

Learn to drive – Gamification with Unity

BY

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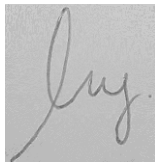
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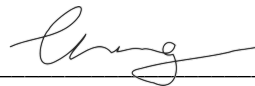
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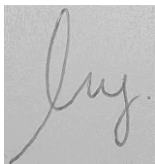
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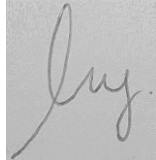


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ABSTRACT

This project is a gamification application development project and the name of the application is called “Learn to drive – Gamification with Unity”. The purpose of this project is to provide a cost-effective, interesting and safer way to learn and improve their driving skills and the knowledge of Malaysia road rules and regulations. In order to improve the driving skills of the users, this project provides the lessons such as slope test, 3- point turn, reverse parking and parallel parking which are included in the driving test of Malaysia. The problem statement of this project includes insufficient teaching manpower and infrastructure to practice, difficult to reflect on own mistake and difficult in practicing real-world scenarios. In order to solve these problems, “Learn to drive – Gamification with Unity” is proposed as it helps to provide an environment for the user to learn driving during their free time and it is able to collect the score, grade and mistake made data for each lesson or game.

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Chapter 1

Introduction

1.1 Problem Statement and Motivation

In Malaysia, driving is almost a necessity as public transport is not well-integrated. [1] Next, in order to avoid an increase in the number of car accidents, it is important for all the drivers to understand the rules and regulations and familiarize themselves with the driving techniques regarding to slope test, reverse parking, parallel parking and 3-point turn, regardless of whether they have been driving for many years or currently taking the driving test. However, there are some of the factors or issues that affect the individuals to improve or obtain the driving skills in Malaysia:

1) Insufficient teaching manpower and infrastructure to practice

With many candidates signing up for the driving test and a limited number of driving instructors available, candidates may not have enough time to practice in a very limited amount of time. Moreover, the driving center may not have enough cars for the candidates to practice. Candidates have to take turns, and have to wait until the previous student is done practicing before they can start. This may result in long waiting time and difficulty in getting extra practice time.

This project, "Learn to drive – Gamification with Unity", a gamification application that provides some realistic driving scenarios and driving tests as well as the road rules and regulations of Malaysia, aims to solve this problem. This driving lesson game is flexible as candidates or users can access the lesson anywhere and anytime in their free time. It helps the candidates to reduce their cost and they can practice again and again in order to strengthen their skills whenever they are about to take the tests or they are already a qualified driver.

2) Difficulty in Understanding and Recalling Detailed Instructions on the Spot

In a real situation, it is very difficult for candidates to remember all the details and instructions provided by the instructor. Often, there is no hardcopy listed down all the instruction during the physical driving lessons and normally relying solely on verbal feedback from driving instructors may not always enough, especially for those new to driving.

Furthermore, candidates may struggle to recall specific instructions or techniques while driving which might lead to errors during their practice sessions. Without a systematic way to reinforce learning and memory retention, it becomes difficult for candidates to apply the necessary skills effectively.

To solve this problem, the "Learn to drive – Gamification with Unity" game provides the candidates and users a solution to enhance their memory and have a better recall of driving instructions. It will point out the all the detailed instructions to improve their driving skills. With the detailed instructions, the candidates will be able to increase the effectiveness of their practice sessions.

3) Difficulty in practicing real-world scenarios

Due to numerous limits including traffic, road availability, and legal limitations, the candidates may struggle to find enough opportunities to practice driving in a variety of real-world circumstances. This restriction may make it more difficult for them to gather real-world experience and acquire the abilities needed to handle various driving scenarios. Next, due to the safety concern, real-world practice may be frightening and sometimes dangerous, especially for less experienced students. Learning to drive in real-world situations may be hindered by candidates' fears of collisions or harming themselves or others.

"Learn to drive – Gamification with Unity" game provides a 100% safe environment to protect the users from dangerous and accidents. The users can make mistakes and learn from them in a safe environment. It also solve the serious heavy traffic problems that occur in the real world and will save even more time. Moreover, the driving

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lesson game may simulate real-world situations, such as road conditions and traffic patterns. This game enables the users to practice and experience real-world driving scenarios that may be difficult to meet in their limited practice opportunities by immersing them in these virtual locations.

1.2 Project Scope

This project is about developing a driving lesson game application called "Learn to drive – Gamification with Unity " which is developed using Unity. The goal of this project is to provide the user a safe and cost-effective virtual driving test environment in Malaysia for skill improvement and skill development. This project also provide beginners an engaging and realistic virtual driving experience. This application provides 4 types of lessons for the users to choose, namely: Slope Test, 3-Point Turn, Selekoh 'S' Road and Parallel Parking.

Moreover, the game has an interactive lessons and guidance by providing instructional materials, tutorials and advices to teach the users about driving skills and techniques, traffic laws and other precautions. For example, users are recommended to watch a video tutorial before they start learning and playing, but users are able to close the video tutorial if they do not need it. Next, there will be a progress tracking and achievement systems to track the user's progress and record all the scores and grades for each game in order to monitor their improvement over time. For example, there will be a final grade and mistakes for each lesson displayed on the screen and all the records are stored in the game for future reference.

Another main focus of the project in the development of the driving lesson game is its features and functionalities. The priority of the game is to create a user-friendly and realistic virtual driving experience that encourages skill improvement and effective learning. However, there are some limitations in developing the game which is the game will imitate the real-world situations, but it cannot capture the complexity and dynamic nature of the actual traffic environments accurately.

1.3 Project Objectives

The main objective of this project is to develop the driving lessons such as Selekoh 'S' Road, Parallel Parking, 3-Point Turn and Slope Test. These driving lessons are designed in order to improve the driving skill of the players. When players are playing this game, a personalized learning experience will be provided. The main objective can be broken down into the following sub-objectives:-

1. To Develop Four Driving Lessons : Selekoh 'S' Road, Parallel Parking, 3-Point Turn and Slope Test using Unity

The objective is to develop the four lessons which includes Selekoh 'S' Road, Parallel Parking, 3-Point Turn and Slope Test using Unity as the development platform. Through this project, the goal is to enhance the player confidence and competence, ultimately contributing to the safety of the road. These 4 lessons are being tested by JPJ in the driving test in Malaysia.

2. To Design Driving Lessons for Improving Player's Driving Skill

This objective is to design driving lessons aimed at enhancing the players' driving skills. By carefully structuring the lessons to include real-world scenarios, players are provided with opportunities to practice and refine their driving techniques in a controlled environment. Moreover, the gamified structure of the lessons not only improve the motivation and engagement but also encourages repeated practice which is significant when acquiring the driving skill. Through these driving lessons design, players can expect a rewarding learning experience that helps in improving the driving skills. Visualization of the driving lessons help the users to reflect their potential mistake.

3. To Create a Personalized Learning Experience for Players by Connecting to Firebase Console

This objective is to create a personalized learning experience for players as they start their journey to learn driving skills and get a pass in driving test by utilizing a login

function to provide each player access to their individual account by connecting to Firebase Console. Through this personalized approach, players will have the opportunity to view their progress and receive feedback based on their performance.

1.4 Impact, significance and contributions

The features provided in this “Learn to drive – Gamification with Unity” application is to provide the driving lessons in an interactive way. This project helps to disseminate the importance of learning the driving skills. The most common issue faced by Malaysians is most of them do not have extra time to learn to drive in the driving school and learn the Malaysia road rules and regulations. By using this gamification application, it helps the users to learn driving in a safer way and there are not many interesting choices for driving test candidates to learn the Malaysia road rules and regulations in a more effective way. This proposed project will provide a less cost lesson for the Malaysians to learn and improve their driving skills as well as they are able to learn anywhere and anytime.

1.5 Background information

In this era of technology, driving simulator are becoming increasingly popular as a way for people to gain the skills and confidence they need to pass their driving test. This project is to develop a game which is to learn how to drive in driving test using Unity. In this project is to help the people to improve their driving skills and learning the road rules and regulation in Malaysia. The expected outcome of this project is to provide people with a realistic driving experience, allowing them to make mistakes and learn from them in a safe environment. Other than that, this application or game can also be a great way for people to relax and unwind after a long day, making them a perfect way to unwind before hitting the road.

The “Learn to drive – Gamification with Unity” gaming application would includes simulating the Malaysia road tests such as slope test, reverse parking, parallel parking and the 3-point turn. Regardless of whether the drivers have been driving for many years or are just taking the driving test, all of them are able to improve their driving skills and knowledges from this gamification application. In this application, the users

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will be given the detailed instructions of each test before the practice starts. Other than that, a warning will also be given to the users if they break the rules and regulations or make a mistake.

1.6 Report Organization

This report is organized into 7 chapters: Chapter 1 Introduction, Chapter 2 Literature Review, Chapter 3 System Methodology / Approach, Chapter 4 System Design, Chapter 5 System Implementation, Chapter 6 System Evaluation and Discussion as well as Chapter 7 Conclusion.

The first chapter is the introduction of this project which includes problem statement and motivation, project scope, project objectives, impact, significance and contribution, background information, and report organization. The second chapter is the literature review carried out on the previous works on driving lessons gamification application such as “Ford Driving Skills”, “Car Driving Test Simulator” and “Driving School Test”. The third chapter is the system methodology which includes system design, use case diagram and gameplay flowchart. The fourth chapter is about the system design which includes the storyboard, lessons objective and requirement specifications. The fifth chapter is the system implementation which includes the hardware and software setup, timeline, system operation and implementation issues and challenges. The sixth chapter is the system evaluation and discussion which consists of the application performance test action list and objectives evaluation. The last chapter is about the conclusion of the whole project which includes project review and future work.

Chapter 2

Literature Review

2.1 Previous Works on Driving Lessons gamification application

2.1.1 Ford Driving Skills [2]

Ford Driving Skills is a driving simulation games from Ford Motor Company Fund. The mission of the Ford Driving Skills is for the users to learn how to stay safe on the road from the comfort of your own home. It is a website for the users to learn how to drive in different situation such as roundabout and off-road. Other than that, it also provide the stopping distance, turning radius as well as danger zones for the semi-truck.

Ford Driving Skills provides a simple way for the user to learn without register or log in to an account. Before playing, users can watch the video tutorial in order to have a better understanding on the road situation. Next, users can click on the play button to start playing and practicing. After clicking the play button, there is an instruction for the users to know how to control the car and the goal of the lesson. After finish the goal, the screen will appear a congratulations message to the user and ask users where they want to retry the lesson. However, for the off-road simulator, after finishing the lesson, there is a replay button for the users understand and watch how they are driving.

