that have disappeared from the world. AR can also be used to transfer knowledge by stacking different periods of history onto screen, allowing user to see old

scenario, and introducing gamification concepts to increase user interaction with the content.

As the California government intends to demolish the area, the CodeCabanyal app used AR to show visitors the urban area, creating an alternative itinerary that presented information about the areas that had not been demolished by the government and had been demolished as well. So that visitors and those who have not seen these scenes could get a better understanding of the area.

Figure **Error! No text of specified style in document.**.14 CodeCabanyal [3]

The application showed each important building, monument and displayed specific content that provided information about these buildings.

Figure **Error! No text of specified style in document.**.15 MiraAlicante [3]

2.5 Enhancing Tourism Potential by Using Gamification Techniques and Augmented Reality in Mobile Games

The review article by Bogdan LENT and Marta MARCINIAK reviewed of the attractiveness of gamification and AR technology to tourists [4]. Analysis of trends in tourism development and the creation of location-based tourism games to enhance the tourism potential of cities.

Gamification and AR could increase commitment and loyalty, increasing tourism brand awareness, strengthening tourist experience and increase of tourists' internal motivation. In particular, it was possible to create special and personal memories through entertainment, as well as using games to give visitors a sense of achievement and interaction with others.

The results of the survey showed that gamification and AR were considered very attractive and that foreign visitors could use their mobile phones to learn about the different tourist information in the city. Most people travelled in groups rather than alone and this needed to be taken into account when developing games. The majority of respondents felt that AR would have a huge impact on the appeal of the game in a good way. Nearly half of them thought that the game would definitely become a memorable experience. There was also a high chance that visitors would return to the place again.

It can be concluded from this survey that the use of gamification and AR technology can increase the attractiveness of the area to tourists, and that foreign tourists are also interested in this technology.

2.6 The Research of Narrative in Digital Game Creation

The review paper by Chien Wen Cheng and Xin Tong Zhao [5], was a review how storytelling could be applied to games, summarizing the medium, structure and some rules of thumb that could be followed when creating a game plot. The narrative consisted mainly of pre-designed story content and player interactions and reactions. The aim was to find the best balance, so that the player could become more involved in the story, as if they were the protagonist, which was a feature of the narrative.

A good storyline could enhance the depth of the game and increased the player's satisfaction with the game. That was why it was important to design a good story and how it was presented when developing new game, so that players could easily understand the intentions of the game's developer and enjoyed the experience.

There were many different forms of interaction and many different narratives. Without narrative or gameplay elements, interactive worked would not be as attractive as they could be. As a protagonist in a story line, the player was easily transported into the game and therefore had a greater sense of immersion.

There are 4 types of narrative, the first being the use of text or written expression, which is the most common type of narrative. The second is to interact with the characters in the game through dialogue, which is easier to integrate with the original backstory. The third type of narrative is the graphical narrative, usually using graphics and text as the main narrative, usually as a turning point in the plot and to provide clues to the player about the plot. The last type of narrative is through CG animation, which is essential in today's games. It is usually used for major storylines or key scenes in the game to make the most impressive impression. The first 2 are usually used in simple games and are the preferred method of narration.

There are two main types of narrative structure, the first is the linear narrative structure (like a so-called story line) and the other is the sandbox narrative mode. Linear narrative structures are divided into 4 types of structures:

2.6.1 Point and line narrative Mode

The whole story is divided into different sections and events, which are then combined together to form a complete story line according to the elements of the game. This makes it very easy for the producer to control the plot and development of the game, and is suitable for most game genres, especially for the Pass through the game.
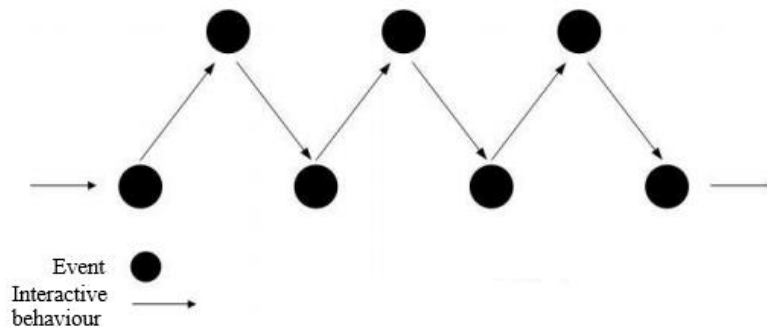
Figure **Error! No text of specified style in document.**.16 Point and line narrative Mode [5]

2.6.2 Branching Narrative Mode

This mode features a storyline or ending that changes depending on the player's choice of events, for example, if the player chooses to spare the life of the final demon king when he defeats him, the demon king will change his ways. Conversely, if the player tries to kill the Demon King, the Demon King will choose to die with the player. This means that the endings are divided into good and bad endings depending on the player's choice.
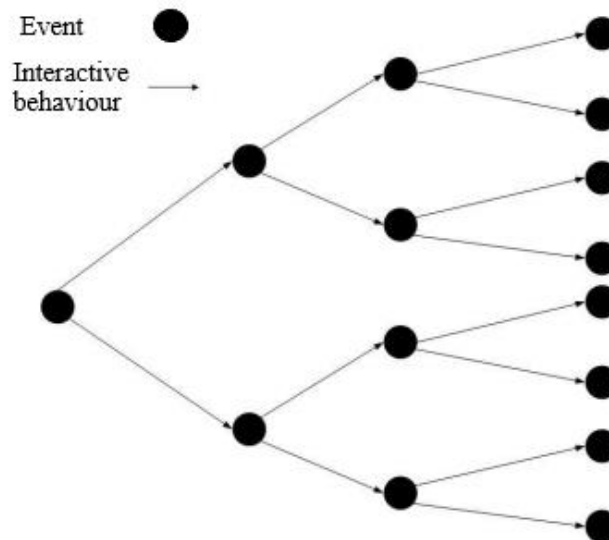

Figure **Error! No text of specified style in document.**.17 Branching Narrative Mode [5]

2.6.3 Parallel Narrative Mode

This mode contains both of the above, with some events being reversed and some differences in the plot in the middle, with the possibility of all story lines being combined at the end.
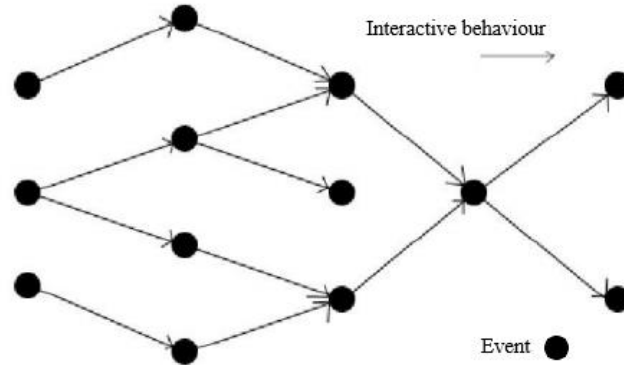

Figure **Error! No text of specified style in document.**.18 Parallel Narrative Mode [5]

2.6.4 Mesh Narrative Mode

In this narrative mode, the player is faced with a number of choices, and depending on the choices the player makes, a butterfly effect occurs. This will change the course of the narrative and the presentation of the game.

As user complete an advanced level, user can unlock a number of short stories, which gradually build up into a complete story as user progress further exploring. At the end of the game, the user will have a thoroughly understand of the entire story.
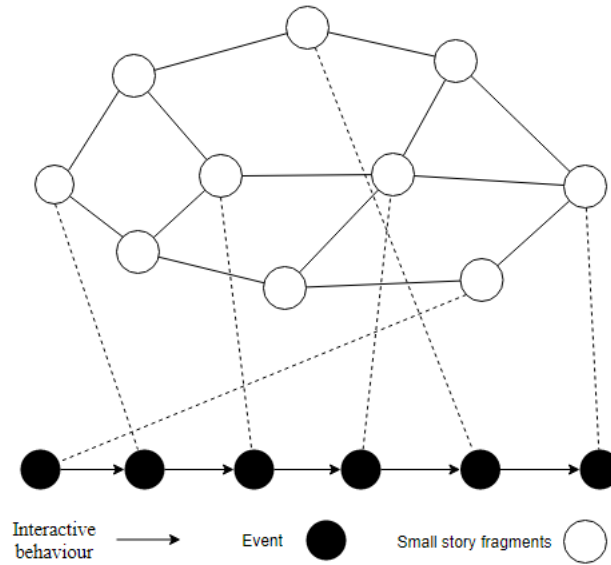
Figure **Error! No text of specified style in document.**.19 Mesh Narrative Mode

2.6.5 Sandbox Narrative Mode

This mode is characterized by freedom and creativity, as the player does not have to follow the main game line to experience the game. Instead, the player is free to experience a variety of characters in the game world and to navigate the world without constraint.

In conclusion, when the developer to develop the new game, need to consider the game content and mechanics to choose suitable narrative medium and structure. There is no one medium or structure that is perfect, that can use on any game.

Chapter 3: System Methodology/Approach

3.1 System Design Diagram

3.1.1 System Architecture Diagram

Figure had shown the system architecture diagram for whole application. Because this application was using the android studio to develop, it could only execute on the android device. The application was using firebase to store the user information and do the authentication of the user.
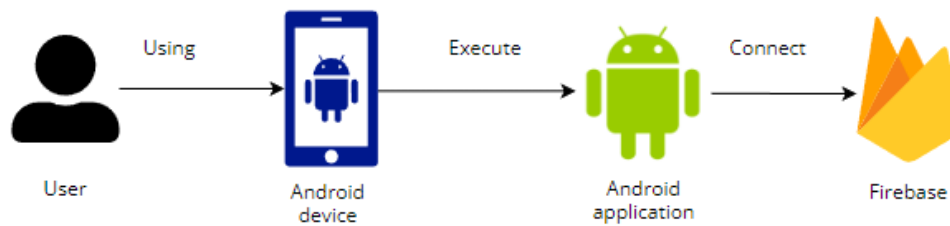

Figure 3.1 System Architecture Diagram

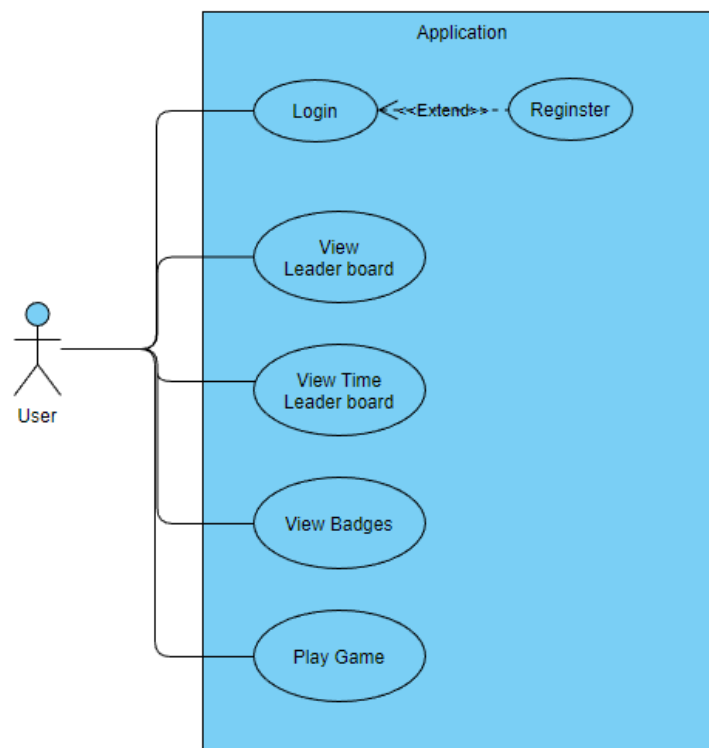**3.1.2 Use Case Diagram and Description**

3.1.2.1 Use Case Diagram

Figure 3.2 System use case diagram

3.1.2.2 Login Use Case Description

Use Case ID	UC001	Version		1.0
Use Case	Login			
Purpose	Authentication of the user and the granting of access to specific users.			
Actor	User			
Trigger	User launch the application			
Precondition	-			
Scenario Name	Step	Action		
Main flow	1	User launches this application.		
	2	System request user enter user email and password.		
	3	User enter the email and password.		
	4	System validates the input user email and password.		
	5	Successful login and redirect to home page.		
Alternate Flow – Invalid Email and Password	4a.1	User enter wrong email or password		
	4a.2	System validates the input email and password		
	4a.3	System display error message and let the user re-login again		
	4a.4	Back to main flow step 2.		
Alternate Flow – Email or Password is empty	4b.1	User does not enter email or password or both		
	4b.2	System validates the input user email and password		
	4b.3	System display error message and let the user re-login again.		

