ASSESSING PLAYER'S SPEED REACTION ON PUZZLE STRATEGY GAME DESIGN

NUR SYAFINA BINTI NIZAN

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Information Technology (Game Technology) with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
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DECLARATION

I hereby declare that this project report entitled

ASSESSING PLAYER'S SPEED REACTION ON PUZZLE STRATEGY GAME DESIGN

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

STUDENT : _____ Date : 3/9/2021

(NUR SYAFINA BINTI NIZAN)

I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Information Technology (Game Technology) with Honours.

SUPERVISOR : M. HaziqLim Date : 3/9/2021

(TS. DR. MUHAMMAD HAZIQ LIM BIN ABDULLAH)

DEDICATION

First of all, thank you to my beloved parent for giving such a moral support and been understanding. Moreover, always give a good motivation and encouragement to fulfil this project development.

To my supervisor, Ts. Dr. Muhammad Haziq Lim Bin Abdullah, thank you for guided and gave a lot of advice while completed this project. Furthermore, for supervised the work of this report writing and progression for development project.

Next, to my classmate that helps to give an opinion for findings a good resource and a good suggestion of reference for writing process of report, it's really honoured to work together and helps each other. In addition, thank you for giving support through the process of finished the project.

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ABSTRACT

The development of this project will emphasise the human reaction to find out the action taken by them in detecting their ability to react. The concept use in this development is the combination between puzzle and strategy which focusing more to puzzle design. Moreover, the study for this project is to assist player speed reaction based on puzzle strategy game design. Next, from the main idea, the problem that been identified is player lack in spontaneous action especially among youth when they encounter with spontaneous event. Furthermore, the objectives that been carried out for this project is to investigate player's speed reaction spontaneously based on puzzle strategy game. From the main objective, three keywords that been found are cognitive abilities, psychomotor skills and attention control which is the main point to recognise player's reaction abilities. In addition, the method used for identified player's reaction abilities is Beta testing that has been conducted on them. Next, along the way of testing been done, player or could be known as participant will be given a questionnaire for them to answering and carry on with the interview session. From the testing conducted, majority of participant agree the game they had played help them in reacting. The main reason is because the movement obstacle element placed in the game which make them respond quickly. In fact, the addition of elements for time limit is use to train participants to be more aware and make a fast action in the game. In conclusion, puzzle game strategy helps participants to discover their control for an attention, educate them in quickly think through what they see and planning their strategies in movement to avoided mistakes continuously. In addition, reactions help brain activity to function properly and identify the signal of sensor in human.

ABSTRAK

Projek pembangunan ini akan menekankan reaksi manusia untuk mengetahui tindakan yang diambil oleh mereka dalam mengesan kemampuan mereka untuk bertindak balas. Penggunaan konsep dalam pengembangan ini adalah kombinasi antara teka-teki dan strategi yang lebih memfokuskan pada desain teka-teki. Lebih dari itu, kajian untuk projek ini adalah untuk membantu reaksi pantas pemain berdasarkan reka bentuk permainan strategi teka-teki. Selanjutnya, dari idea utama, masalah yang telah dikenal pasti adalah kekurangan pemain dalam tindakan spontan terutama di kalangan remaja ketika mereka menghadapi peristiwa spontan. Selanjutnya, objektif yang dijalankan untuk projek ini adalah untuk menyiasat reaksi kepantasan pemain secara spontan berdasarkan permainan strategi teka-teki. Melalui objektif utama, tiga kata kunci yang dijumpai adalah kebolehan kognitif, kemahiran psikomotor dan kawalan perhatian yang merupakan titik utama untuk mengenali kebolehan reaksi pemain. Di samping itu, kaedah yang digunakan untuk mengenal pasti kebolehan reaksi pemain adalah melalui ujian Beta yang telah dijalankan ke atas mereka. Seterusnya, sepanjang proses pengujian dilakukan, pemain atau dikenal pasti sebagai peserta akan diberikan soalan untuk mereka jawab dan dilanjutkan dengan sesi wawancara. Melalui ujian yang dijalankan, majority peserta bersetuju permainan yang mereka mainkan dapat membantu mereka dalam memberi reaksi. Ini disebabkan oleh, elemen halangan pergerakan yang diletakkan dalam permainan yang membuat mereka bertindak balas dengan cepat. Sebenarnya, penambahan elemen had masa digunakan untuk melatih peserta menjadi lebih peka dan membuat pergerakan yang pantas di dalam permainan. Kesimpulannya, strategi permainan teka-teki membantu para peserta untuk mengetahui kawalan mereka untuk memberi perhatian, mengajar mereka untuk tangkas berfikir melalui apa yang mereka lihat dan merancang strategi mereka dalam gerakan untuk mengelakkan kesalahan secara berterusan. Di samping itu, reaksi membantu aktiviti otak berfungsi dengan baik dan mengenal pasti isyarat sensor pada manusia.