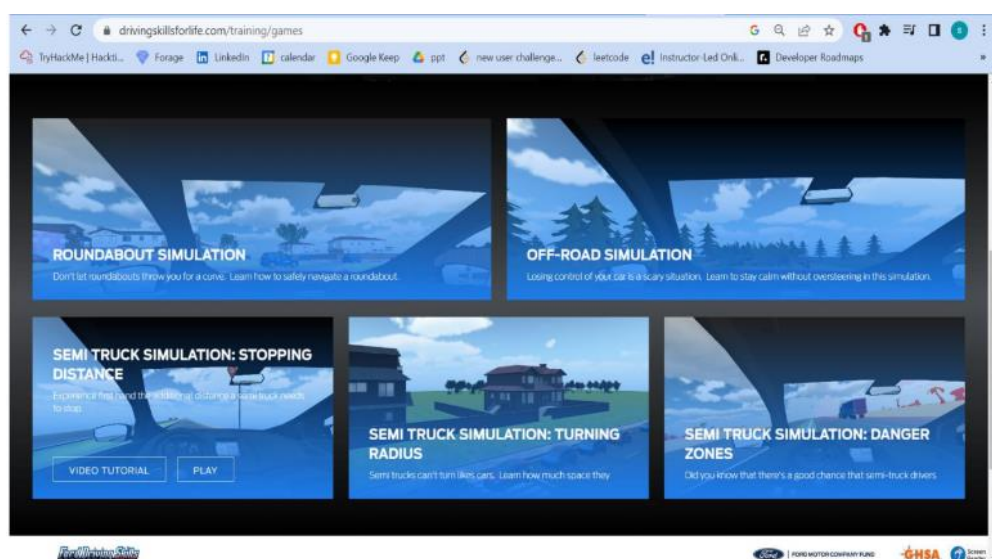


Figure 2.1 Homepage of Ford Driving Skills

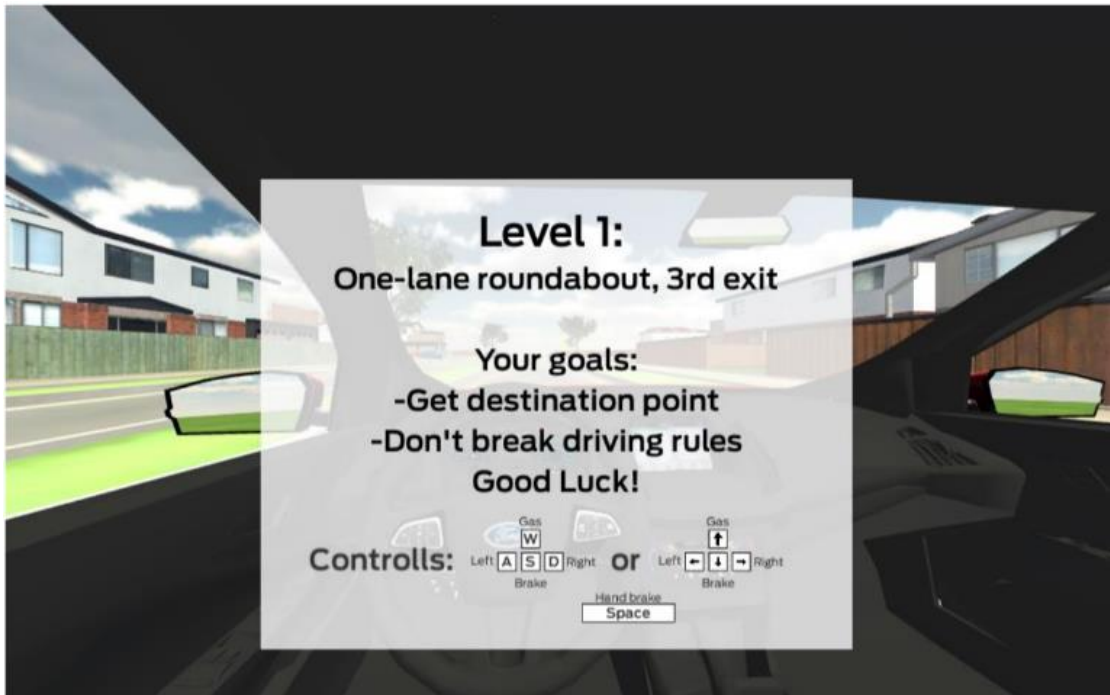


Figure 2.2 Instruction Given for the lesson of Ford Driving Skills



Figure 2.3 Completion of lesson of Ford Driving Skills

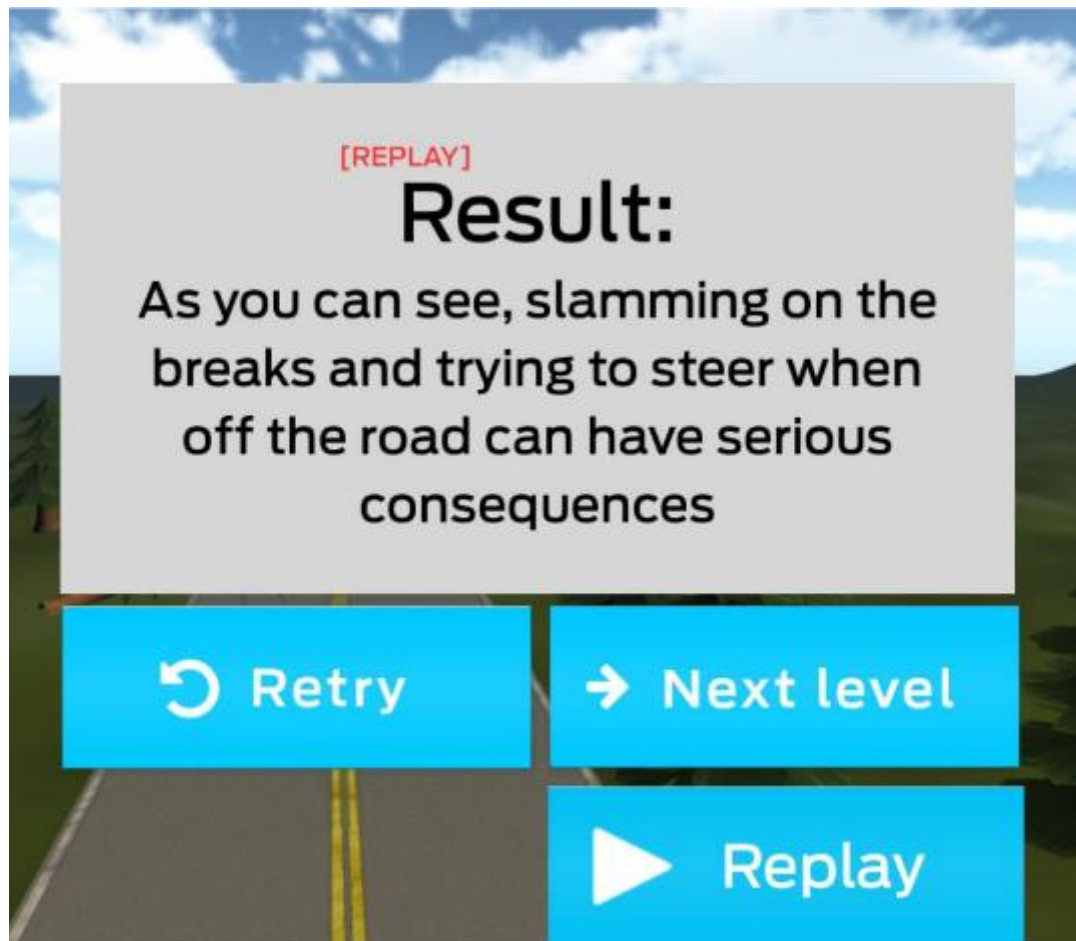


Figure 2.4 Result of lesson of Ford Driving Skill

2.1.1.1 Strengths and Weakness

The strengths of Ford Driving Skills includes the game design is simple and easy, the users can start playing the game without signing in and log in an account. All the lesson are well-labelled with the different road situation and the description of the road situation. Moreover, all the road condition simulator involves a video tutorial for the users to refer to. Next, some of the driving lesson provide the replay function for the users to review back. It helps the users to deeply understand the error or mistakes they have done. The game is smooth, thus, it provides a better gaming performance and better practice experience to the users. Other than that, the game is highly recreated the roads situation in real life, because the game is not just a car that the user is driving. The game is free of charge for the public and it is a cost-effective game for the users to practice and learn driving.

However, Ford Driving Skills also have several weaknesses. The game only provides one language version, which is the English language version and some of the users will face issues when they read the instructions before playing. Next, while

playing the game, it does not provide the features inside the car dashboard such as speedometer, tachometer and so on. The game did not provide the warning message when the users did some mistake.

2.1.2 Car Driving Test Simulator [3]

Car Driving Test Simulator is a game that driving lessons for the public from Y8.com. This game is more detailed as the users need to pay attention to the road signs, traffic lights, and indicators. The users have to finish the level one by one to unlock the next level. After choosing the level, users are able to choose the car based on their preferences and there will be an instruction about the description of each level for the users to read. Next, user can click the start button and the screen will display a “Turn Engine On” instruction to teach the users to turn on the engine before driving as well as fasten the seatbelt. Then, the users will be able to drive and finish the mission. After completing the mission, there will be a lesson summary which includes pass or fail, the score and the rewards earn. Lastly, users can choose to retry the lesson or go to the next level if they pass the current level.