	4b.4	Back to main flow step 2.
Rules	-	
Author	Chen Zhe Sheng	

Table 3.1 Login Use Case Description

3.1.2.3 Register Use Case Description

Use Case ID	UC002	Version		1.0
Use Case	Register			
Purpose	Allow new user to create a new account in order to use this application.			
Actor	User			
Trigger	User click "if no account click here"			
Precondition	User at login page			
Scenario Name	Step	Action		
Main flow	1	User click "if no account click here" words.		
	2	System request user enter user email, password and confirm password.		
	3	User enter the email, password and confirm password.		
	4	System validates the input user email, password and confirm password.		
	5	System push the information to firebase to create new account.		
	6	System request user input user name.		
	7	User input user name.		
	8	System update user information to firebase.		

	9	System redirect to welcome new user page.
	10	User click "OK!" button.
	11	System redirect to home page.
Alternate Flow – Email, Password or confirm password is empty.	4a.1	User does not enter email or password or confirm password.
	4a.2	System validates the input user email, password and confirm password.
	4a.3	System display error message.
	4a.4	Back to main flow step 2.
Alternate Flow – Password do not match confirm password	4b.1	User's password do not match confirm password.
	4b.2	System validates the input email, password and confirm password.
	4b.3	System display error message.
	4b.4	Back to main flow step 2.
Rules	-	
Author	Chen Zhe Sheng	

Table 3.2 Register Use Case Description

3.1.2.4 Game Use Case Description

Use Case ID	UC004	Version	1.0
Use Case	Game		
Purpose	Let the user understand the local story and play the game to get the points.		
Actor	User		
Trigger	User click play game image in home page.		

Precondition	-	
Scenario Name	Step	Action
Main flow	1	User click play game image in home page.
	2	System check the user current location and trigger condition of the game.
	3	System redirect to find module page
	4	User fined the module and click the button to iterate with module.
	5	System redirect to local story page and wait user click play game button.
	6	User click play game button
	7	System redirect to game page.
		Request user select answer.
	8	User select answer and click submit button.
	9	System validate the user selected answer.
	10	System update user information to firebase.
	11	System redirect to ending story page.
	12	User click OK button.
	13	System redirect to home page.
Alternate Flow – The distance between the user and the game point is more than setting trigger condition.	2a.1	User click play game image in home page. But user no near to the game point.
	2a.2	System check the user current location and trigger condition of the game.
	2a.3	System display error message

Alternate Flow – User do not finish game 1, 2 and 3. User current location trigger the final game point.	2b.1	User click play game image in home page. But user do not finish other game.
	2b.2	System check the user current location and trigger condition of the game.
	2b.3	System display error message.
Alternate Flow – User choose the wrong answer	9.1	User select the wrong answer.
	9.2	System validate the user selected answer.
	9.3	System display error message and let user to select new answer again.
Rules	-	
Author	Chen Zhe Sheng	

Table 3.3 Game Use Case Description

3.1.2.5 Leader board Use Case Description

Use Case ID	UC005	Version		1.0
Use Case	Leader board			
Purpose	Display the user where they rank and points in the application.			
Actor	User			
Trigger	User click leader board image in home page.			
Precondition	User at home page			
Scenario Name	Step	Action		
Main flow	1	User click leader board image in home page.		
	2	System read all user data from firebase.		
	3	System display leader board information.		

Rules	-
Author	Chen Zhe Sheng

Table 3.4 Leader Board Use Case Description

3.1.2.6 Time Leader board Use Case Description

Use Case ID	UC006	Version		1.0
Use Case	Time leader board			
Purpose	Display the user where they rank and spend time in the application.			
Actor	User			
Trigger	User click time leader board image in home page.			
Precondition	User at home page			
Scenario Name	Step	Action		
Main flow	1	User click time leader board image in home page.		
	2	System read user data who are finish all game from firebase.		
	3	System display time leader board information from data get from firebase.		
Rules	-			
Author	Chen Zhe Sheng			

Table 3.5 Time Leader Board Use Case Description

3.1.2.7 Badges Use Case Description

Use Case ID	UC007	Version		1.0
Use Case	Badge			
Purpose	Display the user collected badges in the application.			
Actor	User			
Trigger	User click badge image in home page.			
Precondition	User at home page			
Scenario Name	Step	Action		
Main flow	1	User click badge image in home page.		
	2	System read current user data from firebase.		
	3	System check users to complete which game point.		
	4	System display badge according to the check result.		
Rules	-			
Author	Chen Zhe Sheng			