TABLE OF CONTENTS

PAGE

LIST OF TABLES

PAGE

LIST OF FIGURES

PAGE

LIST OF ABBREVIATIONS

EEG	-	**Electroencephalogram**
VGP	-	**Video game player**
NVGP	-	**Non- video game player**
BCI	-	**Brain-Computer Interface**
GDLC	-	**Game Development Life Cycle**
MCO	-	**Movement Control Order**

LIST OF ATTACHMENTS

PAGE

CHAPTER 1: INTRODUCTION

1.1 Project Background

This project is based on puzzle strategy game and the idea is to assess player's speed reaction based on puzzle strategy game design. Therefore, main purpose for this development project is for assisting player with their speed reaction and to find out player lack of spontaneous action or reaction when they are having an interaction with spontaneous event. Furthermore, this project is carried out through observation from a group of people which consisting youths. The standardised age for this group of people is from 15 until 24 ages. From this group of people, the purposed of project can be identified by observe their different action and reaction while playing the game. The game is designed with several element that can help player to balance their skills in action, train their visual abilities and knowing their speed in paying attention.

Next, this project used first person perspective for player to interact with any kind of object and showed the sight of first person perspective. In addition, the concept chosen for this game is based on the environment and conditions of a house. The level also is divided according to several parts of the house. Next, certain assets will be added in the game to make the game look more real and interesting. The inside of house are like living room, entrance hall, the rooms and also kitchen while the outside of house is resemble as a yard. Besides, for the game development, three levels are

built in different environment and for each level included with several task that player have to perform to complete the level themselves.

In each level, different time limit is given based on the difficulties of task. The most important part is that players get points if they successfully complete each task given in the level. However, the player's health bar will decrease if the player is unable to survive before they find the checkpoint to the next level. Also, health bars vary based on difficulty level. In other words, player have to complete all the tasks given from each level and always be alert to time limits and health bars.

Furthermore, this project used Unreal Engine as software engine for development. Additionally, other helpful software that is important for project are Blender which use for designing asset in game and Adobe Illustrator is used for create user interface that easily help player to interact.

1.2 Problem Statement

Player abilities is different according to their potential while playing game and how their performance effect the gameplay to certain games. Moreover, player nowadays prefer action and adventure game as their main genre because the gameplay, storyline and mechanic for this type of genre is more complicated and more upgraded rather than other genres. Furthermore, these types of genres can be one of factor that can help players to give a full attention and improving their coordination with hand movement and cognitive abilities. In addition, player shows a lot of attention to a game with genre of action as it conclude their speed reaction for action and movement of theirs hand for controlling characters movement based on their abilities and skills while playing.

In contrast, for games that have strategy and puzzles, not too many tests are done using this type of game and quite a bit less to find and associate human speed reaction with puzzle strategy games. The main of this project to investigate human lack of spontaneous reaction or action is different among youth when they interact with random events. In other words, this project purpose is to identify about human reaction when faced random challenge and obstacle. From the game that is built, the elements incorporated in the game can help in the player skills and intelligence to be identified.