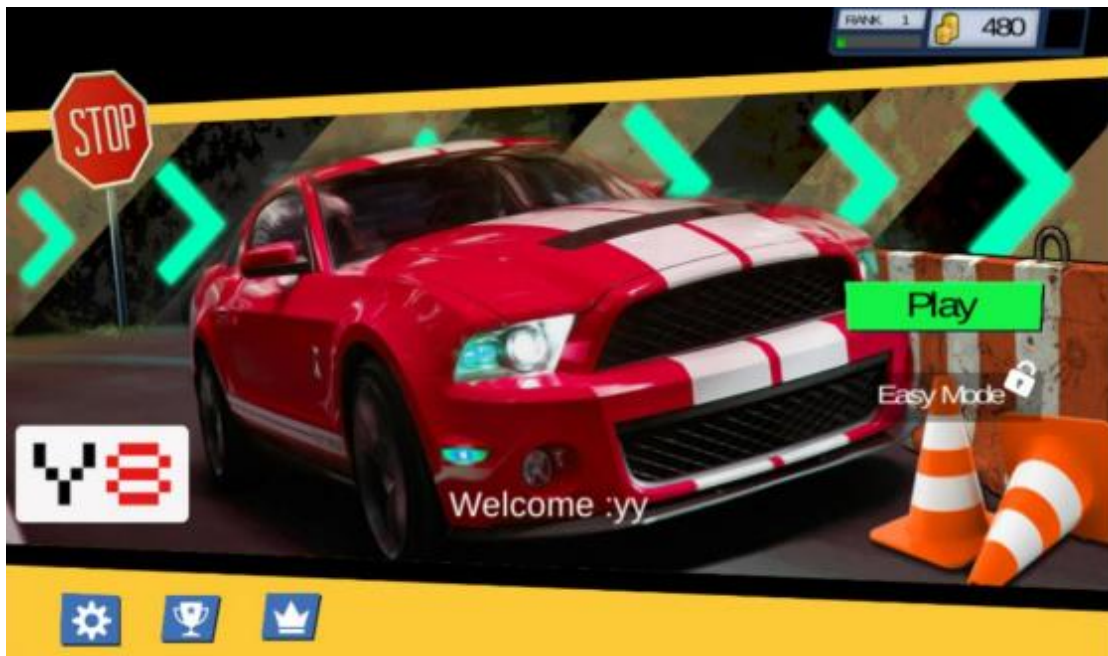


Figure 2.5 Homepage of Car Driving Test Simulator

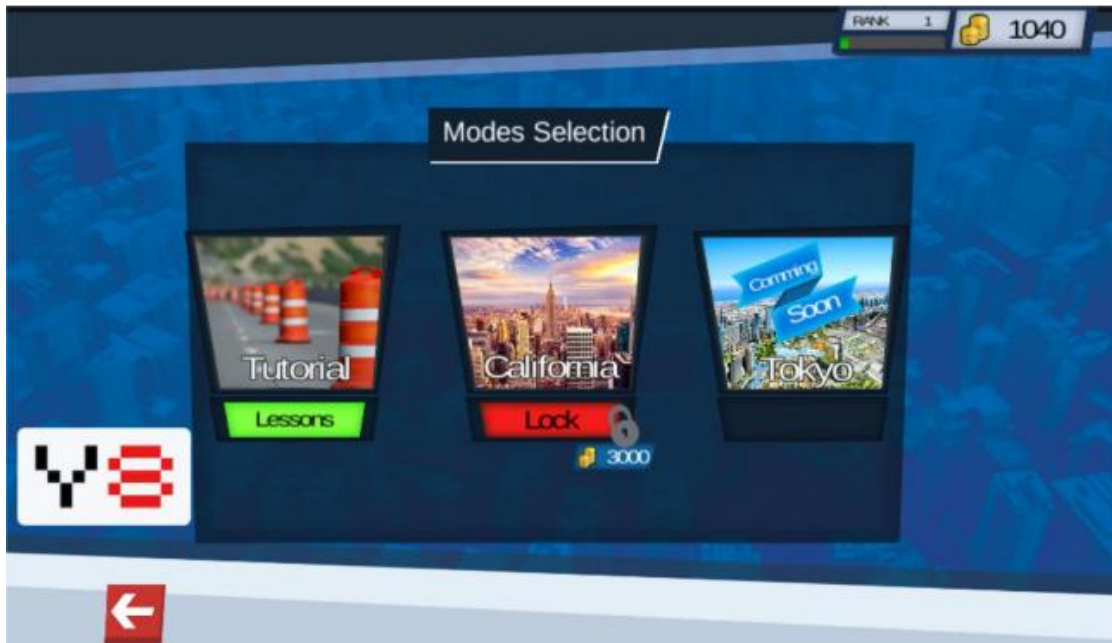


Figure 2.6 Modes Selections Page of Car Driving Test Simulator



Figure 2.7 Tutorial Lessons Page of Car Driving Test Simulator



Figure 2.8 Car Selection Page of Car Driving Test Simulator

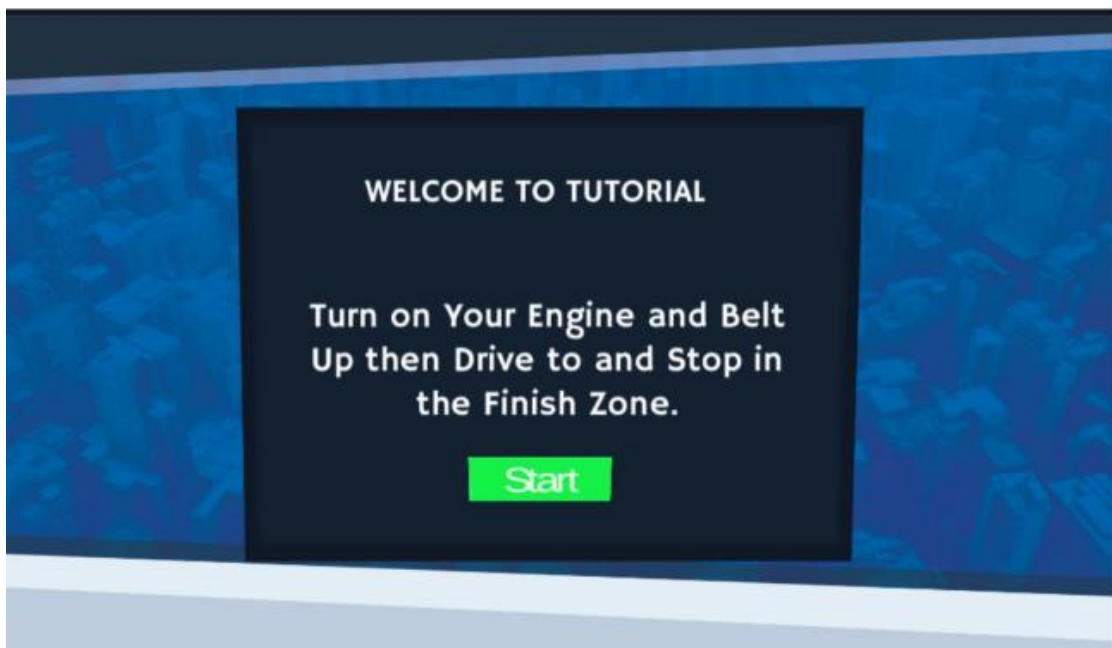


Figure 2.9 Instruction Page of Car Driving Test Simulator



Figure 2.10 Game Page of Car Driving Test Simulator

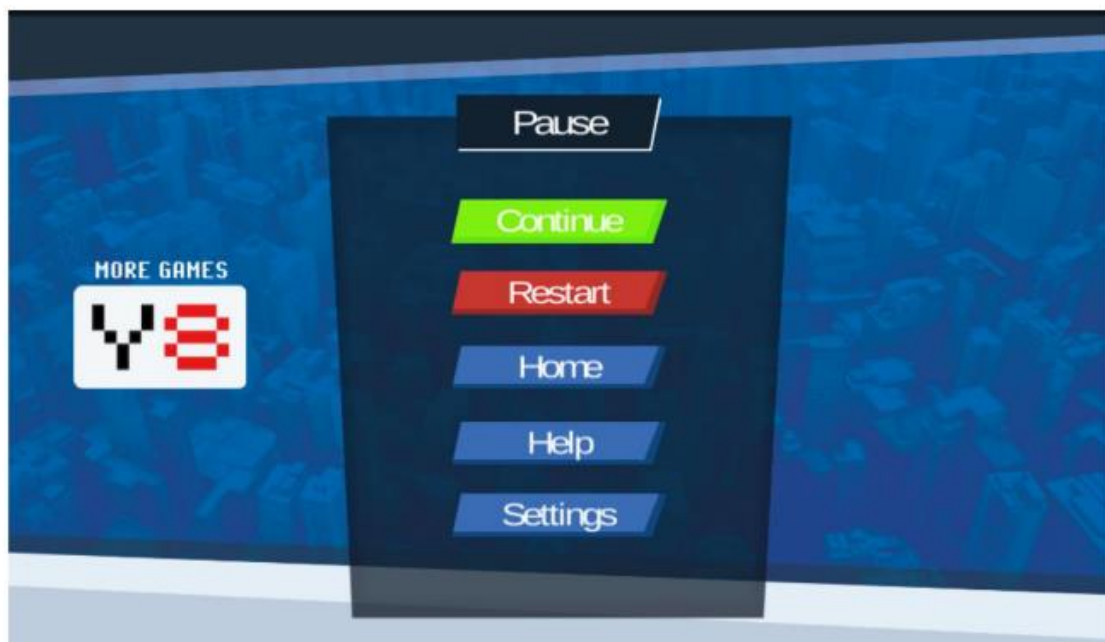


Figure 2.11 Setting Page of Car Driving Test Simulator

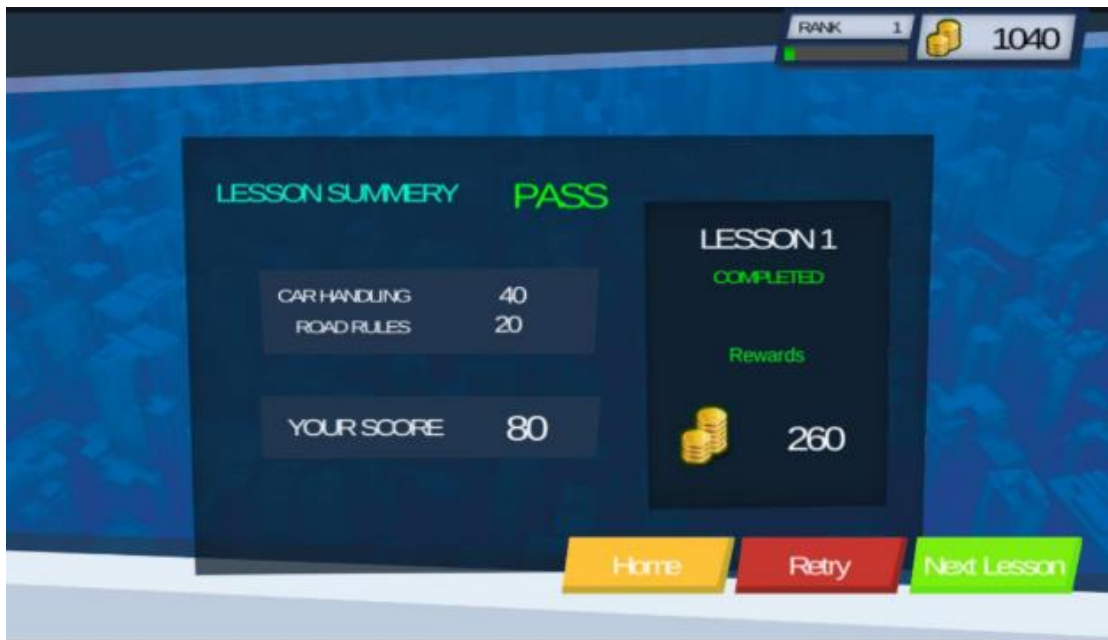


Figure 2.12 Result Page of Car Driving Test Simulator (PASS)

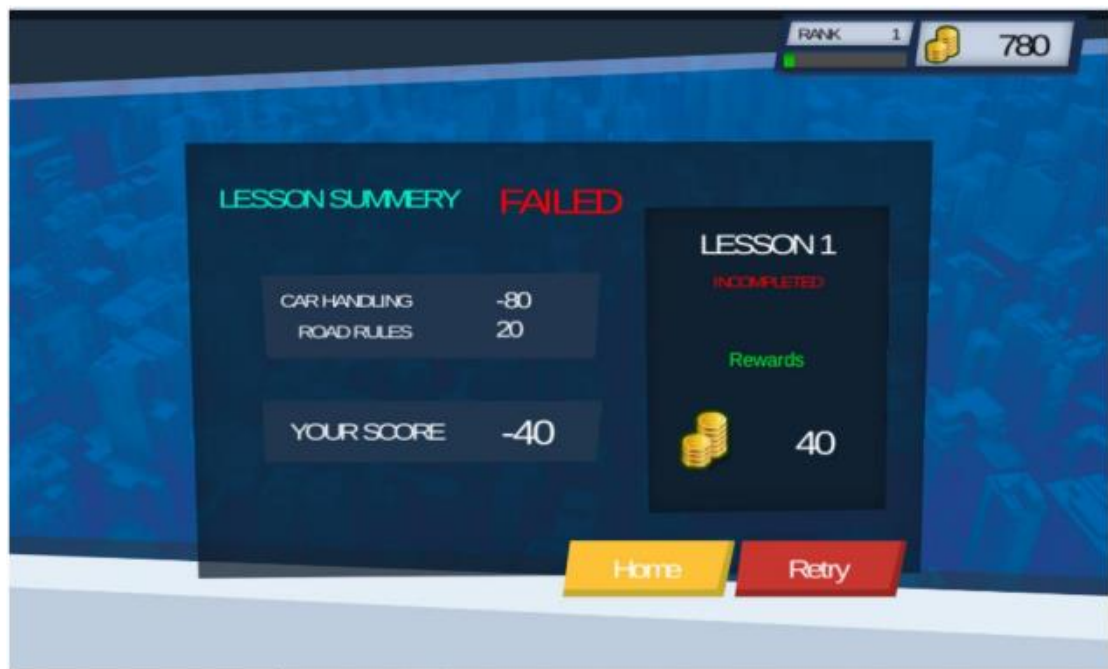


Figure 2.13 Result Page of Car Driving Test Simulator (FAILED)

2.1.2.1 Strengths and Weakness

The first strength of the Car Driving Test Simulation from Y8.com is it includes the details and important parts which is turning on the engine button and fasten the seatbelt. It helps to remind the users that they must turn on the engine and fasten the seatbelt before driving. Next, the Car Driving Test Simulation provides several cars for the user to choose. Before start playing the game, the system will display the car and the power, torque and weight of the cars in order to let the user know more about the chosen car. In the lesson summary page, it shows the detailed and overall score and the pass or fail grade. It also reward the user coins after passing the lesson and the user can use the coins to buy for a new car.

However, the first weakness of the Car Driving Test Simulation from Y8.com is that it only provides English-version language instead of Multilanguage such as Chinese, Spanish and so on. Next, when the user selecting the lesson or level, it does not pop out or show the instruction for the user to read through before playing. Thus, the user only can choose again the lesson in the beginning of the game by clicking the setting button.

2.1.3 Driving School Test [4]

Driving School Test is a mobile gamification application in Play Store. This mobile game can only play in portrait mode and the user can start to play the game once they open the application without clicking on the other button. It provide the guide to the user using the arrows and the crown icon. Thus, the user does not required to read through the instructions in words.



Figure 2.14 Main Page and Instruction of Driving School Test



Figure 2.15 Game View of Driving School Test

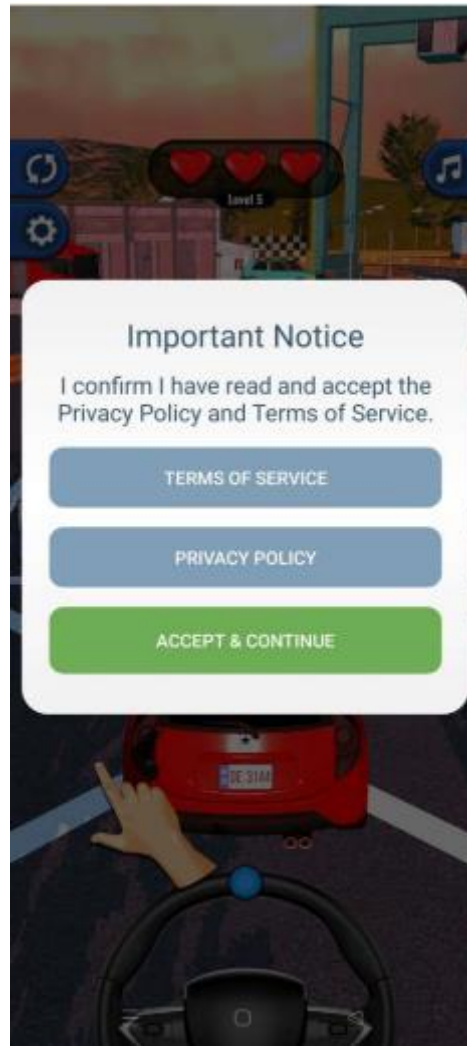


Figure 2.16 Setting Page of Driving School Test

2.1.3.1 Strengths and Weakness

The first strength of this game is it is simple and easy to use. The 3D modelling, colour, lightning, the car controlling sensitivity and the signs are all creative, comfortable and ease to use. Next, this game provide the automatic mode stick swift for the user to control the car to drive out or reverse. This game also provides 3 lives to the user for each lesson, thus, the user will only have 3 chances of making mistakes and the user will become more serious while playing the game.

However, the first weakness of this game is it did not have the register account and log in function. Thus, it causes the users are not able to continue the progress if they change their smartphone. Next, the second weakness of this game is the users are not able to retry the previous lesson once the next lesson start. The users will not be able to practice again the lesson once completed. The third weakness of this game is

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the users unable to change to another languages because it only provides one language which is English. It is not user-friendly to the users that do not know the English language. Moreover, after the user finished the lesson, it does not provide the score or the mistake made. It only displayed a “Level Completed” message to the user.