Table 3.6 Badges Use Case Description

3.1.3 Activity Diagram

3.1.3.1 Login Activity Diagram
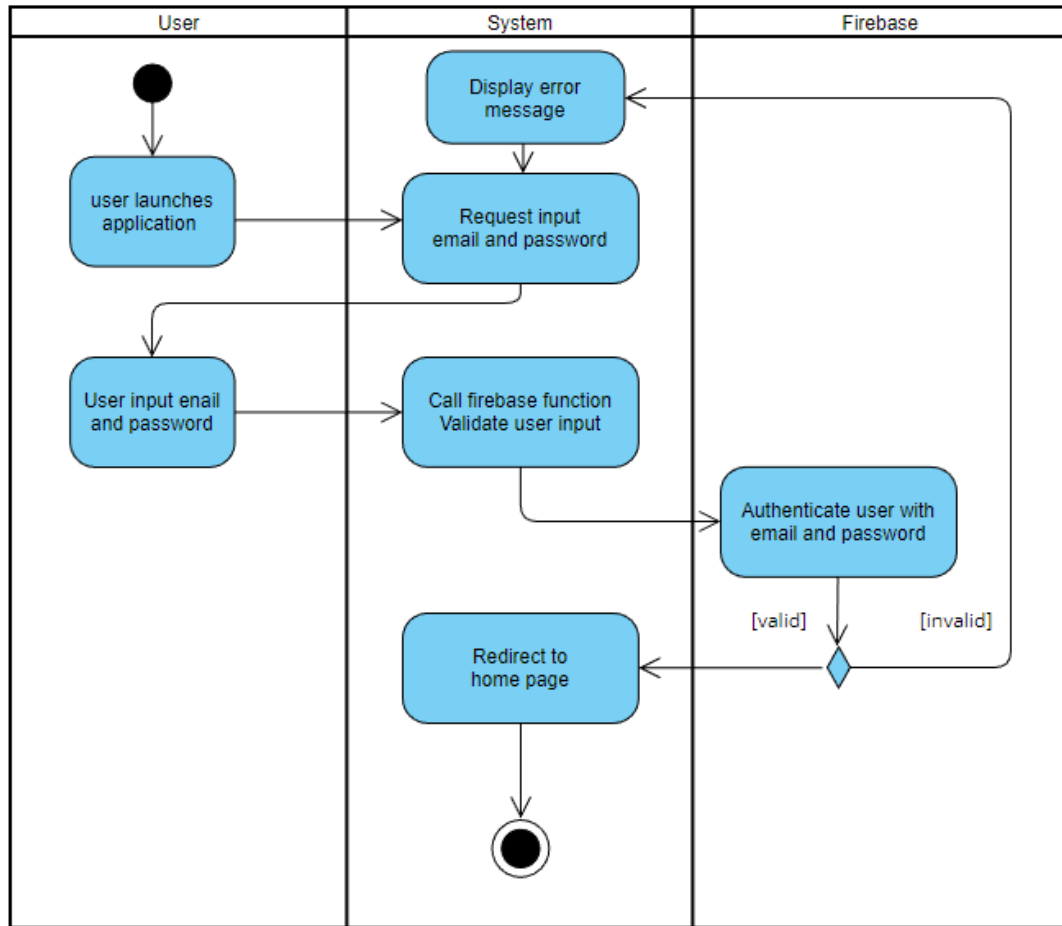
Figure 3.3 Login Activity Diagram

3.1.3.2 Register Activity Diagram
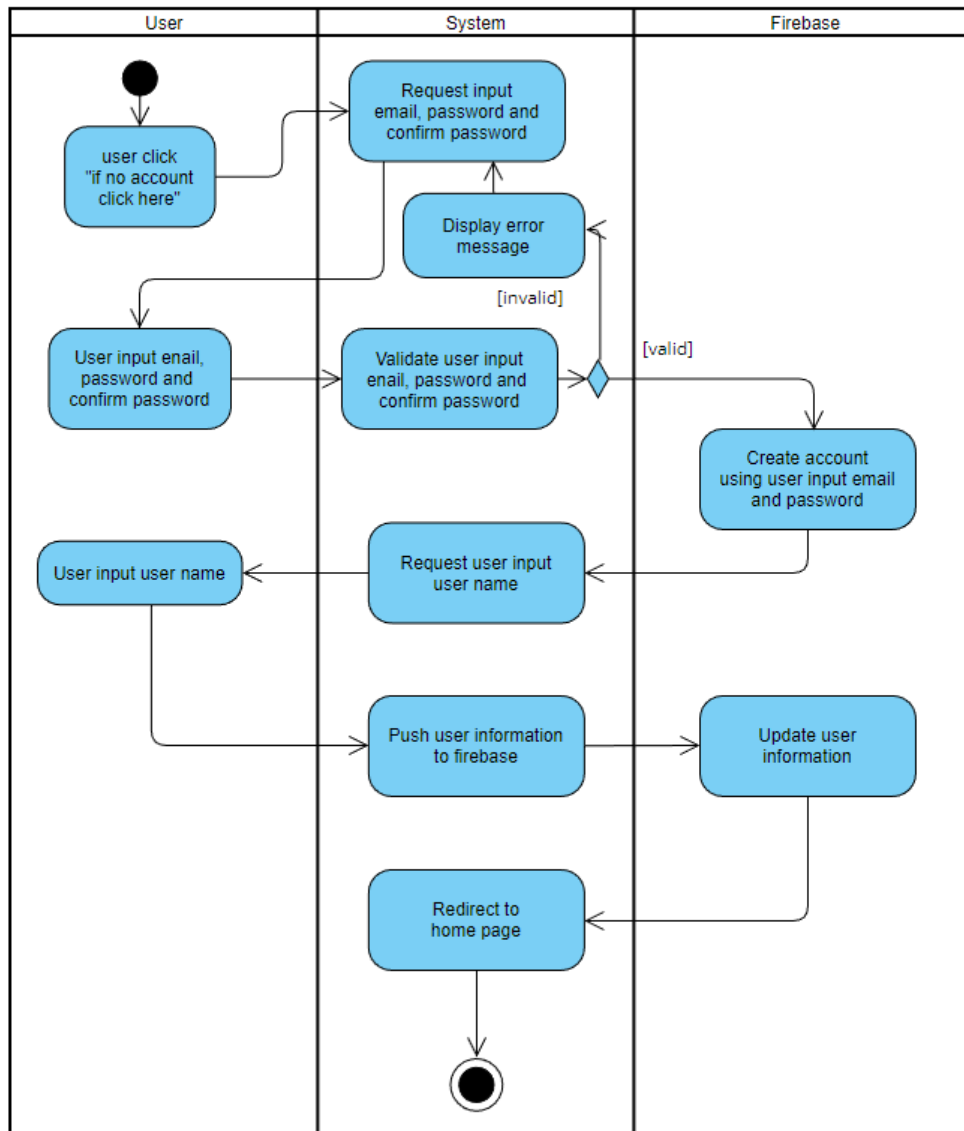
Figure 3.4 Register Activity Diagram

3.1.3.3 Game Activity Diagram
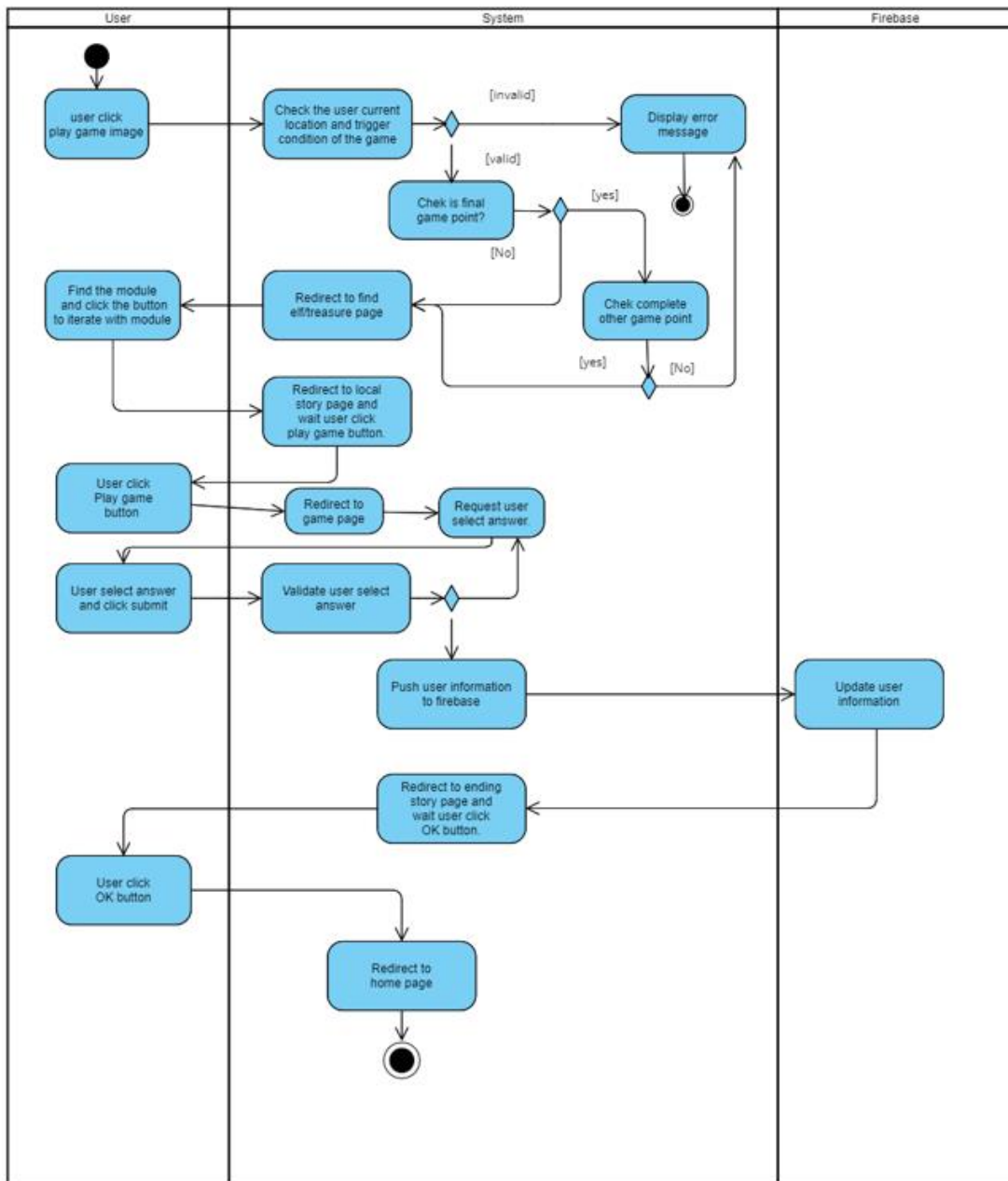
Figure 3.5 Game Activity Diagram

3.1.3.4 Leader Board Activity Diagram
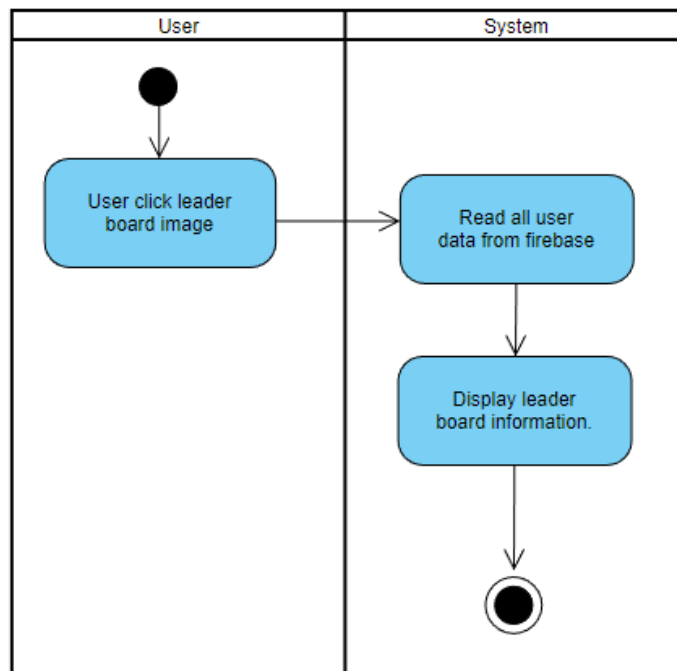
Figure 3.6 Leader Board Activity Diagram

3.1.3.5 Time Leader Board Activity Diagram
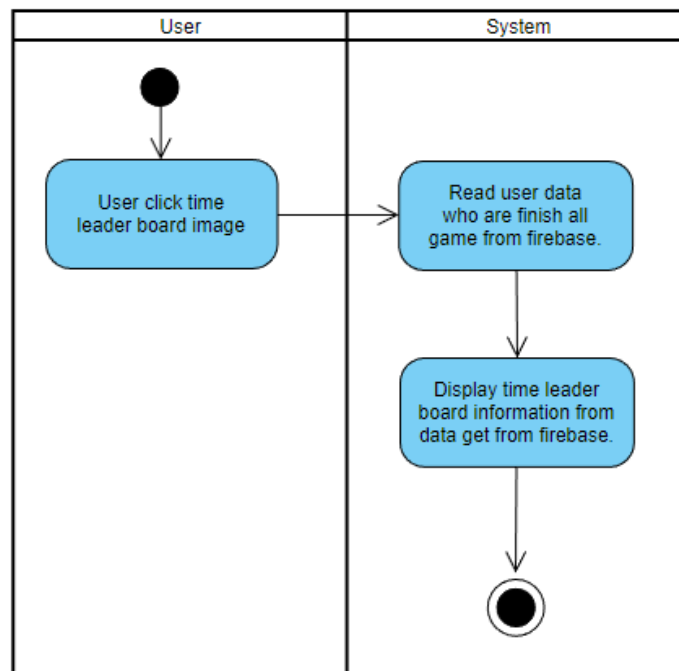
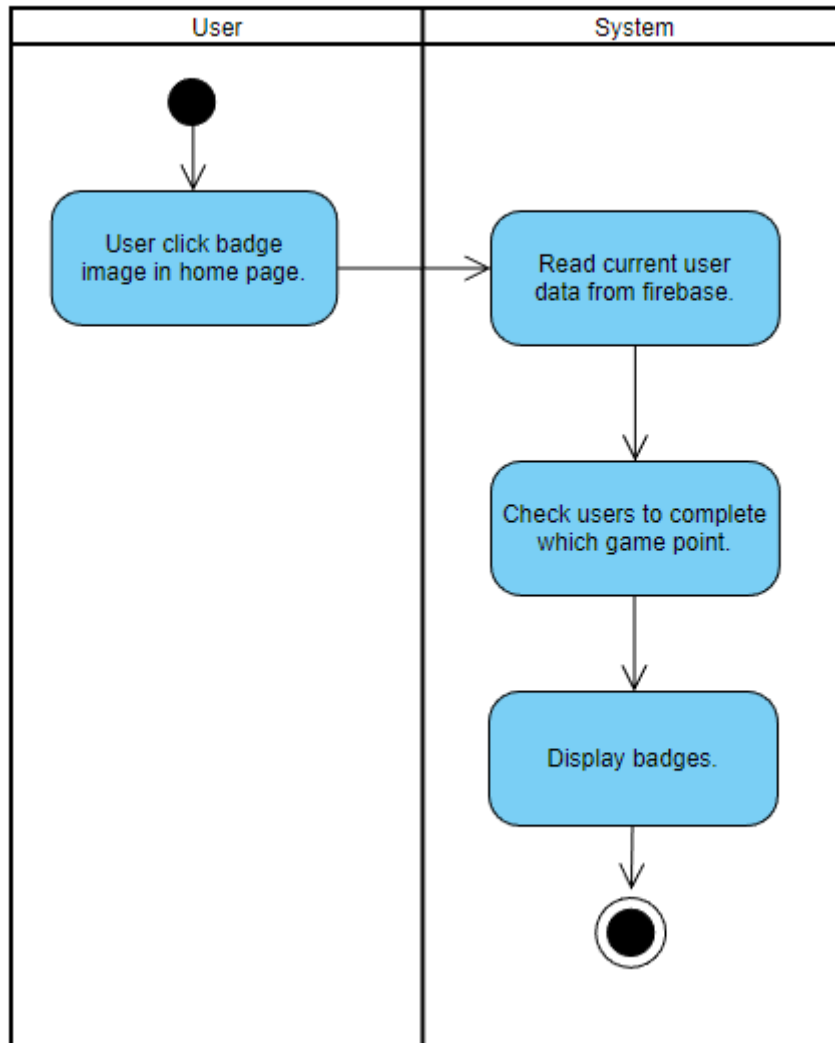Figure 3.7 Time Leader Board Activity Diagram

3.1.3.6 Badges Activity Diagram

Figure 3.8 Badges Activity Diagram

Chapter 4: System Design

4.1 Login Module

Figure 4.1 shown the flow char of the login module. User wanted to use this application need to do login in login page first. In login page, application would require user to fill in the email and password. If user input email or password was incorrect, user not had any account. Application would require user to fill in again. The function to use to authenticate user was using the firebase authentication function.
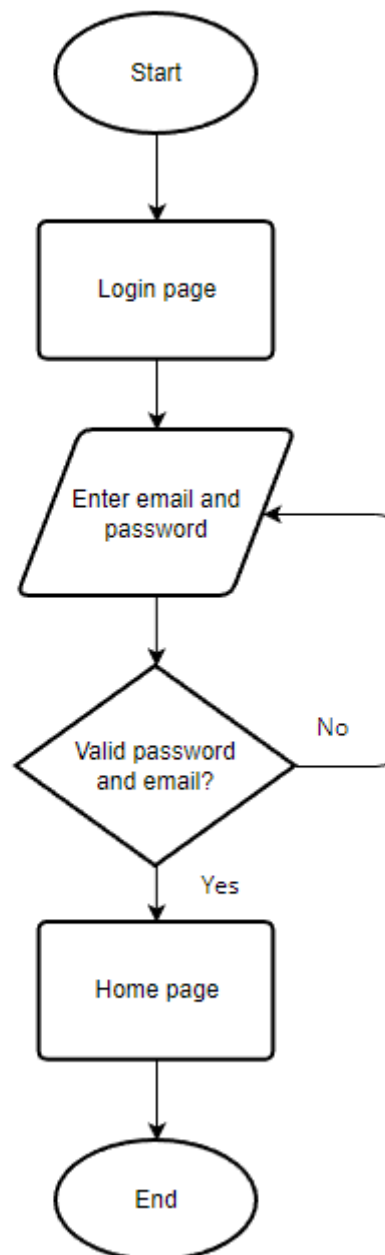
Figure 4.1 Login flow chart