1.3 Objectives

The project objectives are:

i. To investigate puzzle strategy game for measuring human speed reaction
ii. To develop puzzle strategy game based on identified strategy
iii. To assess the player's speed reaction through playing puzzle strategy game

1.4 Goals and Genre

The main goal of this project is to assist players speed reaction with puzzle strategy game and help players know their ability in reaction and control their speed in action. In addition, the reactions and attention given by players can also be used to classify their skills and expertise when playing video games.

This project is a puzzle strategy game in the framework of 3D design. Moreover, it focuses on the players in helping them play by a given rule. Then, add levels for player progress while playing and include entertainment for player purposes.

1.5 Game Features

The target audience allocated for this project is between15 to 24 years, it aims to identify the effectiveness of the project carried out by expecting a group of people

from a young age to assist in providing the progress and success of the project. Moreover, there is no limitation to gender as the entertainment purpose of this project is to show the similarities between these two genders. This group of people chosen can come from casual types of players as well as hardcore types of players which they are experienced in playing video games.

The game rules for each level are different according to the difficulties and the situation that occurs in that level. Next, the time limit given is varies based on the level that player faced. In addition, this time limit used is purposeful to study the player speed while handling the situation and give a reaction based on the event occurs. In the games, scores are given to record player's achievements as they go through each level in the game. In fact, a health bar is provided to help players to be more careful in taking the appropriate action to keep survive in the game. In general, players need to have a good strategy and great thinking skills to complete the mission and found a way to survive in game. Furthermore, player lose when they did not settle down the mission by the time given or player fail to survive with their health bar down to zero.

1.6 Conclusion

In conclusion, this chapter explained about the idea concept for the project and described the gameplay and mechanics that include in the development project. Moreover, the project developed is intended to meet the requirement for helps player in detect their speed reaction with spontaneous event. Furthermore, in this chapter it is concluded about puzzle strategy game can also be one of the methods used to see player abilities to give attention and reaction while playing game.

Therefore, the next chapter is about literature review elaborated in accordance with evidence support obtained from finding research that related to project

requirement. Next, an explanation of the project methodology for development progress of this project will be described in more detail in the next chapter.

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

First of all, the objective of this project was to study and observe the human reaction rate when confronted with unexpected situations. Moreover, the project focuses on the game's unique design as well as the puzzle strategy features used in it. Secondly, this project will discuss and examine the usage of video games as a tool for train players to enhance their eye-hand coordination and their ability to pay attention to their surroundings. Furthermore, the genre of action games is the genre that is most frequently used to conduct research on the abilities of players. It is also the genre that is prioritized and preferred by all players. However, other video game genres are rarely used as research material and less exposed to the outside world.

Next, the literature review is done from the collected research finding papers to explained the evidence and solid argument that can supported the related title of project. Also, the project methodolgy used is to defined targets and plan objectives for the project. Hence, a problem statement of the projects was consent to strengthen the purpose of the project being developed.

2.1.1 Literature Review

This project is created for objective purpose which for helps player to enhance their speed reaction and detect their attention skills with cognitive abilities while they

are playing the game. In addition, puzzle strategy game also can be one of elements used for assisting player reaction and helps their performance.

In the literature review, there are three (3) research article that related with project title which are:

i. **Electroencephalogram (EEG) is a functional brain tools that can measure and record signal of human brain activity and discovered any signal in the tools from the brain.**

Ismail. W et.al (2016) stated that when electrical happened simultaneously across the brain, waves like the EEG signal are produced which contain information about brain activity and range in amplitude from 0.5 to 100V when measured from peak to peak voltage. Another studied by Cabanero-Gomez et.al(2018) said EEG and video games in terms of relation for identified human cognitive skills and their training performance with the uses of general methodology such as include preprocess of the data, extract the features and classified the features by training. For example, Artificial Neural Networks (ANN) which a strong machine learning technology that used biological neural networks to do classification and regression. Then, Zabcikova M(2019) declared that the use of modern technology such as brain-computer interfaces (BCI), the human brain may directly interface with the environment, and the device executes its role as a BCI with an acceptable level of accuracy and can opening up many new possibilities. Furthermore, Seal A et .al (2020) applied EEG signals to five types of brain waves such as Delta, Beta, Theta, Alpha and Gamma and they also discovered another signal include in EEG signals which is noise that corrupts the signal of interest.