2.2 System Review Summary and Comparison of Proposed Project

	Ford Driving Skills	Car Driving Test Simulator	Driving School Test	Proposed project
Login and Registration	NO	NO	NO	YES
User Profile Function	NO	NO	NO	YES
Choose lessons Function	YES	YES	NO	YES
Mute or unmute the sound	YES	YES	YES	YES
Graphic	MEDIUM	MEDIUM	BETTER	BETTER
Log out function	NO	NO	NO	YES
Fasten seatbelt and turn on engine instructions	NO	YES	NO	YES

Table 2.1 Comparison of 3 Driving Lesson Gamification Application

Chapter 3

System Methodology / Approach

3.1 System Design

3.1.1 System Life Cycle

The figure below shown the life cycle of the “Learn to drive – Gamification with Unity” gamification application:

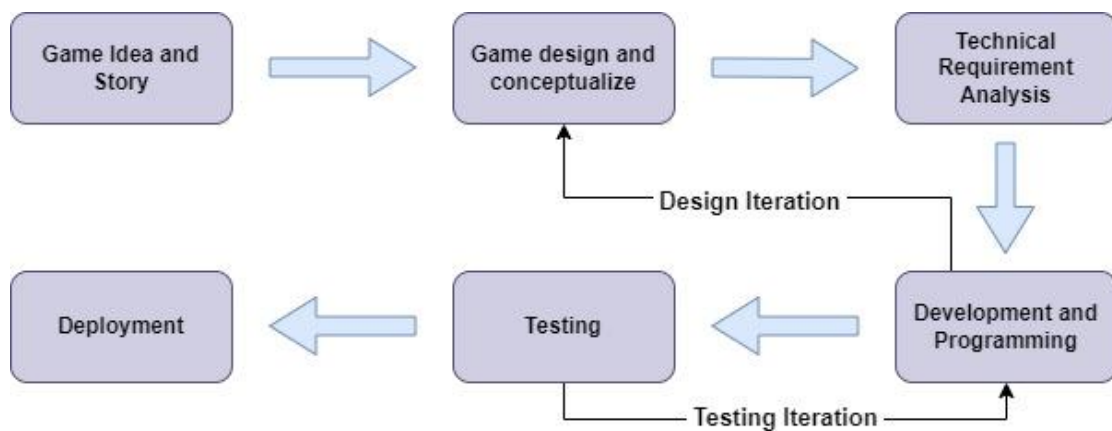


Figure 3.1 Life Cycle of Gamification Application

Game Idea and Story

Game idea and story phase also known as a pre-production stage. In the first phase, we need to brainstorm and plan the idea or the story of the game as well as decided the audience of the gamification application. In this proposed project, we need to brainstorm the idea of the road condition, the functions, warning messages and other creative ideas to improve the “Learn to drive – Gamification with Unity” gamification application. Other than that, in order to develop the application successfully, the team members must check the requirement as much as possible with the product owner. In the Game Development Life Cycle from LinkedIn, there are 10 game design documents need to be created which includes game data, music and audio, VFX effects, game design and progression, AI, 3D Environment, UI interface, Level Design, Game Play and Mechanics as well as the Player Characteristics. [5] All of these features are indispensable in the proposed project, otherwise, the game experience will become worse. Other than that, in the game design phase, the software

CHAPTER 3

tools are important which helps to edit the image, modelling the 3D, workflows, drawing, and project management.

Game Design and Conceptualize

In the second phase which is the game design and conceptualize, it brings all the brainstorming idea and story to the reality. The developer must be more creative and more innovative in this stage. Based on the game design elements that mentioned in the Game Development Life Cycle from LinkedIn, there are 10 game design documents need to be created which includes game data, music and audio, VFX effects, game design and progression, AI, 3D Environment, UI interface, Level Design, Game Play and Mechanics as well as the Player Characteristics. All of these features are indispensable in the proposed project, otherwise, the game experience will become worse. Other than that, in the game design phase, the software tools are important which helps to edit the image, modelling the 3D, workflows, drawing, and project management.

Technical Requirement Analysis

In the technical requirement analysis phase, all the checklists shown below are the framework and game architecture that suggested by Sumit Jain to build into the proposed project. [5]

- UI System	- 3D Modelling and Texturing	- Animation
- Sound or Audio	- Performance and Optimization	- Data Management
- Physics or Collisions	- Game Analytics	- Video Player and Subtitles
- Graphics or Shaders	- Lighting, Shadows and Reflection	- Sky Box
- Camera Projections		

Table 3.1 Framework and Game Architecture Checklists

Development and Programming

After the planning, brainstorming, conceptualize and the framework phases, programming has to be implemented as the next challenge. In the programming and development phase, the Object-Oriented Programming and the Data Structures and Algorithms skills is important.

Testing

In the testing phase, we will test the completeness, performance, stability and the resource usage of the game. Moreover, the proposed project has to test whether it is fun and helps to improve the driving skills and the road rules and regulations of Malaysia.

Deployment

In the final phase, deployment, the application is ready to publish on the platform for the users to install and start playing the game.

Design Iteration

Design iteration occurred when facing issues during the development and programming stage and required to do some changes in game design and conceptualize stage.

Testing Iteration

Testing iteration occurred when facing issues and bugs appeared when playing the game. Thus, it will required to back to the development and programming stage to fix the bugs and problems.

3.2 Use Case Diagram

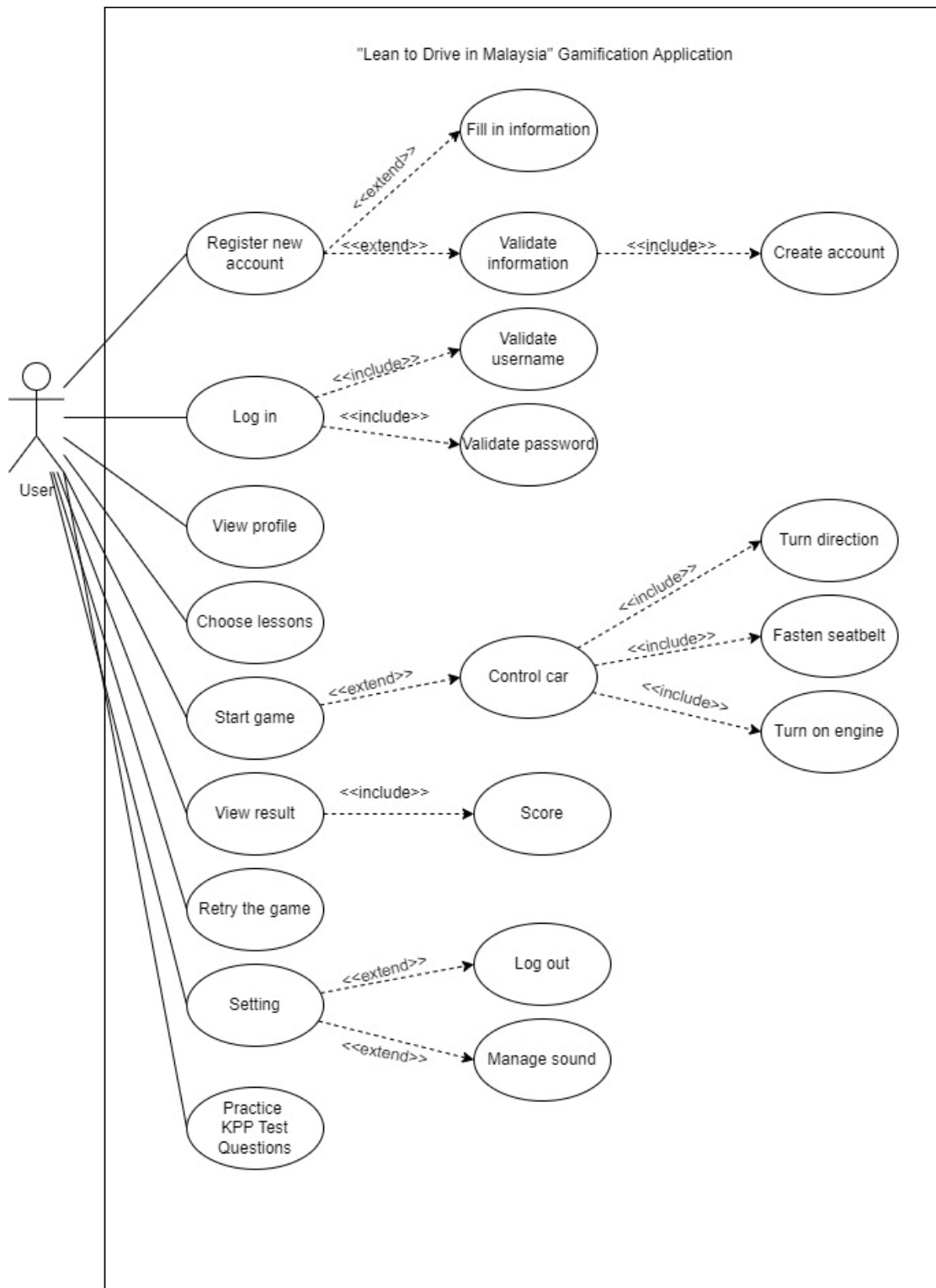


Figure 3.2 Use-Case Diagram of “Learn to drive – Gamification with Unity”

3.2.1 Use Case Description

Use Case Name: Register New Account	ID: 001	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to create and register for a new account		
Brief Description: This use case describes how the user register a new account before playing the game.		
Trigger: 1. User clicks the sign up button in the main page		
Relationships: Association: User Include: Create account Extend: 1. Fill in information 2. Validate information Generalization:		
Normal Flow of Events: 1. User clicks on the sign up button. 2. The system displays the registration page to user. 3. User fills in the personal information. 4. The system will verify all the input data after user filling in the information. 5. The system display a “Successfully Register” message. 6. The system will direct the user to login page.		
Alternate/Exceptional Flows: 4a. The system display an “Invalid Input Data” message when the user fills in the invalid information.		

Table 3.2 Register New Account Use-Case Description

Use Case Name: Log in existing account	ID: 002	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to log in to an existing account		
Brief Description: This use case describes how the user log in to their own account.		
Trigger: 1. User clicks the log in button in the main page		
Relationships: Association: User Include: 1. Validate username 2. Validate password Extend: Generalization:		
Normal Flow of Events: 1. User clicks on the log in button. 2. The system displays the login page. 3. User fills in the username and password. 4. The system will verify all the input data. 5. The system display a “Log in successfully” message. 6. The system will direct the user to the homepage of the game.		
Alternate/Exceptional Flows: 4a. The system display an “Invalid Input Data” message when the user fills in the invalid information in the login page.		

Table 3.3 Log In Existing Account Use-Case Description

CHAPTER 3

Use Case Name: View profile	ID: 003	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to view the information from their profile		
Brief Description: This use case describes how the view their own profile.		
Trigger: 1. User clicks the user profile button in the home page		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. User clicks on the user profile button. 2. The system displays the profile page. 3. User able to view username and email.		
Alternate/Exceptional Flows:		

Table 3.4 Manage Profile Use-Case Description

Use Case Name: Choose lessons	ID: 004	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to choose a suitable lessons		
Brief Description: This use case describes how the user decide and choose a suitable lesson.		
Trigger: 1. User clicks the play button in the home page		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. User clicks on the “Play” button. 2. The system displays the driving lessons list. 3. User select a lesson from the list. 4. The system displays the description of the lesson.		
Alternate/Exceptional Flows: -		

Table 3.5 Choose Lessons Use-Case Description

CHAPTER 3

Use Case Name: Start game	ID: 005	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to start and play the game		
Brief Description: This use case describes how the user play the game.		
Trigger: 1. User clicks the start button in the list of the lessons page		
Relationships: Association: User Include: 1. Turn direction 2. Fasten seatbelt 3. Turn on engine 4. Turn on signals Extend: 1. Control car Generalization:		
Normal Flow of Events: 1. User clicks on the “Start” button after selecting a lesson. 2. The system displays the instruction of the lesson. 3. User clicks the close button. 4. The system displays the instruction of turning on the engine. 5. User clicks on the turn on engine button. 6. The system displays the instruction of fasten the seatbelt. 7. User clicks on the fasten seatbelt button. 8. User starts control the car.		
Alternate/Exceptional Flows: 5a. The system will display a warning message when the user did not click on the turn on engine button. 7a. The system will display a warning message when the user did not click on the fasten seatbelt button.		

8a. User controls the direction of the car using the left right button.
8b. User controls the car by clicking on the gas pedal and the brake pedal.
8c. User turn on the signals by clicking on the signals button.
8d. The system will display the warning message when the user did some mistakes.

Table 3.6 Start Game Use-Case Description

Use Case Name: View result	ID: 006	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to view the result after a game.		
Brief Description: This use case describes how the system display the result to the user.		
Trigger: -		
Relationships: Association: User Include: 1. Score Extend: Generalization:		
Normal Flow of Events: 1. The system displays the overall score gained of the game. 2. The user click on the main menu button to go back to the home page.		
Alternate/Exceptional Flows: 2a. The user can click on the retry button to replay the game again.		