4.2 Register Module

Figure 4.2 shown the flow chart of register module. In register page the application would require the user to fill in the email, password and confirm password. If the input was invalid, application would require user to fill in again. After user fill in all information and create account successfully. The firebase would had new user node be created. The function of create account was use the firebase createUserWithEmailAndPassword function.
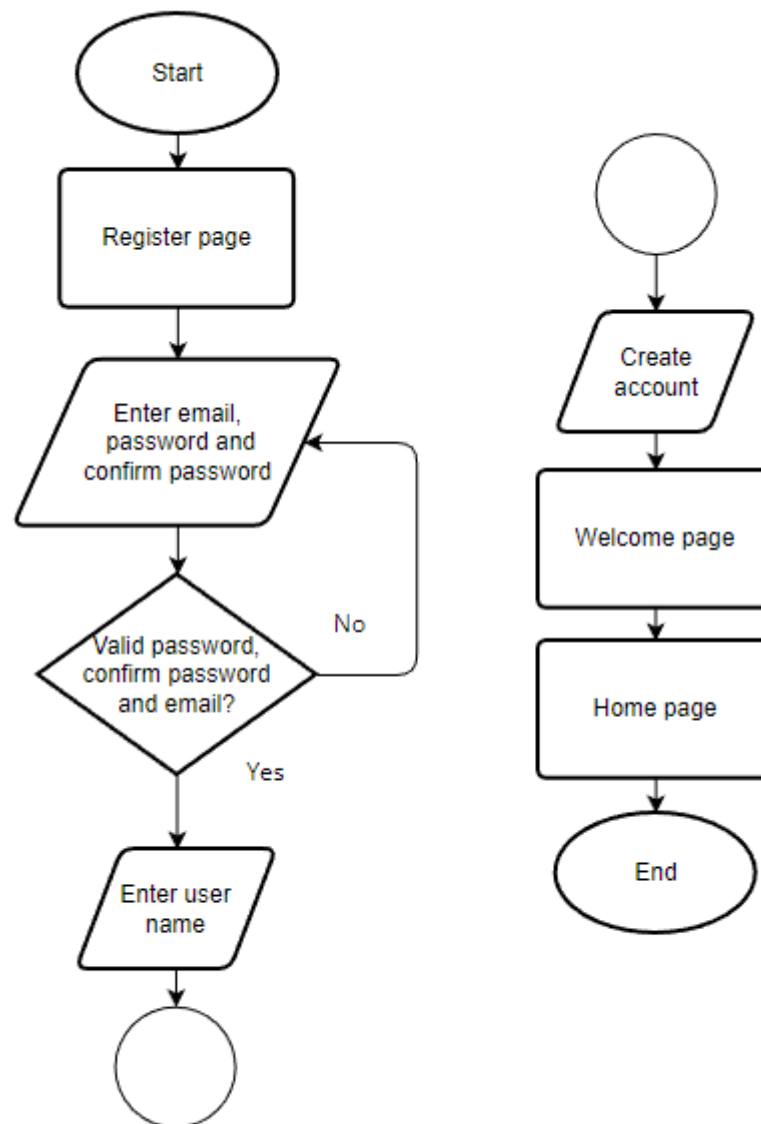
Figure 4.2 Register flow chart

4.3 Game Module

Figure 4.2 to 4.4 shown the flow chart of game module. When user press "play game" button, application would check the user current location using the GPS (Global Positioning System) function in the phone and calculate the distance between user and the game point. The calculation were using longitude and latitude, if the distance between user and game point fulfill the trigger condition, the application would redirect to AR game page.

In AR game page, there were using the ARcore and sceneform to build the 3D model and display on the screen and enables user interaction with model. The 3D model would be generated around the user. When the user click the button, there was one small bullet be fired. If the bullet overlap with the 3D model, the interaction event would be trigger and allow user to go to next local story page.
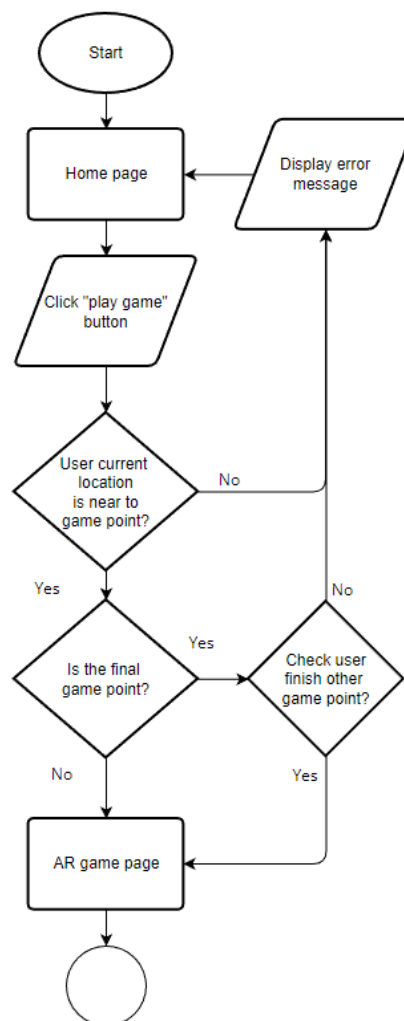
Figure 4.3 Game flow chart 1

In local story would show some story about the current location. After user read it, user could go to next Q&A page to answer question. The question in Q&A section was related to the previous local story.
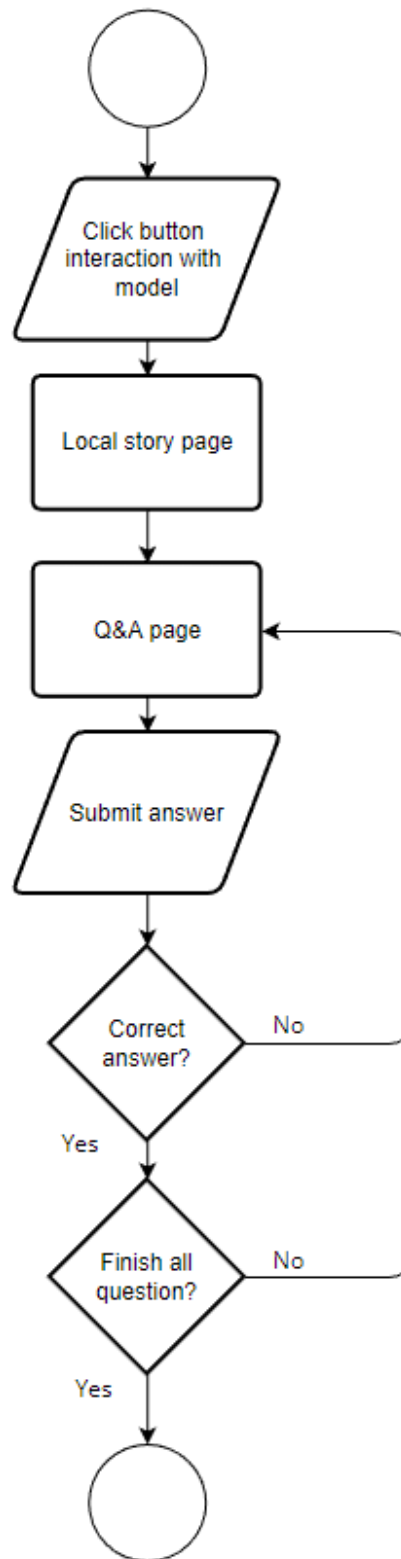

Figure 4.4 Game flow chart 2

After finish all the question, the application will calculate the user got point and update to the firebase. The faster the user completes the question, the higher the score. The calculation would read the data from firebase, and Plus the points earned by the user at this point in the game. After finish calculate, using the hashmap hold all the user information and push it to the firebase.
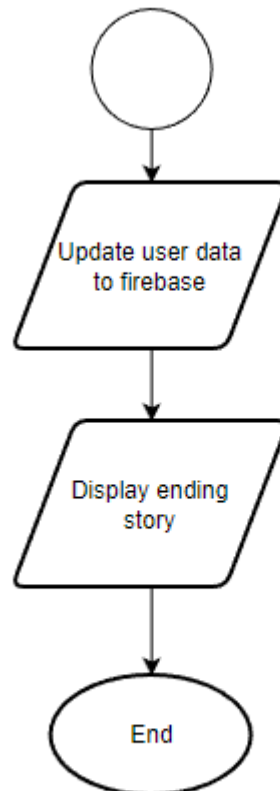
Figure 4.5 Game flow chart 3

4.4 Leader Board and Time Leader Board Module

The Figure 4.6 shown the flow chart of leader board module. In leader board page user did not need to input anything. After user press the leader board icon, the application would redirect user to leader page. Application would read all user data from firebase, but the data read from firebase was not sorting. So before display the user data in leader board, application would call the comparepoint() function to sorted the user data. After it will display the leader board.
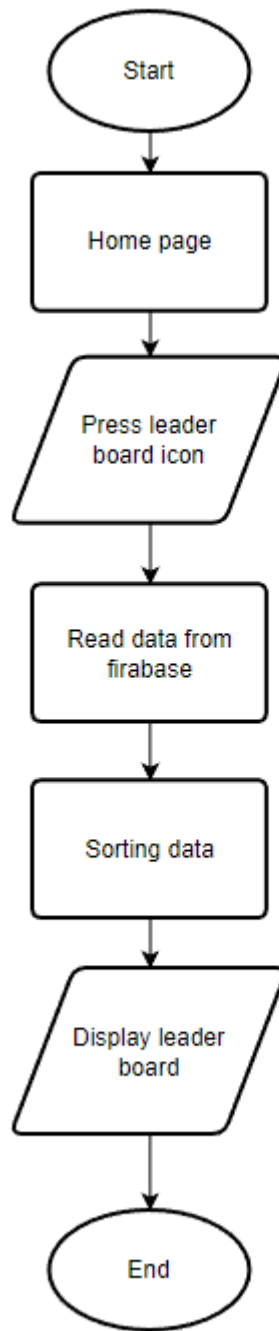
Figure 4.6 Leader board flow chart

The Figure 4.7 shown the flow chart of time leader board module. The function was almost same like the leader board module. There were two difference, before sorting the user data, the application would check the user are finish all game? If not finish all, it would be deleted from the array list. Another was sorting of user in time leader board, the shorter the time spent, the higher the ranking
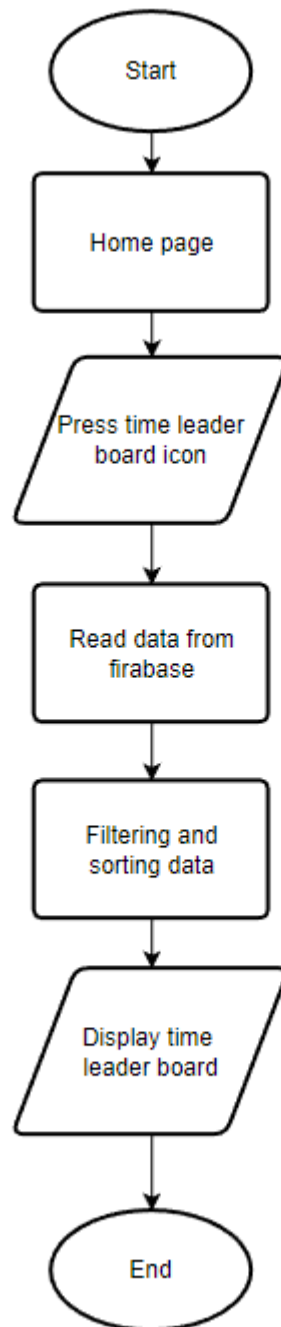
Figure 4.7 Time leader board flow chart

4.5 Badges Module

The Figure 4.8 shown the flow chart of badges module. The badges page will according the user pass which game point and corresponding badges will be displayed. After user press the badges icon in home page, the application would read the user data from firebase, if the point of the game point not equal to 0 that mean the user pass the game point and unlock the badges. Then the application would show the unlock badges for user.
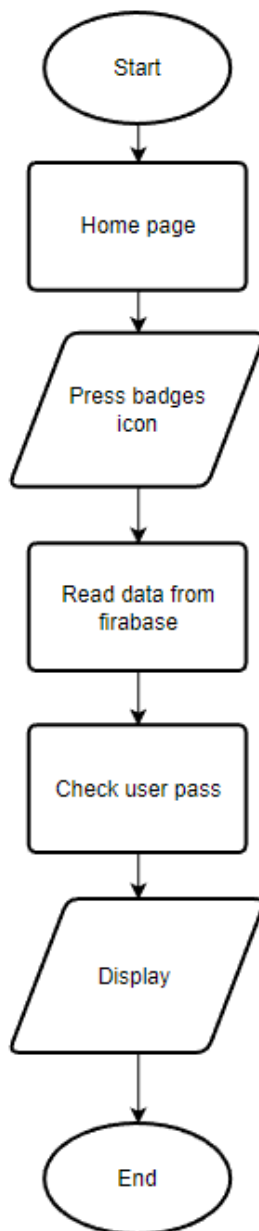