Table 3.7 View Result Use-Case Description

Use Case Name: Setting	ID: 007	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to manage the setting of the application.		
Brief Description: This use case describes how the user manage the setting of the application.		
Trigger: 1. User clicks the setting button in the home page.		
Relationships: Association: User Include: Extend: 1. Log out 2. Manage sound Generalization:		
Normal Flow of Events: 1. The system displays the setting functions. 2. User manages the sound of the game by clicking on the mute button or unmute button. 3. User clicks on the log out button to log out the account.		
Alternate/Exceptional Flows: -		

Table 3.8 Setting Use-Case Description

Use Case Name: Practice KPP Test Questions	ID: 008	Importance Level: High
Primary Actor: User		
Stakeholders and Interests: User – wants to practice the KPP Test questions.		
Brief Description: This use case describes how the user can practice and get the result for the KPP Test based on different sections.		
Trigger: 1. User clicks the KPP Test button in the home page.		
Relationships: Association: User Include: Extend: Generalization:		
Normal Flow of Events: 1. The system displays 4 different KPP Test Topics for user to choose. 2. User clicks on 1 topic and start to do the questions. 3. User clicks on the correct answer. 4. User able to view the result after each test.		
Alternate/Exceptional Flows: -		

Table 3.9 Practice KPP Test Questions Use-Case Description

3.3 Gameplay Flowchart

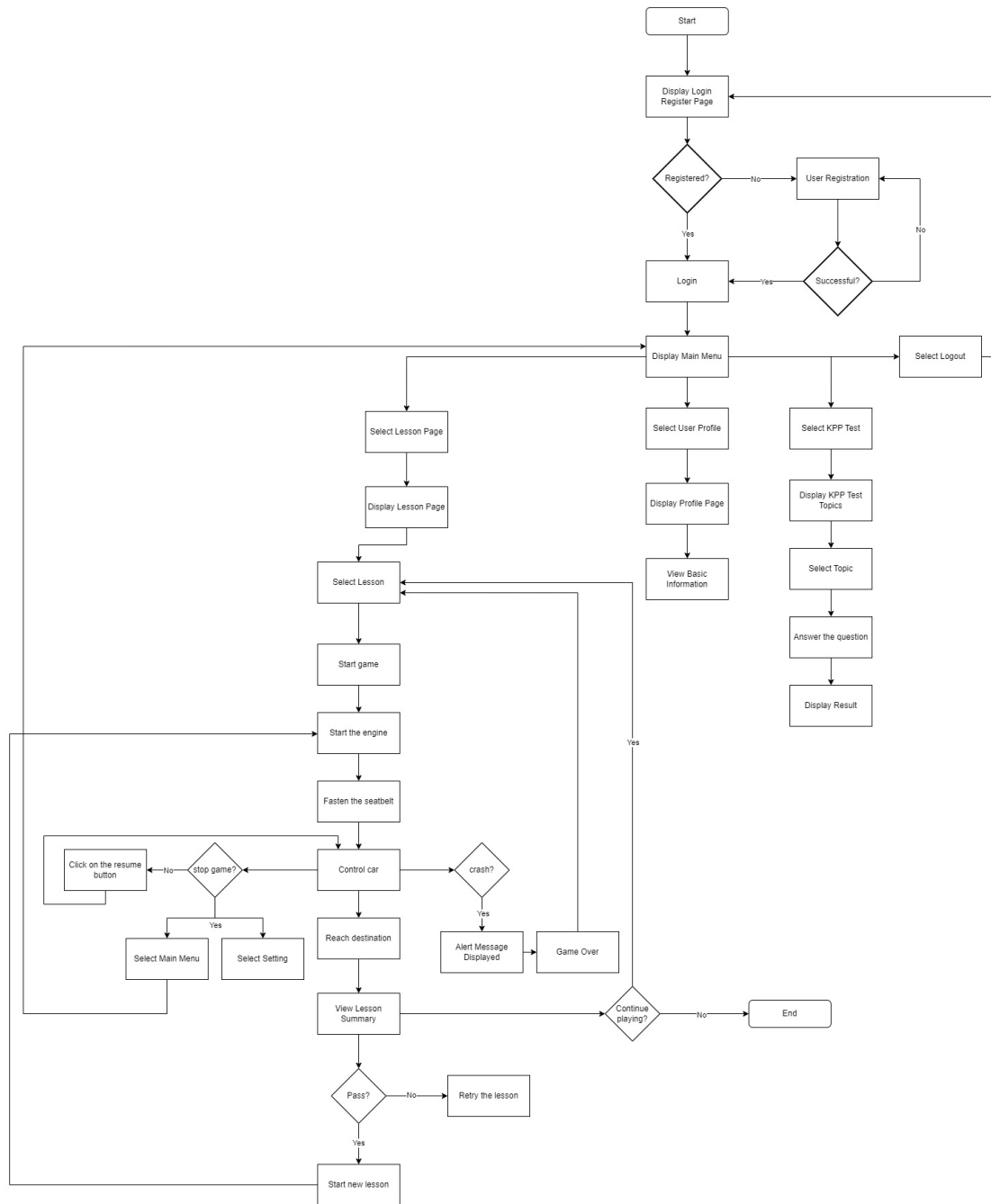


Figure 3.3 Gameplay Flowchart

3.3.1 Gameplay Flowchart Description

The gameplay flow of the project begins with the display of a login or register page. If the user is not registered, they are directed to the user registration page. Upon successful registration, they are redirected to the login page. Users who are already registered proceed directly to the login page. Following login, the main menu is displayed, offering options such as logging out or accessing the user profile. Selecting the user profile option leads to the display of basic information like username and email.

Additionally, users can navigate to the lesson page from the main menu. Upon selecting a lesson, the game starts, and users engage by controlling a car. They must navigate obstacles and avoid crashes. If a crash occurs, an alert message prompts, signaling the end of the game, and users are returned to the lesson selection page. Users can pause the game and return to the main menu or resume play. Upon reaching the destination, users are presented with a lesson summary page, where they can choose to continue playing or end the game.

If users opt to continue, they return to the lesson selection page. If they choose not to continue, the session ends. If the user passes the lesson, they can choose to start a new lesson and it will direct them back to the lesson selection page. Alternatively, they can retry the current lesson by selecting the restart button.

Moreover, users can practice the KPP Test by selecting the “KPP Test” in the main menu. In the KPP Test, there are 4 different topics and different sets of questions for users to choose based on their preferences. After finish the test, users can view their practice result immediately. In summary, this structured flow ensures a seamless and engaging user experience throughout the gameplay journey.

CHAPTER 4

System Design

4.1 Storyboard

TITLE Learn to drive – Gamification with Unity Storyboard
NAME Hang Shy Mun YEAR & SUBJECT Y3 & FYP2

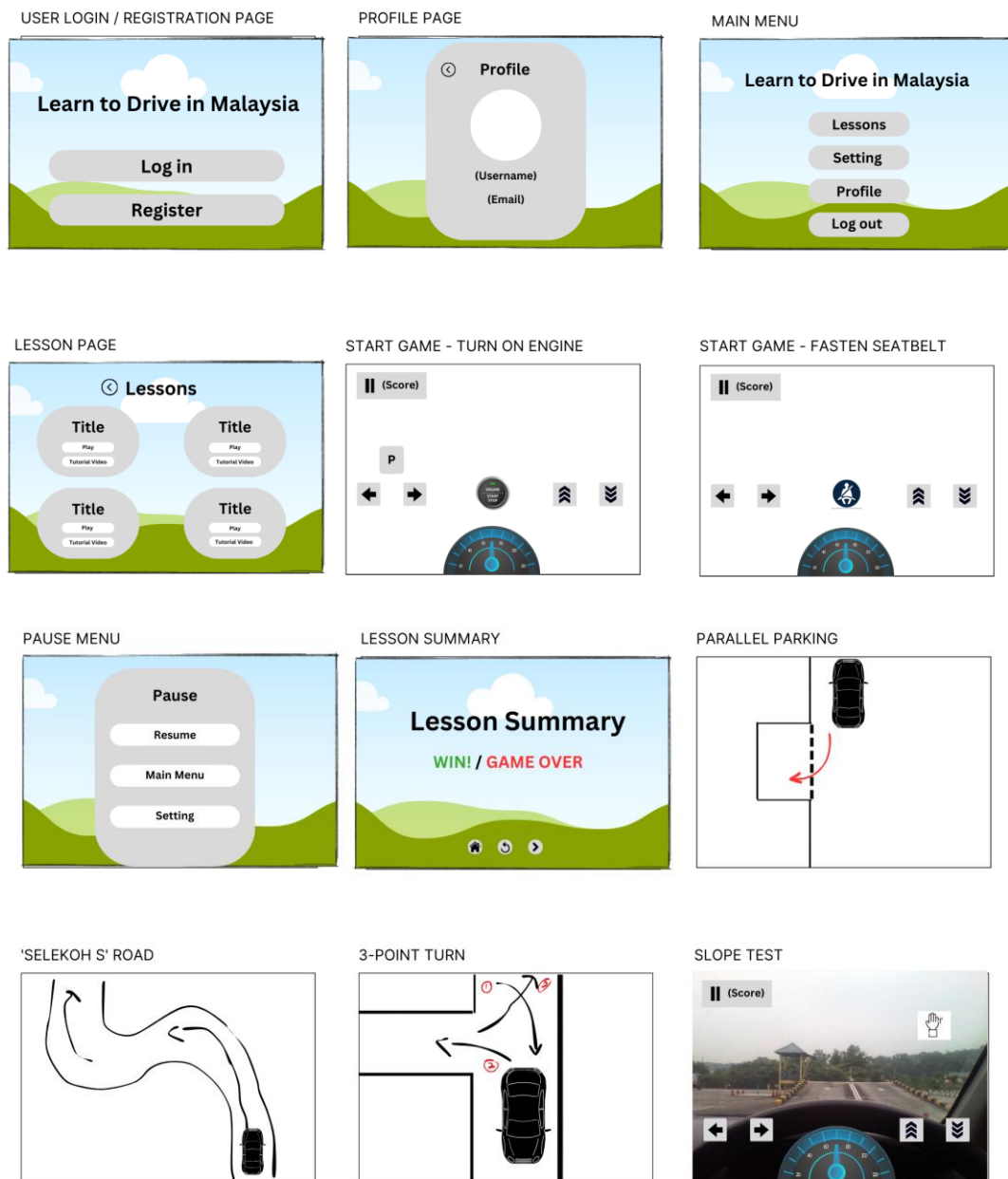


Figure 4.1 Storyboard

CHAPTER 4

4.2 Lessons Objectives

The 4 lessons were designed based on the following outcome:-

4.2.1 Slope Test

Objective:

- To teach users how to effectively control a vehicle's movement on slopes, both when starting and stopping.

Learning Goals:

- Master the coordination between the accelerator and brake pedals to prevent the vehicle from rolling backward.
- Ensure that the vehicle does not collide with objects or other vehicles.

Outcome:

- Users will gain more experience and acquire the skills when navigating slopes.

4.2.2 Selekoh 'S' Road

Objective:

- To familiarize users with navigating through S-shaped roads and curves by using the steering, accelerator and brake.
- To maintain control of the vehicle and avoid collisions with surrounding obstacles or vehicles.

Learning Goals:

- Learn techniques for negotiating curves and bends in the road which includes proper speed management and steering control.
- Practice maintaining a smooth and steady driving rhythm while navigating through S-shaped roads in order to minimize the risk of oversteering or losing control of the vehicle, while also avoiding collisions with surrounding obstacles or vehicles.

Outcome:

- Users will gain more experience and acquire the skills when handling challenging road curves and avoiding collisions with surrounding obstacles or vehicles.

CHAPTER 4

4.2.3 Parallel Parking

Objective:

- To teach users how to parallel park a vehicle efficiently within a designated parking space.

Learning Goals:

- Understand the key steps involved in parallel parking which includes assessing the parking space and positioning the vehicle.
- Gain skill in estimating distances and angles to park parallel to the curb while keeping a safe distance from other vehicles.

Outcome:

- Users will gain more experiences and acquire the skills to parallel parking in various real-world scenarios.

4.2.4 3-Point Turn

Objective:

- To enable users to perform a three-point turn in a confined space.

Learning Goals:

- Learn the step-by-step process of executing a three-point turn which includes proper positioning while also being aware of nearby obstacles.
- Practice coordinating accelerator and brake actions to smoothly transition between forward and reverse movements during the lesson.

Outcome:

- Users will gain more experiences and acquire the skills necessary to safely and confidently perform three-point turns while avoiding collisions with nearby objects or vehicles.