Figure 4.8 Badges flow chart

4.6 Firebase Structure for User Module

Figure had shown the Firebase Real-time Database structure for user module. After user register new account, new child node would be add under the "User" parent node. Each child node had their own id, and the id was uniquely in this database. The child user node stored the user information. For example, user name, user play game spend time and got point.
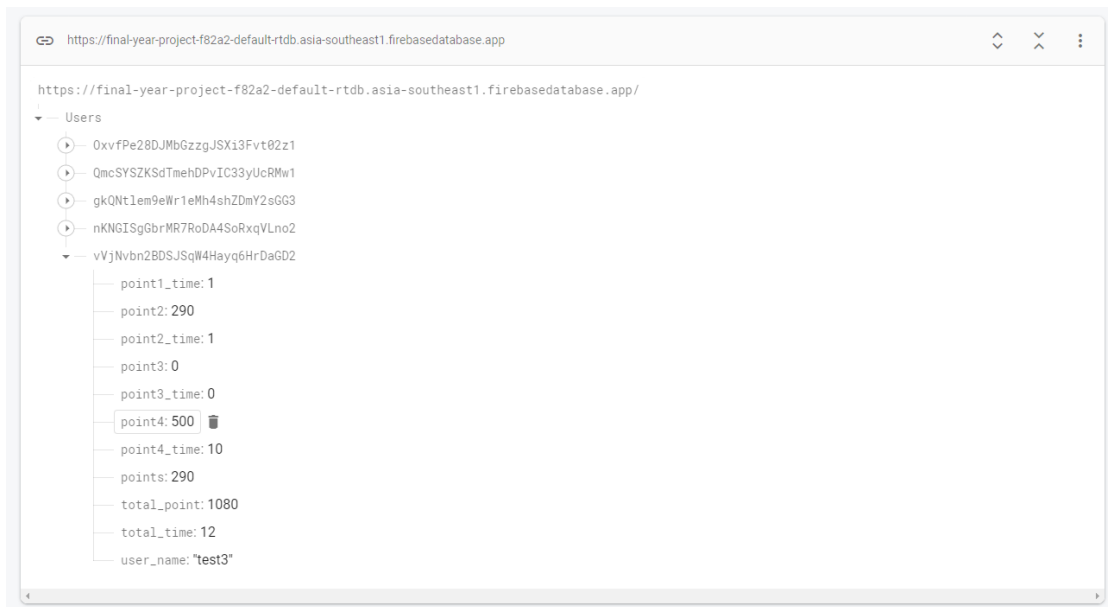

Figure 4.9 Firebase Structure for User

4.7 Story design

These three elves don't like to work with others, so their teacher gives them a puzzle to understand the importance of cooperation. To the teacher's surprise, they did not share the clue with the other two students. In the end, they had to ask users to help them. The teacher tells the user that if the player can answer the student elves' questions correctly, they will get the clues they are holding. After the user has gathered all the information and found the unlocked treasure, the teacher will thank the player for teaching his students a lesson.

Chapter 5: System Implementation

5.1 Hardware Setup

Hardware Name	Detail
Laptop	Model: ASUS FX503V CPU: Intel® Core i5-7300HQ CPU @ 2.5GHz GPU: NVIDIA® GeForce® 940MX 2GB GDDR5 RAM: 12GB OS: Windows 10 Home Single Language
Smartphone	Model: OPPO Reno4 CPU: Octa-core (2x2.3 GHz Kryo 465 Gold & 6x1.8 GHz Kryo 465 Silver) GPU: Adreno 618 RAM: 8GB OS: Android 10, ColorOS 7.2

Table 5.1 Hardware Setup

5.2 Software Setup

Software Name	Description
Android Studio	Android Studio is a development tool from Google designed specifically for Android.
ARCore	It is an API provide from Google. Also is the platform to create the AR application in Android Studio.

Table 5.2 Software Setup

Choose android to be the main platform is because the many smartphone user there are using this OS. It provides developers with an integrated Android development tool for development and debugging. It also allows developers to see how their application looks on screen while they are coding it. Developer can directly use the Drag and drop function to design the UI more convenient.

ARCore can track the position of mobile devices when it moves, and gradually making sense of the real world in its own way. These two functions are used to achieve motion tracking and allow users to view these virtual objects from different perspectives. The Developer can down load the ARCore SDK in Android Studio, it

means the developer can use the Android Studio to develop the AR function and mobile application at the same time. Developer need to prepare the real device to test the application, because ARCore does not support Android Emulator. And the device android OS version should at least 7.0 or higher.

5.3 Setting and Configuration

5.3.1 AR model generate

When user go to the AR game page to found the elf or treasure model, the program would generate model near by the user. The program generated modules within 5 metres of the user. Avoid the module is too far and user hard to find the module.

5.3.2 AR model interactive

The interactive of the AR models were using the shooting game logic. User presses the button and the bullet is fired, the bullet would move 10cm every execute time. When bullet overlap with AR models, the event will be trigger.

5.3.3 Game point setting

There were total 4 game point in the game. First one was Confucius and the Einstein Statue, the trigger condition was within 60m of the statue. The distance was set so far away for the user experience. For example, when it was raining or too hot, this allows the user to play at the entrance of Block A's building.

In Block C, the triggering condition was within 40 metres of the centre of the walkway in front of the restaurant, giving the user a full view of the lake.

For the library, the triggering condition was also set within 60 metres of the square in front of the library, taking into account the weather, so that users could play in an area out of direct sunlight.

In the dewan tun dr ling liong sik, the trigger was set at a distance of 150 metres around the tian yuan di fang, a distance that allows user to see the traditional Chinese cultural elements in front of the auditorium and to play the game while viewing the buildings from different angles.

5.4 System Operation

5.4.1 Login

The Figure 5.1 had shown the user account login page for the application. The user need to fill in the user's email and password, after click "LOGIN" button to login to the application.
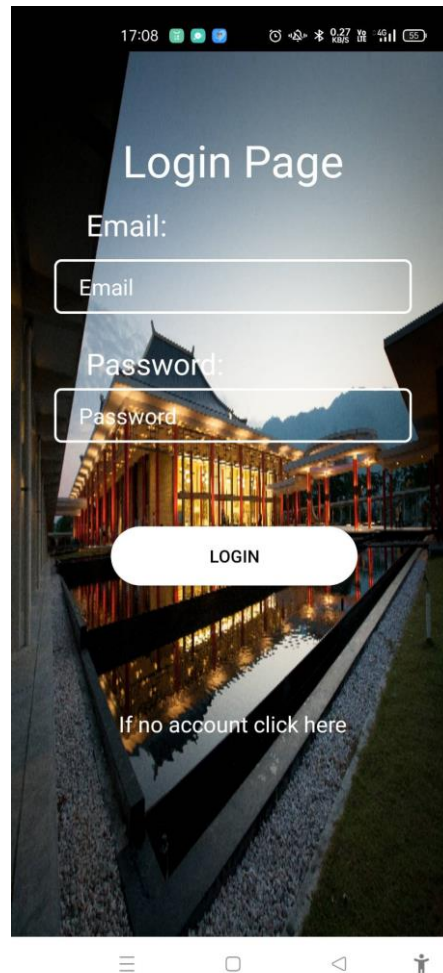

Figure 5.1 Login page

If the user leave email (Figure5.2) or password empty, user enters email which is not registered email or the user enter incorrect password. The application will pop up the message to inform user the problem and let user to try to login again.
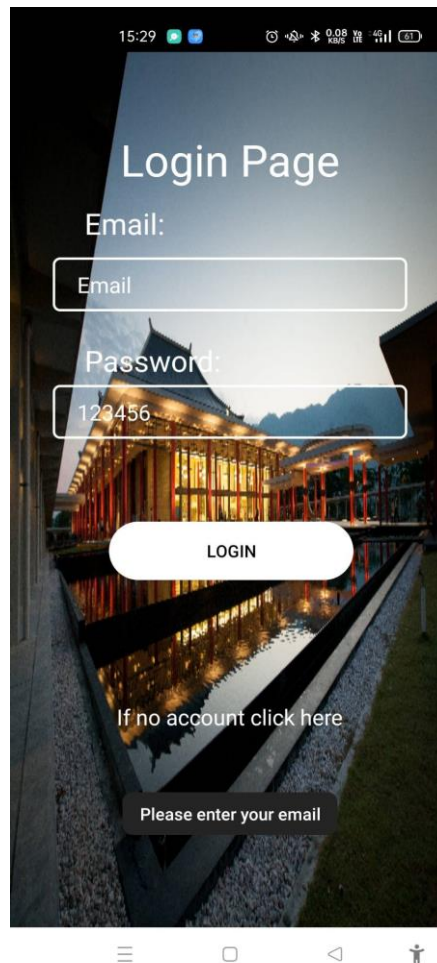
Figure 5.2 Login page leave email empty

5.4.2 Register

When user press the "If no account click here" in login page, the application will redirect user to register page (Figure5.3). In this page, user need to fill in the user's mail, password and confirm password to create new account. If the password and confirm password is not match, application will popup message to inform user to confirm and enter the password again. After fill in all information and click the "next step" button, it will be redirect to next page (Figure 5.4) to request user to fill in the user name, after user fill in the user name and click the "REGISTER", the application will update the user information to the firebase and redirect to welcome new user page to get the information about the game (Figure5.5).
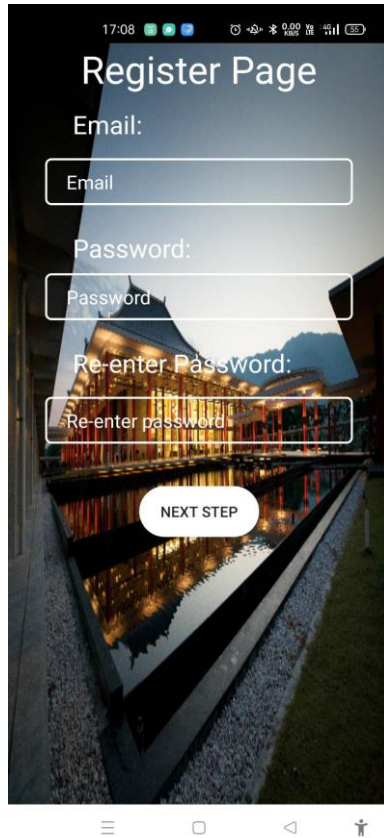
Figure 5.3 Register page

Figure 5.4 Setting user name
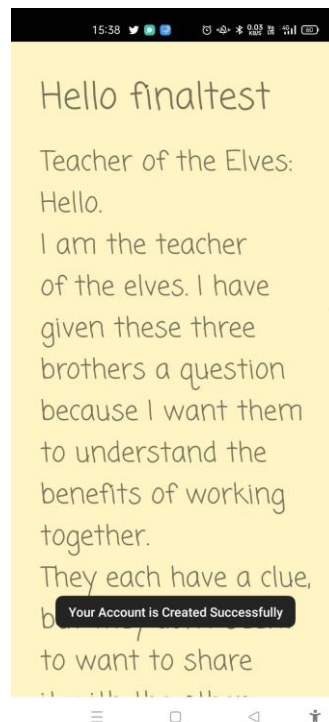
Figure 5.5 Welcome user page

5.4.3 Game

When user click the "Game" icon in the home page, the application check the user is near to any game point. If user are far away from the game point, application will pop up the message to inform user (Figure5.6).
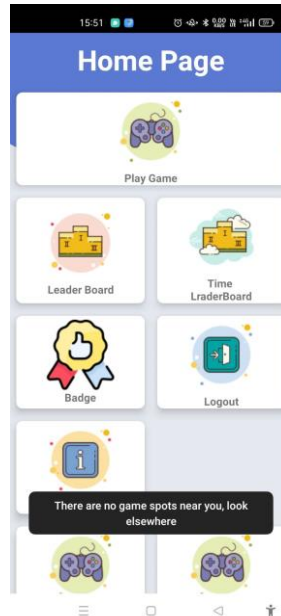
Figure5.6 Not near message

If the game point is not the final game point, the application will redirect to the interface for finding the elf. If the game point is final game point, application will check user complete of other game point. If user not complete other game point, application will popup message to let user finish other game point first (Figure5.7). Else application will redirect to the interface for finding the treasure.

Figure5.7 Inform message

The Figure5.8 and Figure 5.9 are show the user fined the elf and treasure in the AR Scene, user need to use the crosshair to aim at elf and treasure and click the button to interact with the model. When successfully interacting with the model, application will pop up dialog show some information. User click the ok in dialog, the application will redirect to the local story page.

Figure5.8 Elf 3D model

Figure5.9 Treasure 3D model

The Figure 5.10 show the local story page, user can read some local story in order to answer the question in next page.
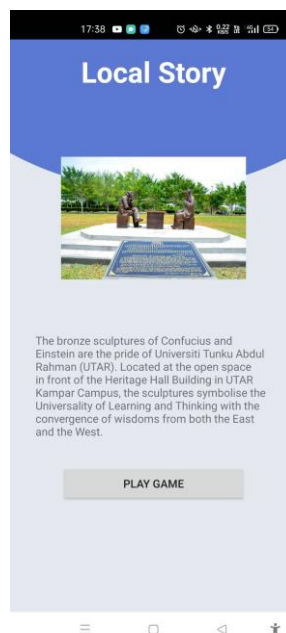
Figure5.10 Local story

The Figure 5.11 show the Q & A page. User need to answer the question, the number of points is calculated based on the time it takes for the user to select the correct answer. The less time spent, the higher the score. The difference between the final game and a normal game is the number of questions answered, normal only need to answer 1 question and final game need to answers 4 question. And in final game (Figure 5.12) there is the process bar to show the process of the question complete. After user complete all the question, application will redirect to the ending story page of this game point.
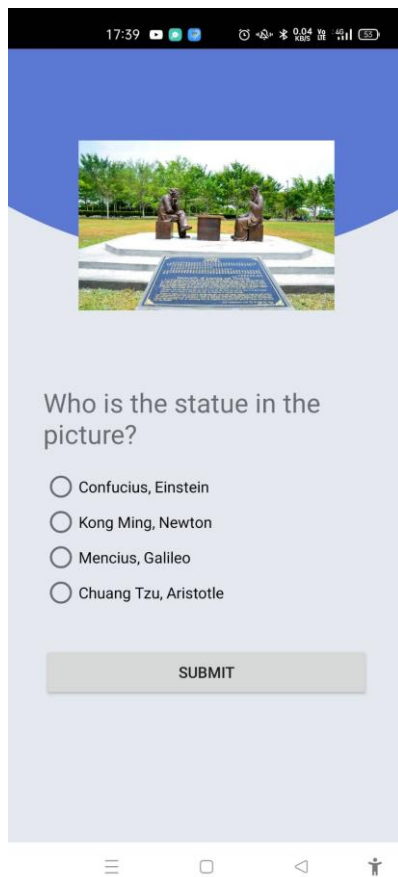
Figure5.11 Normal Q&A   Figure5.12 Final Q&A
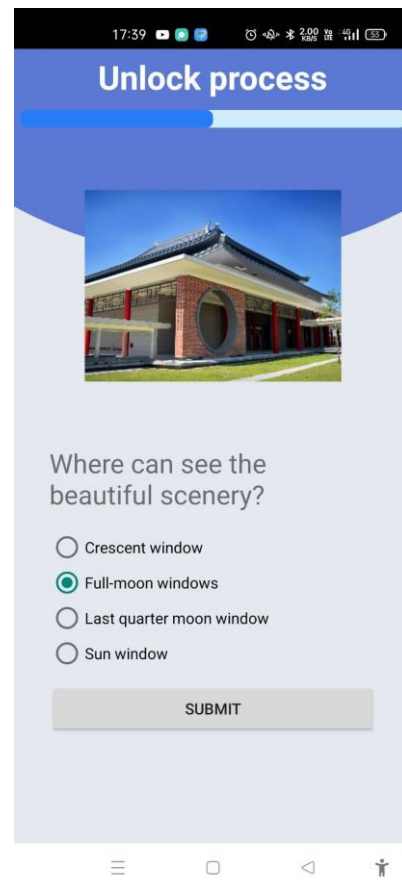
The Figure 5.13 show the ending story page, user can get some final game point information, after user finish 3 normal game point, the final game point will be unlock.
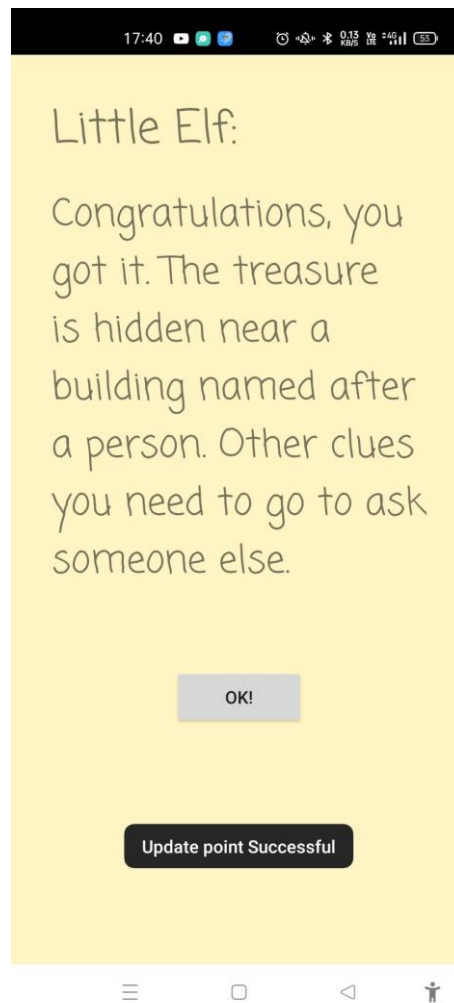
Figure 5.13 Ending story

5.4.4 Leader board and Time leader board

The Figure 5.14 and Figure 5.15 are show the leader board and time leader board. When the user is redirected to leader board page, application will display all the user name and how many points their get from the game. And it is ranked according to the amount of points scored, from highest to lowest.

The time leader board almost the same as leader board. However, the ranking is based on the time taken by the user to complete the game. If the user not finish all game, it would not display in this time leader board.
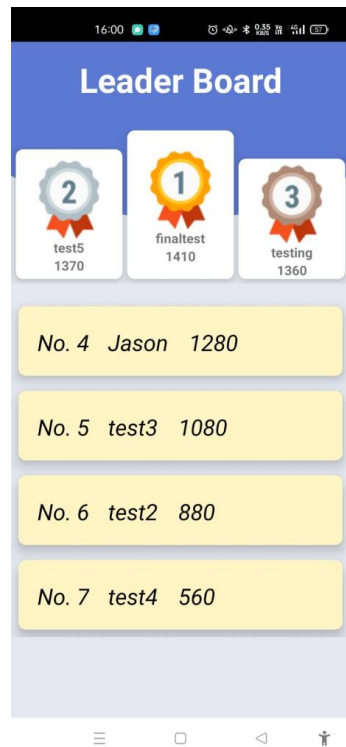
Figure5.14 Leader board   Figure5.15 Time leader board
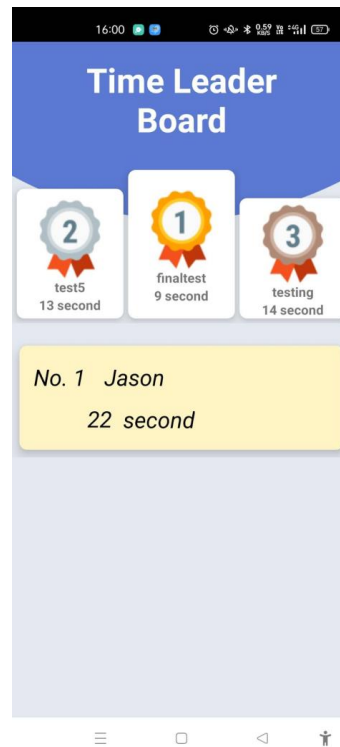
5.4.5 Badges

The Figure 5.16 show the badges page. There are 4 badges in this page, and all the badges in default will set as question mark icon. The icon will according to the user completed what game point, if the user completion of the game point will unlock the corresponding badge. The Figure 5.17 is finish all game and unlock all the badges.
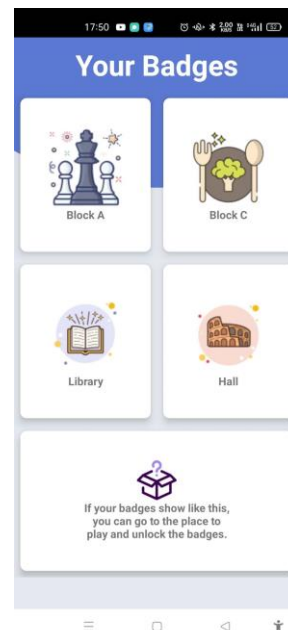

Figure5.16 New user badges page   Figure5.17 Complete all game point

5.5 Implementation Issues and Challenges

1. GPS positioning errors may occur

Current positioning systems can determine the approximate location of the user, but there are still some errors that prevent accurate determination of the user's location. However, the positioning of the building is easily disturbed when it is close to the building. It is possible that the game point will be triggered from a distance other than the required distance.

2. The problem in importing 3D model into Android Studio

There are the problem when trying to import the 3D model into Android Studio. The plug in Google Sceneform Tools (Beta) is not workable. And also try to use the .obj file to generate the .sfa file and .sfb file. But the problem with android studio version 3.6 and later. Sceneform was also abandoned and no sign of further development of new versions. Finally, .glb is used as the source of the model. Store .glb file in Github and call the model via the URL if need it.

Chapter 6: System Evaluation and Discussion

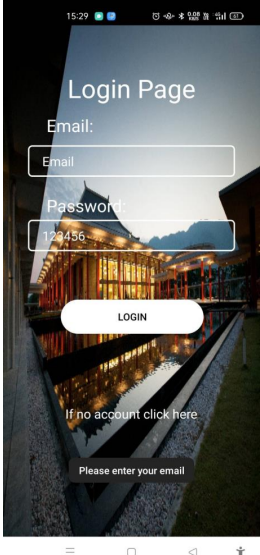**6.1 System Testing and Result**

6.1.1 Login

Test Case	Not fill in email
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.1 Test Case for not fill in email
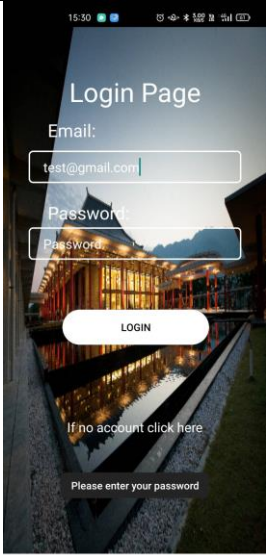
Test Case	Not fill in password
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.2 Test Case for not fill in password
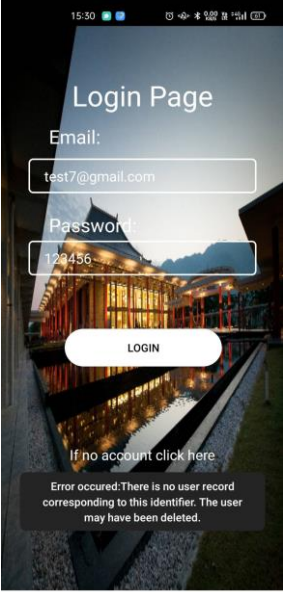
Test Case	Fill in invalid email
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.3 Test Case for fill in invalid email
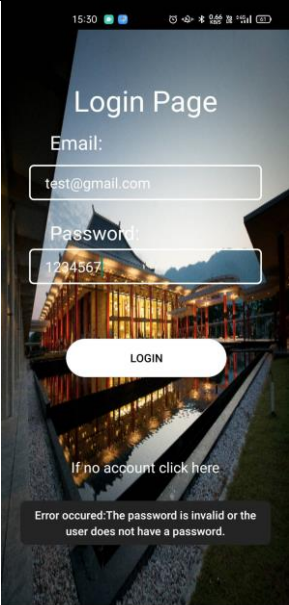
Test Case	Fill in invalid password
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.4 Test Case for fill in invalid password

Test Case	Fill in valid email and password
Expected Result	Redirect to home page
Actual Result	
Pass/Fail	Pass