4.3 Requirement Specifications

4.3.1 Functional Requirements

1. User Registration, Authentication and Profiles
 - User should be able to create account using email and password.
 - User should be able to log in.
 - User should be able to log out.
 - User should be able to enter username.
2. General Settings
 - User should be able to mute music.
3. Lessons Selection
 - User should be able to start the lesson directly.
 - User should be able to watch the tutorial video before start.
 - User should be able to control the tutorial video with button clicks (play and pause)
 - User should be able to choose different lessons such as ‘Slope Test’, ‘Parallel Parking’, ‘Selekoh S’ Road’ and ‘3-Point Turn’.
4. In-Game Features
 - User should be able to start the engine before driving with a button click.
 - User should be able to fasten the seatbelt before driving with a button click.
 - User should be able to control the car with the buttons (left, right, forward, backward and stop).
 - User should be able to pause the game by clicking the pause button.
 - User should be able to resume the game.
 - User should be able to back to the main menu after pausing the game.
 - User should be able to navigate to the setting page after pausing the game.
 - User should be able to view the score.
5. Feedback and Scoring
 - User should be able to view the lesson summary (score detail and passed / failed).
 - User should be able to back to the main menu with a button click.

CHAPTER 4

- User should be able to replay the game with a button click.
- User should be able to navigate to the next lesson with a button click.

4.3.2 Non-Functional Requirements

- User should be able to access a user-friendly and easy to use interface.
- The information provided by the user should be able to be protected from the unauthorized access.

CHAPTER 5

System Implementation

5.1 Hardware Setup

The hardware involved in this proposed project is laptop and android smartphone. The laptop is used to design the game, analysis the technical requirement, programming, development as well as maintenance. The android smartphone device is used for the performance testing and deploying the “Learn to drive – Gamification with Unity” gamification application.

Description	Specifications
Model	Msi Modern 14 A10M
Processor	Intel Core i7-10510U
Operating System	Microsoft Windows 10 Home Single Language
Graphic	Intel UHD Graphics
Memory	8GB RAM
Storage	512GB

Table 5.1 Specifications of laptop

Description	Specifications
Model	OPPO A93
Processor	Octa-core
Operating System	Android version 12
Memory	8GB RAM
Storage	128GB

Table 5.2 Specifications of Smartphone Device

5.2 Software Setup

Description	Specifications
Development Environment	- Unity Hub - Visual Studio 2019
Cloud Service	Firebase Console

Table 5.3 Specifications of Software

The project is being developed using Unity Hub and Visual Studio 2019, which facilitates smooth interaction between the Unity game engine and powerful code editing features. Additionally, Firebase Console served as the cloud service for managing backend functionalities such as user authentication.

5.3 Timeline

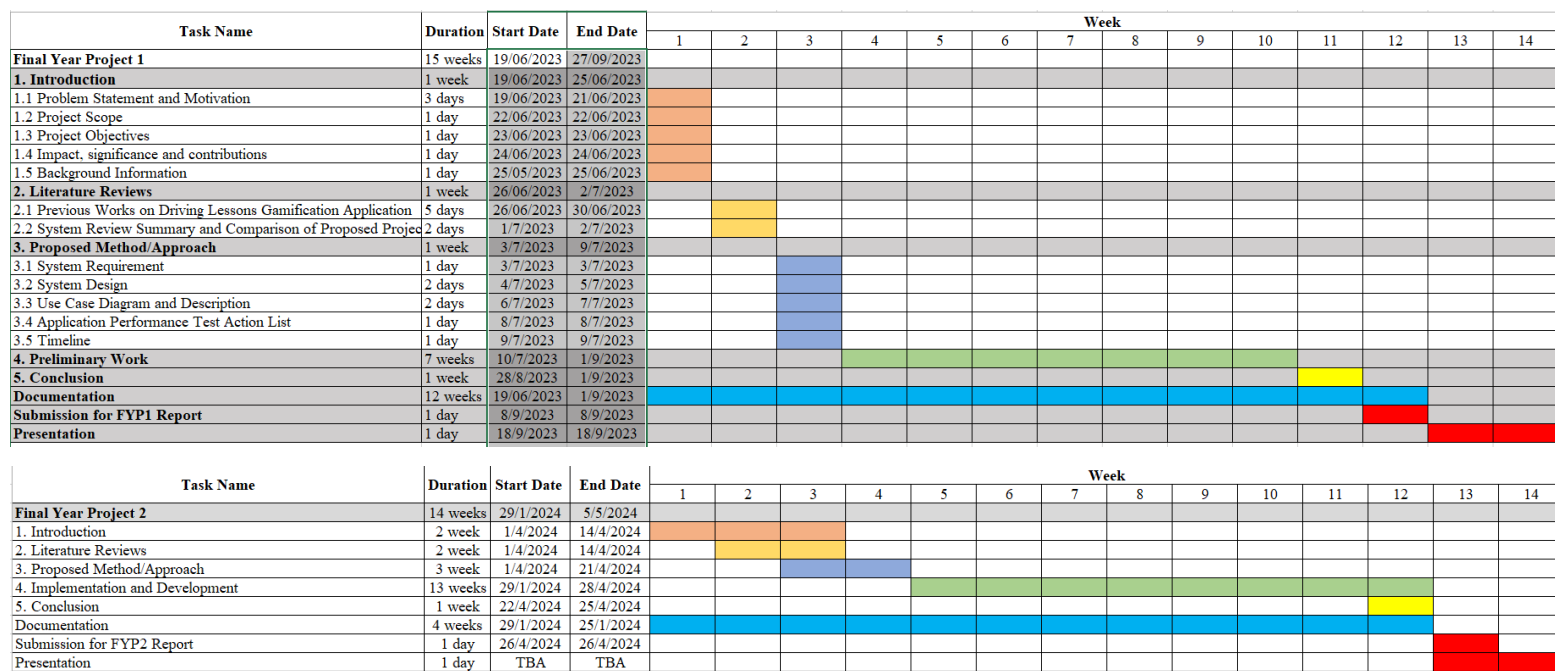


Figure 5.1 Timeline for FYP1 and FYP2

5.4 System Operation

5.4.1 Overview

The features and functions done in the “Learn to Drive – Gamification with Unity” project includes, login and register function, logout function, user profile system, forget password function, 4 types of lessons and so on.

5.4.2 Login

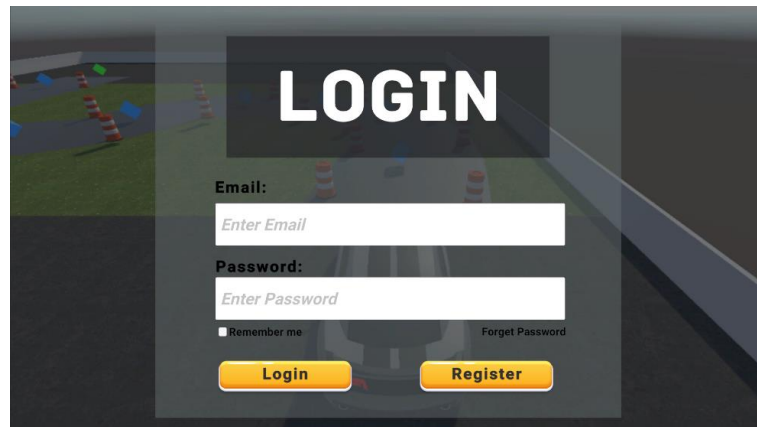


Figure 5.2 Login Page



Figure 5.3 & 5.4 Error Message

The figure 5.2 shows the login page. Users are required to login to their account using the registered email and password. There is a ‘remember me’ toggle which is to remember the logged in account without logging out automatically after users quit the game. Next, the error message will pop out when the users enter invalid email address or invalid password.

5.4.3 Register



Figure 5.5 Register Page

The figure 5.5 shown the register page. The users are required to enter the username, valid email address and the password for registration.

5.4.4 Forget Password

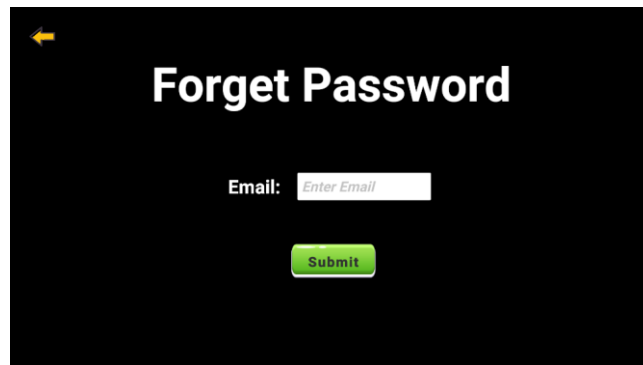


Figure 5.6 Forget Password Page

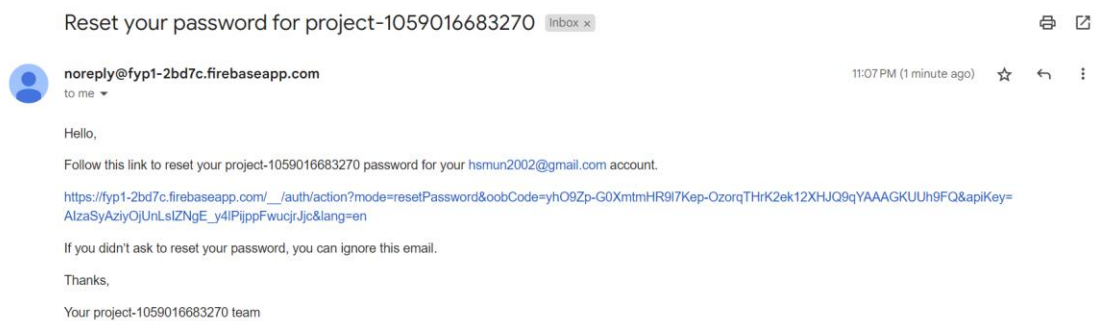
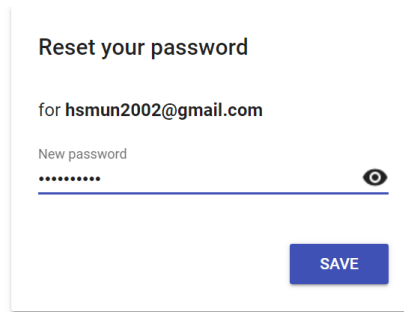


Figure 5.7 Reset Password Link in Email Inbox

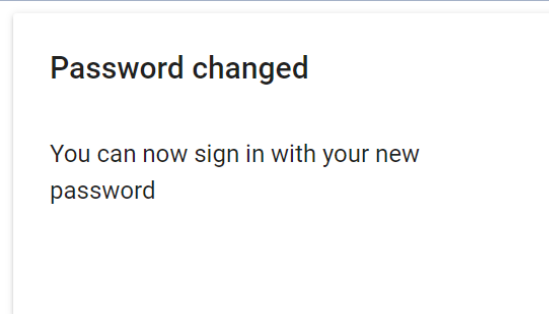


Reset your password

for **hsmun2002@gmail.com**

New password
.....

Figure 5.8 Reset password and Save new Password



Password changed

You can now sign in with your new password

Figure 5.9 Message box inform users password changed

The figures 5.6, 5.7, 5.8 and 5.9 show the steps to reset a new password. First, users are required to submit the email address that wish to reset a new password. After clicking the submit button, the notification message will pop out to inform the users that the reset password link has been successfully sent to the submitted email address. Next, the users are required to click on the link in the email inbox and it will direct the users to a new page to enter a new password. After saving the new password, users can login their accounts using the new password.

5.4.5 User Profile

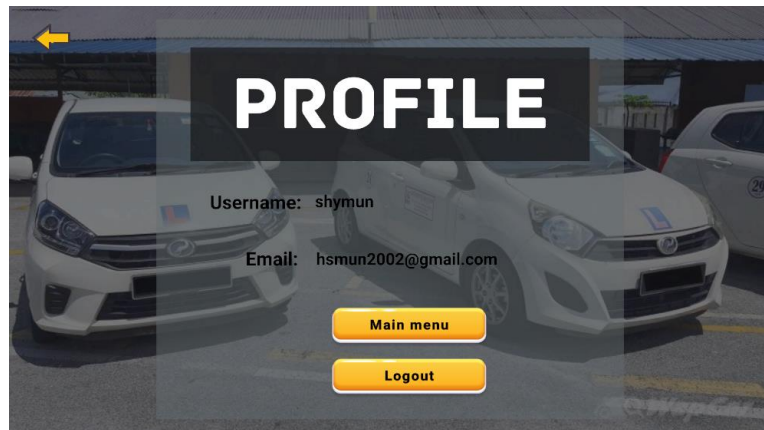


Figure 5.10 User Profile Page

The figure 5.10 shown the username and the email address of the user. There are a logout button in the user profile. After clicking the logout button, it will navigate to the log in account. After clicking the main menu button, it will navigate to the main menu page.