Table 6.5 Test Case for Fill in valid email and password

6.1.2 Register
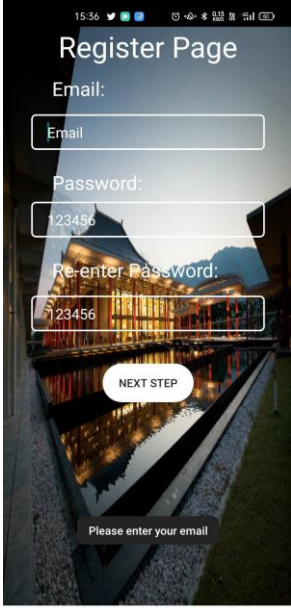
Test Case	Not fill in email
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.6 Test Case for not fill in email
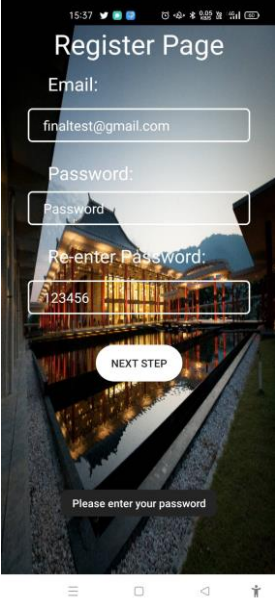
Test Case	Not fill in password
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.7 Test Case for not fill in password
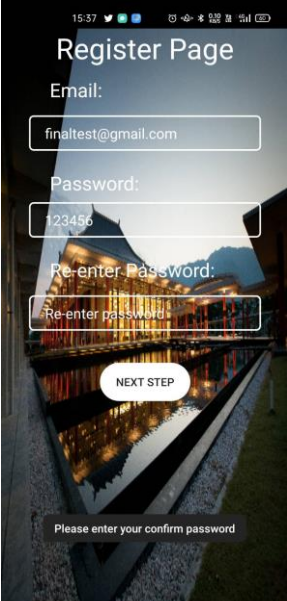
Test Case	Not fill in confirm password
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.8Test Case for not fill in confirm password
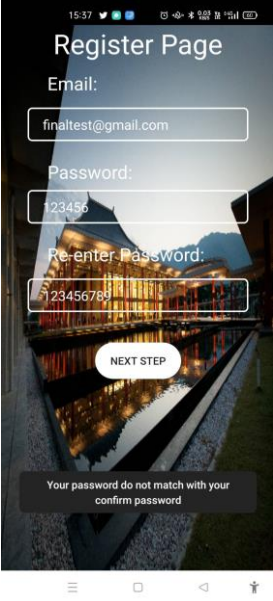
Test Case	Password not match with confirm password
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.9 Test Case for password not match with confirm password

Test Case	Fill in valid email, password and confirm password
Expected Result	Redirect to setting detail page
Actual Result	
Pass/Fail	Pass

Table 6.10 Test Case for fill in valid email, password and confirm password

Test Case	Not fill in user name
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.11 Test Case for not fill in user name
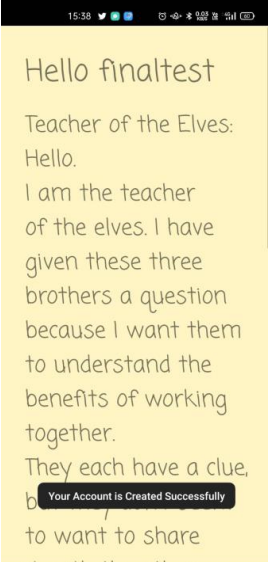
Test Case	Fill in valid user name
Expected Result	Redirect to welcome page
Actual Result	
Pass/Fail	Pass

Table 6.12 Test Case for fill valid user name

6.1.3 Game

Test Case	User not near to the game point
Expected Result	Display not near message
Actual Result	
Pass/Fail	Pass

Table 6.13Test Case for user not near to the game point

Test Case	User near to the game point
Expected Result	Redirect to AR game page
Actual Result	
Pass/Fail	Pass

Table 6.14Test Case for user near to the game point

Test Case	User trigger final game point and user not complete other game point
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.15 Test Case for user trigger final game point

and user not complete other game point

Test Case	AR screen of location in normal game point
Expected Result	Elf 3D model should generate around the user
Actual Result	
Pass/Fail	Pass

Table 6.16 Test Case for AR screen of location in normal game point

Test Case	AR screen of location in final game point
Expected Result	Treasure 3D model should generate around the user
Actual Result	
Pass/Fail	Pass

Table 6.17Test Case for AR screen of location in final game point

Test Case	User interact with elf model
Expected Result	Display interact message
Actual Result	
Pass/Fail	Pass

Table 6.18 Test Case for user interact with elf model
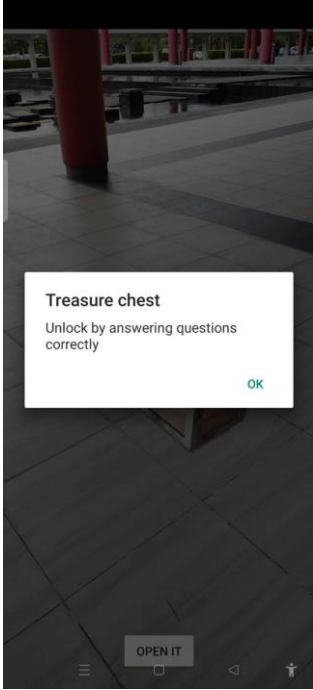
Test Case	User interact with treasure model
Expected Result	Display interact message
Actual Result	
Pass/Fail	Pass

Table 6.19 Test Case for user interact with treasure model
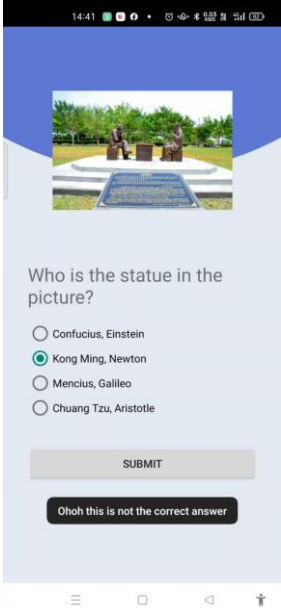
Test Case	User answered the question incorrectly
Expected Result	Display error message
Actual Result	
Pass/Fail	Pass

Table 6.20 Test Case for user answered the question incorrectly
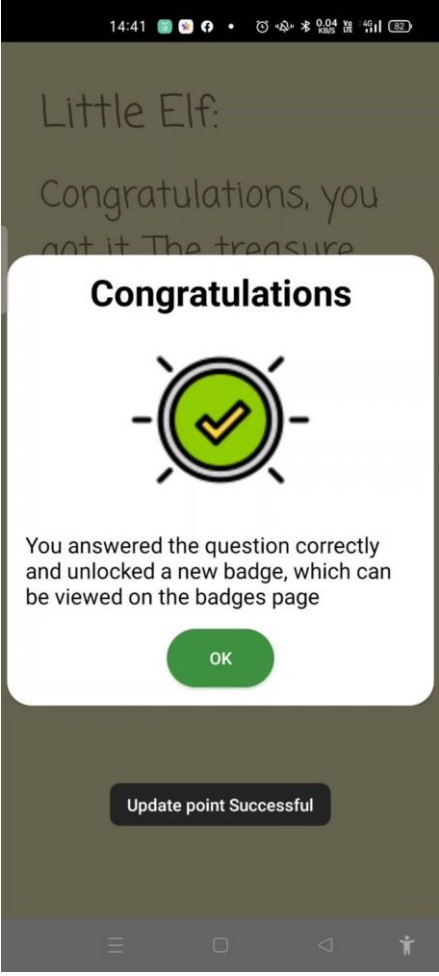
Test Case	User answered all question correctly
Expected Result	Redirect to ending story page
Actual Result	
Pass/Fail	Pass

Table 6.21 Test Case for user answered all question correctly

6.1.4 Leader board
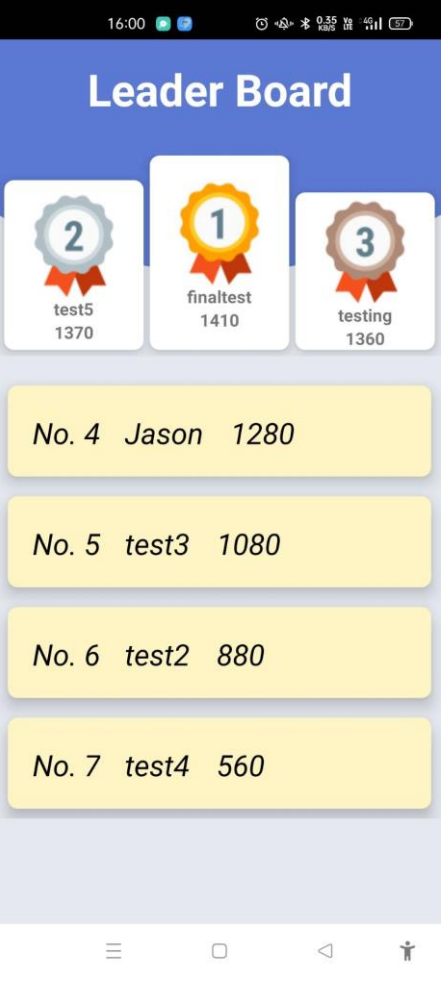
Test Case	Click leader board icon in homepage
Expected Result	Display all users on the leaderboard and sort them by highest to lowest score.
Actual Result	
Pass/Fail	Pass

Table 6.22Test Case for click leader board icon in homepage

6.1.5 Time leader board
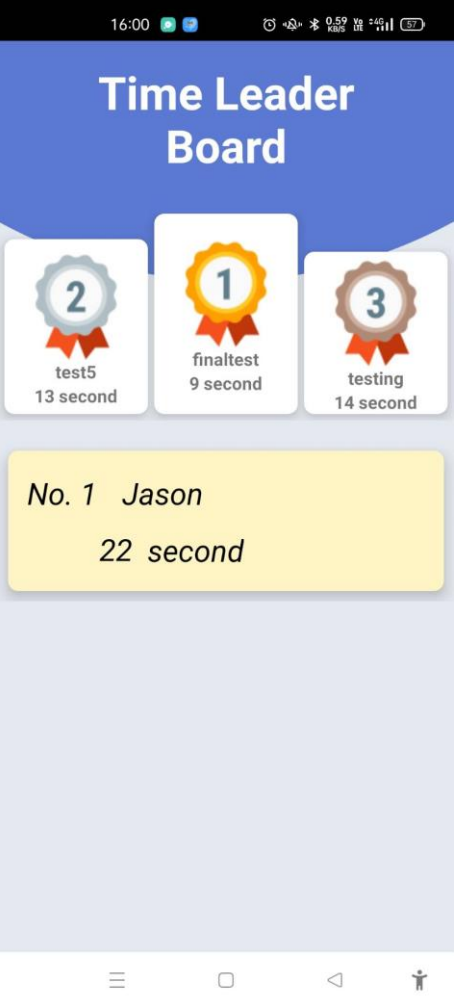
Test Case	Click time leader board icon in homepage
Expected Result	Show all users on the leaderboard and sort them by time spent from least to most.
Actual Result	
Pass/Fail	Pass

Table 6.23 Test Case for click time leader board icon in homepage

6.1.6 Badges
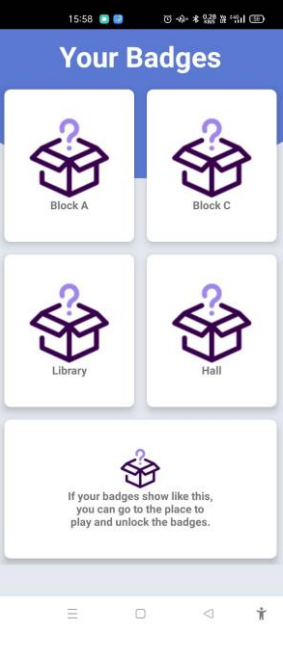
Test Case	User not complete any game
Expected Result	All the icon should be question mark icon.
Actual Result	
Pass/Fail	Pass

Table 6.24 Test Case for user not complete any game

Test Case	User complete all game
Expected Result	All the icon should be turn into corresponding icon.
Actual Result	
Pass/Fail	Pass

Table 6.25 Test Case for user complete all game

6.2 Project Challenges

There are a number of challenges in the development of the project. Initially, when testing the GPS function in buildings, the error values were around 10 meters or more. The location and trigger distance were then set in an outdoor area, which is less likely to be affected by buildings, the trigger distance is then set to a location where the user can play comfortably, the trigger distance is set to a greater distance, and this prevents the GPS from being inaccurate and not allowing the user to play.

When setting up the ARcore in android studio, the build.gradle format was changed slightly due to an update, and the method of setting it up also needed to be adjusted slightly. The problem was solved by using information from the web.