5.4.6 Main Menu



Figure 5.11 Main Menu Page

The figure 5.11 shown the main menu of the game which includes the lessons button, profile button and KPP Test button. Each of these button will navigate the users to lessons page, profile page and KPP Test page. Moreover, there is a mute music toggle at right bottom which is for the users to mute the background music.

5.4.7 Lessons Page

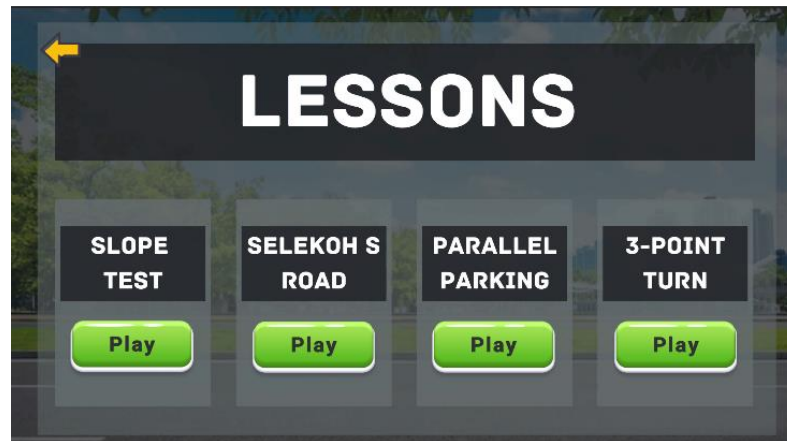


Figure 5.12 Lessons Selection Page

The figure 5.12 shown the 4 main lessons of the game such as Parallel Parking, ‘Selekoh S’ Road, 3-Point Turn and Slope Test. Users can start playing the lesson by clicking the play button.

5.4.8 Start Engine and Fasten Seatbelt Reminder Page

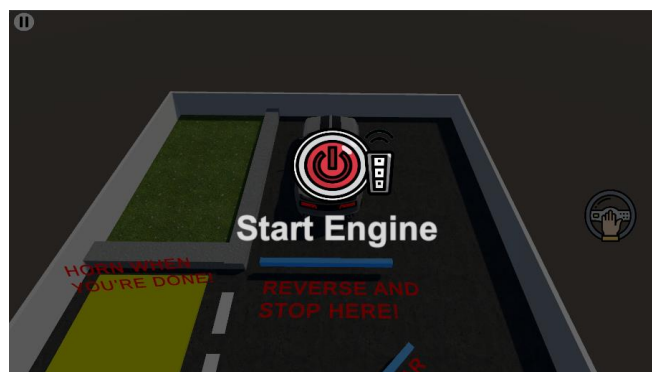


Figure 5.13 Start Engine Page

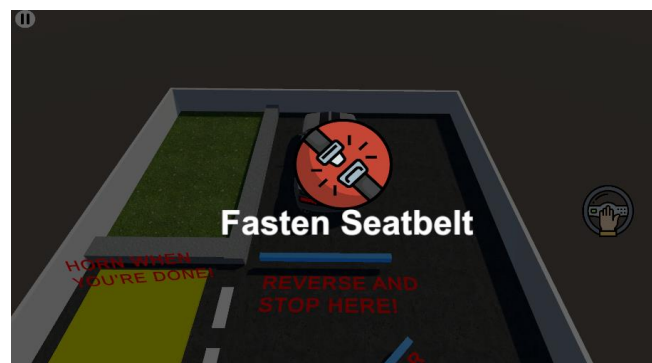


Figure 5.14 Fasten Seatbelt Page

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The figures 5.13 and 5.14 shown the reminder of start engine and fasten seatbelt instruction. When the users click the play button, users can view these reminders and users are required to click on the button to start the engine and fasten the seatbelt. After users clicking these buttons, there will be a sound effects of starting the engine and fasten the seatbelt appear.

5.4.9 Pause Menu



Figure 5.15 Pause Menu

The figure 5.15 is the pause menu that will be appeared after the users clicking the pause button. First, users can resume the game. Next, users can go to the settings page to mute the background music or change the language of the game. Lastly, users can navigate back to the main menu after clicking the main menu button.

5.4.10 Lesson 1 (Selekoh S Road) Road Scene

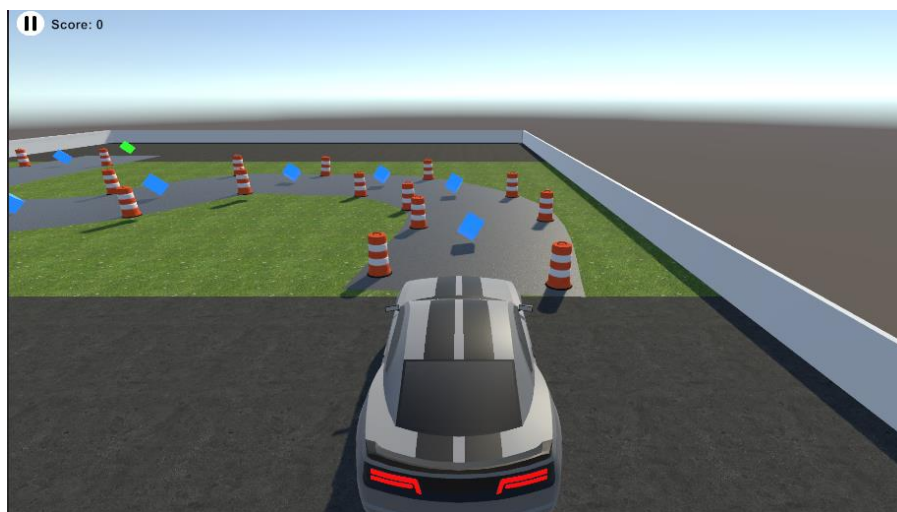


Figure 5.16 Selekoh S Road Start Scene

Next, the figure 5.16 shows the game view of lesson 1. Users have to collect the collectibles which 1 collectible is 10 points and the users have to avoid crashing on the road cone banners, otherwise, it will consider as 'Game Over'. Users can click on the accelerate pedal to move the car forward and the brake pedal to move the car backward. There are left and right buttons for the users to control the direction of the car. Beside the pause button, the scores gain by the users will be shown there.

5.4.11 Lesson 2 (Parallel Parking) Road Scene



Figure 5.17 Parallel Parking Start Scene



Figure 5.18 Turn Left Instruction

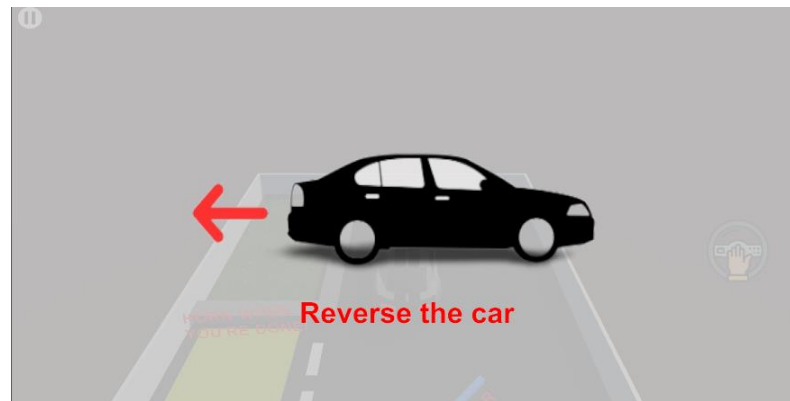


Figure 5.19 Reverse Car Instruction

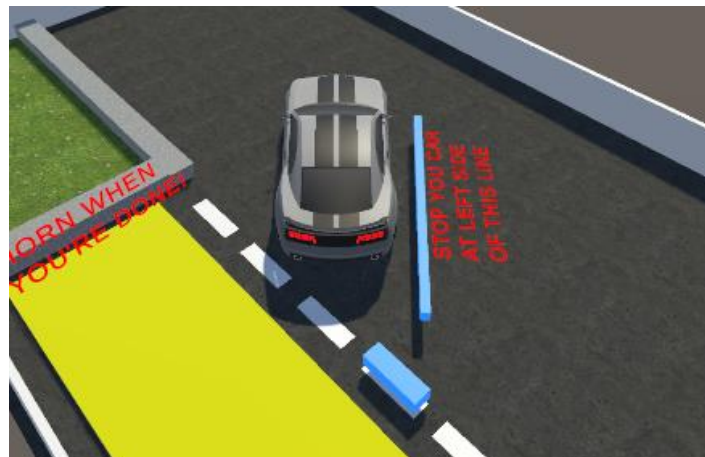


Figure 5.20 Stop Beside the Line Instruction

Figure 5.17 shown the game view of lesson 2 – Parallel Parking. In this lesson, users will be guided by the instructions. First, users will have to see and read the instruction “Reverse and Stop Here” to stop at the line. When the users press the space bar to stop the car, an instruction (Figure 5.18) will appear which tell the users to turn the steering to fully left. Then, after users pressing the left key, a “Reverse” instruction (Figure 5.19) displayed on the screen. Then, users have to pressing the left key and reverse at the same time and stop beside the line when the line and instruction destroyed (Figure 5.20). Next, users have to stop when the right back tyre stop on the third line (the blue block). The users will see a turn fully right and reverse instruction and after parking into the parking area, users have to horn then the congratulations panel will be shown.

5.4.12 Lesson 3 (3-Point Turn) Road Scene



Figure 5.21 3-Point Turn Start Scene



Figure 5.22 Instruction 1



Figure 5.23 Going into the Second Parking Area



Figure 5.24 Instruction 2



Figure 5.25 Instruction 3

Figure 5.21 shown the game view of lesson 3 – 3-Point Turn. Users will be guided based on the instructions set in the lesson. First, user have to turn right to the yellow parking area and the instruction 1 (Figure 5.22) will be shown to guide users to park into the next parking area and users have to click the “Got It” button when they finish reading. Then, the first parking area will be destroyed and the next parking area will appear. When the users start parking into the second parking area, there is a blue block on the parking area 2 and when the users collide the blue block the second instruction (Figure 5.24) displayed. Then, users have to turn steering wheel back to straight and continue reverse. After parking in the second parking area, the third parking area and instruction text (Figure 5.25) will be displayed. Then, when users successfully parking into the last parking place, users have to horn and the lesson finished.

5.4.13 Lesson 4 (Slope Test) Road Scene



Figure 5.26 Slope Test Start Scene



Figure 5.27 Successfully inside the Yellow Line

Figure 5.26 shown the game view of lesson 4 – Slope Test. Users have to drive to the yellow line and there is a “STOP HERE” instruction text. When user successfully stop inside the yellow line, the alert box shown in Figure 5.27 will tell the users to stop and horn. After user stop and horn, the blue block that prevent the users will be destroyed and users can go down the hill. There will be a green collectible at the downside of the hill, after users collect it then the congratulations panel will be displayed which indicates that user have finished the lesson 4. Moreover, the users have to avoid crashing on the wall and road cones, otherwise, it will consider as ‘Game Over’. Users can click on the Up Arrow on keyboard to move the car forward and the Space Bar to move the car backward. There are left and right buttons for the users to control the direction of the car. If user would like to stop the game, restart the game or go back to the main menu, user can click the pause button which located at the top left side.

5.4.14 KPP Test

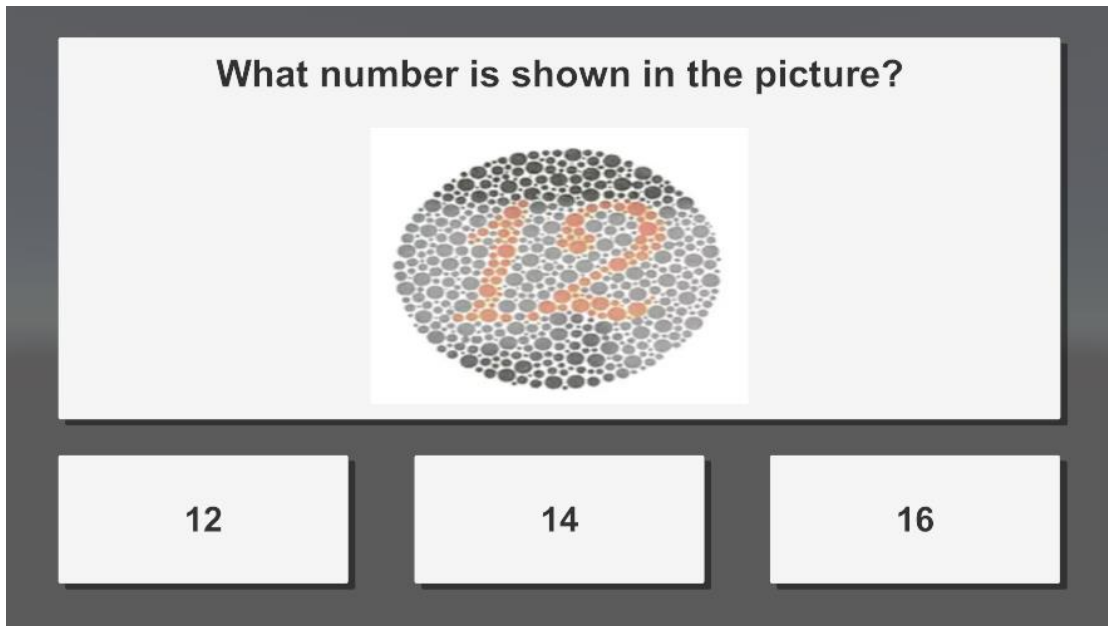


Figure 5.28 KPP Test (Example Color Blind Topic Question)

Figure 5.26 shown one of the topic of the KPP Test which is the color blind test. Users can choose the topic listed and start answering the question by selecting the correct button. If users choose correct answer, it will show a tick icon. However, if users choose the wrong answer, it will show a wrong icon.