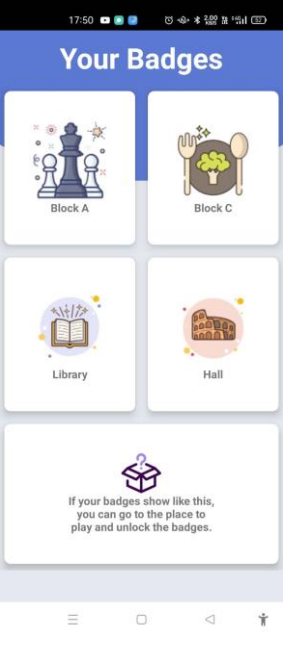Problems were also encountered when importing the format of the 3D model. Google Sceneform Tools (Beta) plug in is not work on the newer android studio, because the Google Sceneform Tools (Beta) no update for a long time. And try to use manual generate the sfa. file and sfb. file from obj. file. But this method still do no work. Finally, the glb. file were using in this project. The glb. file stored into the Github and using the url to call the medel. However, this method loding time of the model will be affected by the speed of the network.

6.3 Objectives Evaluation

1. To develop a mobile game that has a good storyline to interact with the visitors on UTAR Kampar campus.

- There was a story to connect all the attractions used in this application.
- On the welcome page was give clues and let user to found the elf and treasure.
- When user found the elf/treasure and answer the question correctly, the application would pop up the dialog to provide the interaction and give feedback.

2. To introduce the interesting backgrounds and stories of the attractions of UTAR Kampar campus to visitors.

- In each attraction in this application, there was show a simple story before the Q&A section.
- In final game point, introduce the building and part of the building's meaning of the dewan tun dr ling liong sik.

3. To enable the visitors to link the attractions on UTAR Kampar campus so that they can have a memorable overall touring experience.

- Let user not only go to attractions to view the landscape. Rather learn about local stories through playing games.
- The user will get a sense of achievement when the puzzle is solved successfully. The leaderboard allows users to see how stack up against other users.

Chapter 7: Conclusion and Recommendation

7.1 Conclusion

There are many small towns in Malaysia that are gradually being forgotten, as most young people aspire to go to the cities to earn a living. As a result, these unique histories and cultures are slowly disappearing in the stream of time. The project will therefore enhance the user's travel experience through the development of an application. The application uses gamification and a story line to connect the attractions together, allowing the user to have a different impression of the place.

At the end of the project, this "UTARGO" was successfully developed. Users had to register to use the app, and a personal account was created to record user information and playing progress. The gameplay is similar to that of Pokémon GO and Questo in that the user's location is used as a trigger for the game. Once the user is close to a set location, they can play the game. The game also incorporates AR elements, allowing users to find and interact with elves and treasures through their phones.

A quiz will be given to the user to answer after the story of the place is introduced, allowing the user to test their knowledge of the place. Users will unlock badges and points for the location after completing the quiz, which they can view on the leader board and badge pages. These are used as a reward for users, giving them something to remember and prove that they have completed the game, and the leaderboard is a great way to stimulate their motivation.

In conclusion, the integration of gamification into the tour will enhance the tourism experience. By promoting the local tourism industry through a more interesting travel experience, young people might be able to return to these small towns.

7.2 Recommendation

There are some thing can be improve in the future. The model are using from cgtrader webside. Although these models are free to download and use, most of the models are not quite what is required, so it was a struggle to find one that fitted the bill. If it is possible, you can have a model designed individually for the story. This will give the user a better sense of immersion in the game.

The next section is the story, which is not written by a professional, so it may be a bit short and rudimentary. It would be more appealing to users if the story was written by a professional.

Lastly, the game section could be a combination of quiz and AR elements. Answering questions that cause damage to monsters, with some special effects and animations, would greatly enhance the user experience.

All in all, it is difficult for one person to make a very attractive game on their own, but it requires the cooperation of talents from other fields to achieve the goal.

Bibliography

[1] Toth, A., Tovolgyi, S, "The introduction of gamification: A review paper about the applied gamification in the smartphone applications" proceedings of the 7th IEEE International Conference on Cognitive Infocommunications (CogInfoCom). 2016.

[2] ZHANG Duo-duo, LUO Peng-ri, "Research on Gamification-based Tourism Experience Design for Cultural Sustainability" PACKAGING ENGINEERING, Vol. 41 No. 14. Pp. 36-42. 2020.

[3] Mesároš, P et al., "Use of Augmented Reality and Gamification techniques in tourism" e-Review of Tourism Research (eRTR), Vol. 13 No. 1. pp. 366-381. 2016.

[4] LENT, B & MARCINIAK, M, "Enhancing Tourism Potential by Using Gamification Techniques and Augmented Reality in Mobile Games" Proceedings of the Vision 2025: Education Excellence and Management of Innovations through Sustainable Economic Competitive Advantage. 2019.

[5] Chien-Wen Cheng and Xin-Tong Zhao (2021 April) "The Research of Narrative in Digital Game Creation"[Online]. Available from: http://www.cyberangel.org.tw/thesis/2016/013.pdf.

[6] LENT, B & MARCINIAK, M, "Enhancing Tourism Potential by Using Gamification Techniques and Augmented Reality in Mobile Games" Proceedings of the Vision 2025: Education Excellence and Management of Innovations through Sustainable Economic Competitive Advantage. 2019.

APPENDIX A Survey Questions and Results

A.1 Survey Questions and Results table

This survey question and results come from Enhancing Tourism Potential by Using Gamification Techniques and Augmented Reality in Mobile Games (Bogdan LENT and Marta MARCINIAK 2019)

Characteristics	Respondents (N=115) %	Characteristics	Respondents (N=115) %
Age group 24 or less 25-34 35 or more	 33.9 37.4 28.7	Children Yes No	 25 75
Sex Female Male Other	 51.3 47 1.7	Professional activity Student Working person Non-working person	 36.5 60 3.5
Country of permanent residence Great Britain Spain Germany Turkey Bulgaria Ukraine Thailand	 18.3 17.4 8.7 6.1 4.3 4.3 4.3	Education level Primary Secondary Higher Vocational education	 0.9 21.7 70.4 7
Latvia France Other	3.5 3.5 29.6		

Question	Total (N=115) %	Target group (N=43) %
With whom do you travel most often?		
Alone	14.6	20.59
With family	41.6	52.94
With friends	43.8	26.47
How many people does this group usually include?		
1	14.9	17.65
2-3	45.7	61.76
4-5	33	17.65
More than 5	6.4	2.94
Do you usually try to get to know the following city's tourist resources while travelling? (The number of 'yes' responses.)		
Historical	76.5	76.7
Cultural	87	88.3
Natural	77.4	81.2
Recreational	72.2	79.1
If a tourist game was to improve the tourist attractiveness of the city, what qualities should it have (according to you)? (multiple choice)		
a. plot of the game associated with the city that would develop along with the game	56.5	58.1
b. earning points for completing tasks and solving puzzles		
c. ranking of game participants	41.7	34.9
d. possibility of interacting with other players		
e. getting to know the city by completing tasks	22.6	30.2
f. reward for participation in the game depending on the result	51.3	60.5
	71.3	65.1
	38.3	37.2
Which activities, except the tasks and puzzles, should be awarded points in that game? (multiple choice)		
a. challenges related to eating places (e.g. going to a specific restaurant)	51.3	51.2
b. challenges related to social media (e.g. posting a photo from a specific place)	56.5	60.5
c. challenges related to the interaction with local people and products (e.g. listening to the story of a local brewer)	56.5	65.1
Should the game additionally contain any of the listed elements? (multiple choice)		
a. city map	83.5	74.4
b. list of restaurants and cafés	64.3	58.1
c. list of cultural resources of the city	60.9	60.5
d. list of natural and recreational resources	47.8	51.2

e. events calendar	57.4	65.1
f. city's nightlife guide	52.2	44.2

Which game variant would you be interested in? (multiple choice)
  a. one-day
  b. two-day
  c. three-day
  d. four-day or longer
	59.1
	34
	17.4
	6.1
		55.8
		46.5
		16.8
		2.3

Will the implementation of augmented reality have a positive impact on the attractiveness of the game? (For example, looking through the smartphone screen on a dead object causes its movement.) Definitely no Rather no Rather yes Definitely yes	3.57 14.29 53.57 28.57	4.8 14.3 47.6 33.3

Would the described tourist game with augmented reality:
  a. encourage you to return to a tourist destination that organized it?
    Definitely no
    Rather no
    Rather yes
    Definitely yes
  b. stand a chance to be a memorable tourist experience?
    Definitely no
    Rather no
    Rather yes
    Definitely yes
	3.6
	16.4
	61
	19
	
	0.9
	8.2
	48.2
	42.7
		0
		9.8
		78
		12.2
		
		0
		4.9
		46.3
		48.8

FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: 05/2022	Study week no.:1
Student Name & ID:19ACB01514	
Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

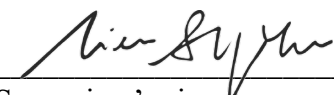**1. WORK DONE**
Finish setting arcore setting

2. WORK TO BE DONE
Try to display simple model

3. PROBLEMS ENCOUNTERED
No

4. SELF EVALUATION OF THE PROGRESS
In Progress

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Supervisor's signature

_____
Student's signature

FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: 05/2022	Study week no.:3
Student Name & ID:19ACB01514	
Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

1. WORK DONE
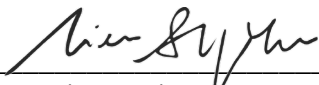Display the simple model and redesign homepage

2. WORK TO BE DONE
Let user can interact with model

3. PROBLEMS ENCOUNTERED
No

4. SELF EVALUATION OF THE PROGRESS
In Progress

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Student's signature

FINAL YEAR PROJECT WEEKLY REPORT
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Trimester, Year: 05/2022	Study week no.:5
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Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

1. WORK DONE
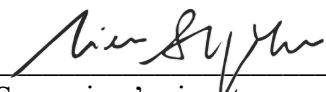User can interact with model

2. WORK TO BE DONE
Badges page design and function

3. PROBLEMS ENCOUNTERED
No

4. SELF EVALUATION OF THE PROGRESS
In Progress

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FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: 05/2022	Study week no.:7
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Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

1. WORK DONE
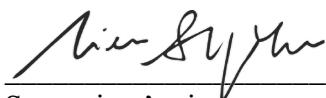Badges page design and function

2. WORK TO BE DONE
Leader board and time leader board design and function

3. PROBLEMS ENCOUNTERED
No

4. SELF EVALUATION OF THE PROGRESS
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FINAL YEAR PROJECT WEEKLY REPORT
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Trimester, Year: 05/2022	**Study week no.:9**
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Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

1. WORK DONE
Leader board and time leader board design and function
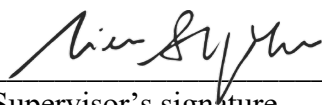
2. WORK TO BE DONE
Adding some dialog let user get the feedback.

3. PROBLEMS ENCOUNTERED
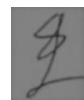No

4. SELF EVALUATION OF THE PROGRESS

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Student's signature

FINAL YEAR PROJECT WEEKLY REPORT
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Trimester, Year: 05/2022	Study week no.:11
Student Name & ID: 19ACB01514	
Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

1. WORK DONE
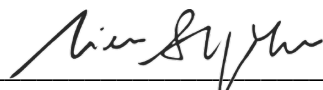Adding some dialog let user get the feedback.

2. WORK TO BE DONE
Report writing

3. PROBLEMS ENCOUNTERED
No

4. SELF EVALUATION OF THE PROGRESS
In Progress

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FINAL YEAR PROJECT WEEKLY REPORT
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Trimester, Year: 05/2022	Study week no.:13
Student Name & ID: 19ACB01514	
Supervisor: Dr. Liew Soung Yue	
Project Title: Mobile Game Development for Kampar Tourism	

1. WORK DONE
Report writing

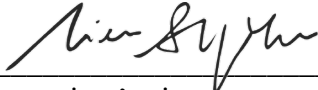**2. WORK TO BE DONE**
Do the final check of the report

3. PROBLEMS ENCOUNTERED
No

4. SELF EVALUATION OF THE PROGRESS
In Progress

_____   _____
Supervisor's signature   Student's signature

Poster

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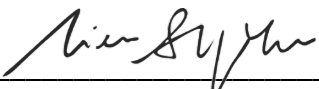| Universiti Tunku Abdul Rahman			
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