5.5 Implementation Issues and Challenges

5.5.1 Issue 1: Cross-Platform Development

- **Description:**
 - During the deployment phase of Learn to Drive – Gamification with Unity on mobile devices, there is a significant performance issues occurred which are severe lag and unresponsive controls.
- **Challenges:**
 - The challenge of issue 1 is the hardware limitations. The mobile devices used have limited processing power, memory and graphics capabilities compared to the laptop. It leads to poor performance experience when playing Learn to Drive – Gamification with Unity
 - The challenge of issue 1 also includes the input latency. The lag performance affects the visual framerate and players hard to control the vehicle accurately.
- **Solution:**
 - Shift the implementation testing and deployment to laptop due to the better hardware resources of laptop. This solution helps to improve the performance of the Learn to Drive – Gamification in Unity which results in better user experience because laptop provides better equipped to optimize the game and ensure the graphic becomes smoother.

Chapter 6

System Evaluation and Discussion

6.1 Application Performance Test Action List

No.	Test Action	Result	Status
1	Tap on the sign up button	<ul style="list-style-type: none"> - Show the sign up information - Able to sign up successfully 	PASS
2	Tap on the log in button	<ul style="list-style-type: none"> - Show the username and password input column - the existing user is able to log in 	PASS
3	Tap on the user profile button	<ul style="list-style-type: none"> - Show the profile page - Able to view the information - Able to log out the account 	PASS
4	Tap on the play button	<ul style="list-style-type: none"> - Show the list of the lessons - Able to select a lesson from the list - Able to read the description of each lesson 	PASS
6	Tap on the start button	<ul style="list-style-type: none"> - Able to show the instruction of the lesson - Able to close the instruction - Display the hint of the turn on engine and fasten seatbelt - Able to control the car using the steering, gas and brake pedal 	PASS
7	Viewing the result	<ul style="list-style-type: none"> - Display the score 	PASS

CHAPTER 6

		- Able to go back to the main menu after viewing	
8	Tap on the retry button	- Able to retry the selected lesson	PASS
9	Tap on the setting button	- Able to tune the sound volume	PASS
10	Tap on the KPP Test Button	- Able to view and select different topics - Able to start practice the questions	PASS

Table 6.1 Application Performance Test Action List

6.2 Objectives Evaluation

1. Development of Four Driving Lessons

The development of the driving lessons which includes Selekoh 'S' Road, Parallel Parking, 3-Point Turn and Slope Test using Unity were successfully completed. Each lesson was designed to provide real-world scenarios as these lessons will be tested physically by JPJ in the driving test in Malaysia.

2. Design of Driving Lessons for Skill Improvement

The driving lessons were well-designed to enhance players' driving skills through a good and gamified experiences. By providing opportunities for repeated practice and detailed instructions, the lessons effectively fostering skill acquisition and improvement of the players.

3. Creation of Personalized Learning Experience with Firebase Console

The implementation of a personalized learning experience for players through connection to Firebase Console was successfully achieved. Each player was provided with access to their individual account which allows them to have an authentication when register a new account.

4. Implementation of KPP Test Feature

The integration of the KPP Test feature is well-implemented. This feature enhanced the educational value of the game which allows players to assess their knowledge and readiness for real-world driving situations.

CHAPTER 7

Conclusion

7.1 Project Review

In conclusion, the “Learn to Drive – Gamification with Unity” project is developed to provide an extra practice for the people who are having the driving test in Malaysia anywhere and anytime. This game helps to solve the problem of insufficient teaching manpower and infrastructure to practice, difficulty in understanding and recalling detailed instructions on the spot and difficult to practice in real-world scenarios. It offers a safe space for the users to learn and make mistakes without any risks. Additionally, this Unity game connects to Firebase Console to keep users’ information safely. In the literature review of Chapter 2, there is a system review summary that consists a list of features and functions that comparing the existing game with the proposed project. The features and functions of the proposed project includes the login, logout and register function, user profile, choose car design, choose lessons, lesson summary, mute or unmute sound, change language function and fasten seatbelt and turn on engine instructions. Next, the system life cycle in developing the “Learn to Drive – Gamification with Unity” gamification application includes game idea and story, game design and conceptualize, technical requirement analysis, development and programming, testing as well as deployment.

7.2 Future Work

In future works, the “Learn to Drive – Gamification with Unity” game aims to advance the driving scenarios. For example, expand the range of the driving scenarios and environment which includes round-about lessons, driving with the weather conditions and night driving instead of only includes the JPJ driving test lessons. Moreover, an advanced feedback function will be implemented to provide users with more details information or insights about their driving performance.

REFERENCES

REFERENCES

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- [4] “Driving school test,” Google Play,
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FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	Study week no.: 2
Student Name & ID: Hang Shy Mun (20ACB01567)	
Supervisor: Ts Dr Chang Jing Jing	
Project Title: Learn to Drive – gamification with Unity	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Lesson 1 (Selekoh 'S' Road) minor modification – the scoring system
- Lesson 2 (Parallel Parking) UI and functions
- Lesson 3 (3-Point Turn) UI

2. WORK TO BE DONE

- Lesson 3 functions
- Lesson 4 UI part

3. PROBLEMS ENCOUNTERED

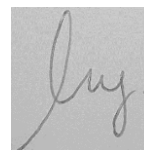
- Consider how to do the hill of the Lesson 4 (Slope Test)

4. SELF EVALUATION OF THE PROGRESS

- Should spend more time to watch the real driving test video and make design close to the real world scenario



Supervisor's signature



Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	Study week no.: 5
Student Name & ID: Hang Shy Mun (20ACB01567)	
Supervisor: Ts Dr Chang Jing Jing	
Project Title: Learn to Drive – gamification with Unity	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Lesson 3 (3-Point Turn) function
- Lesson 4 (Slope Test) UI part

2. WORK TO BE DONE

- Lesson 4 (Slope Test) functions
- Changes of the scoring system and the game flow for Lesson 2 & 3

3. PROBLEMS ENCOUNTERED

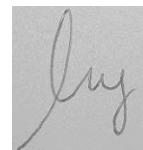
- Hard to unite the scoring system for each lessons

4. SELF EVALUATION OF THE PROGRESS

- Need to spend more time in figuring out the scoring system and referencing the scoring system and some functions from other game



Supervisor's signature



Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	Study week no.: 7
Student Name & ID: Hang Shy Mun (20ACB01567)	
Supervisor: Ts Dr Chang Jing Jing	
Project Title: Learn to Drive – gamification with Unity	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Lesson 4 (Slope Test) functions
- Changes of the scoring system and the game flow for Lesson 2 & 3 (each Lesson will have scoring system and some does not have)

2. WORK TO BE DONE

- Change sequences of the lessons in lesson selection page (from easy to difficult)
- Add on more instructions for users
- Documentation
 - o Add on the objectives of each lessons
 - o Modify the project objectives

3. PROBLEMS ENCOUNTERED

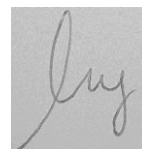
- The lessons still not solving one of the problem statement – Difficult to reflect on own mistake

4. SELF EVALUATION OF THE PROGRESS

- Should find more information about each lessons and provide the information to the users for better understanding and experience while playing the game



Supervisor's signature



Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	Study week no.: 13
Student Name & ID: Hang Shy Mun (20ACB01567)	
Supervisor: Ts Dr Chang Jing Jing	
Project Title: Learn to Drive – gamification with Unity	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Lesson 2, 3 & 4 added instructions
- Report done and ready for checking

2. WORK TO BE DONE

- Submit the report for checking
- Submit report to Turnitin
- Minor modification for the game
- Add in all the KPP Test

3. PROBLEMS ENCOUNTERED

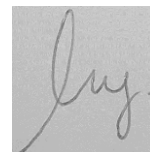
- Not facing problems now

4. SELF EVALUATION OF THE PROGRESS

- Everything is good so far



Supervisor's signature



Student's signature

POSTER



Faculty of information communication and technology

LEARN TO DRIVE - GAMIFICATION WITH UNITY

Introduction 🔍

- Learn to Drive is a gamification application developed with Unity.
- This game involves the simulation of 4 of Malaysia road tests such as Selekoh S Road, Slope Test, Parallel Parking and Reverse Parking





Problem Statement 🔍

- Insufficient Teaching manpower & infrastructure to practice
- Difficult in understanding and recalling detailed instructions on the spot
- Difficulty in practicing real-world scenarios

Objectives 🔍

- To Develop Comprehensive Driving Lessons including Parallel Parking, 3-Point Turn and Slope Test
- To Design Driving Lessons for Improving Player's Driving Skill
- To Create a Personalized Learning Experience for Players when Learning to Drive



Why the proposed gamification application in this project is better than the existing system? 🔍

- With Login & Register
- User Profile
- Better graphic
- Fasten seatbelt & turn on engine instructions
- KPP Test




Project Developer : Hang Shy Mun
Project Supervisor : Ts Dr Chang Jing Jing

PLAGIARISM CHECK RESULT

Learn To Drive - Gamification With Unity

ORIGINALITY REPORT

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SIMILARITY INDEX

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INTERNET SOURCES

1 %

PUBLICATIONS

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STUDENT PAPERS

PRIMARY SOURCES

1

Ofelia Rodríguez Alzueta. "2'-Methoxyacethopenone as DNA Photosensitiser for Mono and Biphotonic Processes", Universitat Politecnica de Valencia, 2020

Publication

1 %

2

Daowei Sun, Xianzhong Liu. "Driving self-learning system based on the virtual reality", 2017 3rd IEEE International Conference on Computer and Communications (ICCC), 2017

Publication

<1 %

3

Robyn M. Dawes. "Predictive Models as a Guide to Preference", IEEE Transactions on Systems Man and Cybernetics, 1977

Publication

<1 %

4

Yee Mun Lee, Karl Miller, David Crundall, Elizabeth Sheppard. "Cross-cultural effects on detecting multiple sources of driving hazard: Evidence from the deceleration detection flicker test", Transportation Research Part F: Traffic Psychology and Behaviour, 2020

Publication

<1 %

PLAGIARISM CHECK RESULT

Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1 of 1



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Full Name(s) of Candidate(s)	HANG SHY MUN
ID Number(s)	20ACB01567
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONOURS) INFORMATION SYSTEMS ENGINEERING
Title of Final Year Project	LEARN TO DRIVE – GAMIFICATION WITH UNITY

Similarity	Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)
Overall similarity index: <u> 1 </u> % Similarity by source Internet Sources: <u> 0 </u> % Publications: <u> 1 </u> % Student Papers: <u> 0 </u> %	The similarity index fulfilled the requirement.
Number of individual sources listed of more than 3% similarity: <u> 0 </u>	
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Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: Ts Dr Chang Jing Jing

Date: 25/4/24

Signature of Co-Supervisor

Name: _____

Date: _____



UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

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Student Id	20ACB01567
Student Name	Hang Shy Mun
Supervisor Name	Ts Dr Chang Jing Jing

TICK (✓)	DOCUMENT ITEMS
	Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
✓	Title Page
✓	Signed Report Status Declaration Form
✓	Signed FYP Thesis Submission Form
✓	Signed form of the Declaration of Originality
✓	Acknowledgement
✓	Abstract
✓	Table of Contents
✓	List of Figures (if applicable)
✓	List of Tables (if applicable)
✓	List of Symbols (if applicable)
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✓	All references in bibliography are cited in the thesis, especially in the chapter of literature review
✓	Appendices (if applicable)
✓	Weekly Log
✓	Poster
✓	Signed Turnitin Report (Plagiarism Check Result - Form Number: FM-IAD-005)
✓	I agree 5 marks will be deducted due to incorrect format, declare wrongly the ticked of these items, and/or any dispute happening for these items in this report.

*Include this form (checklist) in the thesis (Bind together as the last page)

I, Hang Shy Mun, have checked and confirmed all the items listed in the table are included in my report.

(Signature of Student)

Date: 24/4/2024