Therefore, EEG measured brain tools implied in any kind of activities that related with brain where it use to identified any signal that occur from human brain either in cognitive skills or performance activity.

ii. Video game is effective tools to measure basic attention and performance among video game players (VGPs) and Non-video game players (NVGPs).

Castel et.Al (2005) mentioned that video game players performed faster time response compare to non-video game players. In other study by Boot et.al. (2008) demonstrated that the expert game player often better performance in term of basic attention during the games and the total practice for each of participant for the practice time is about 21.5 hours. In additional, Dye M. W. et .al (2009) stated that both impulsivity and sustained attention measures for video game players is faster than non-video game players, but the groups did not differ on the accuracy measure, implying that video game players' faster responses were not due to impulsive responses to the stimuli and that they did not have greater problems sustaining their attentions.

In a similar vein, Donohue S. E et.al (2010) highlighted that non-video game participants exhibited a point of subject simultaneity that was pushed towards scenarios in which the visual stimulus preceded the aural input, remarkably different from physical simultaneity which is 0 msec. Furthermore, Bavelier D. et.al(2019) claimed that by using two primary experimental methods, such as cross sectional work and intervention research, can investigate the effects of playing video game to cognitive

psychology and enhanced attentional control. Moreover, Kazimoglu C and Bacon L.(2020) declared player's brain is at a heightened state of alertness while playing the video game and it increase the player psychomotor abilities like eye-hand coordination in a favorable and significant way.

Therefore, video games showed impact and benefits for video game player's experience in their cognitive recognition and psychomotor skills than non-video game player's experience.

iii. Reaction time of human is the response from two group of age which is older and younger to determine the speed of action between them.

Ratcliff et.al (2001) stated older subjects select more conservative answer criteria than young subjects, older subjects also have longer non-decisional components or response than young subjects and that been showed older subject is slower than younger subject in terms of reaction time with wider distribution across situations. Moreover, Hultsch et.al (2002) clarified from the four tasks which are simple reaction time, choice reaction time, lexical and semantic, that older subjects is more intra-individual variability in reaction time latency across trials than younger ones. Furthermore, Tun P.A and Lachman, M.E (2008) stated the difference in complex task reaction time can be linked to adult age and education, which helps for understanding the executive control mechanisms and the aging process better. Then, Vaportzis E et.al (2013) said that when comparing the younger subjects with older subjects, it showed that older subjects were significantly slower but as accurate in basic choice reaction time while they fast in complex choice reaction time tasks but less in accuracy.

Therefore, reaction time between older and younger is different and based on the conditions or situation that happened in terms of response from these two group of age

2.2 Genre

This project is puzzle strategy game. The main genre of this project is puzzle while strategy is the subgenre of the game. In fact, Puzzle and strategy game having a similar definition which stated about problem solving as the main point. Therefore, for genre puzzle, problem solving is related to logical and conceptual with the sequence, the pattern and include with main knowledge of player to solve it. In contrast to genre strategy game is about player internal decision and thinking skills for make a decision to solve problem. Moreover, both of this genre is in a large scope where it can combined with other subgenre and also combined with each other. In strategy games include with the level progression as the difference of player in a way of their thinking while playing the game. Also, strategy game involve with player role as there is a reflect outcomes from their decision to make a choice and also bring a benefits for player knowledge. However, for puzzle game also contribute to the development of the player's brain by applying mathematical strategy and have set of rules for player to manipulate in the game.

2.3 Existing Games

There are several findings from existing games that related with the project title and purpose where it focusing to assist player reaction when they interact with random event. Also, observe their ability while playing the game. Moreover, there are a lot of games from mobile and PC platform that can easily purchase which is free to download or buy from any trusted app store. In fact, this game also can be used to determine

player reaction while playing and not necessarily from an action game genre. From the literature review also can be said that game also can be an effective tools to differentiate skills and abilities of player between player with experience and without the experience.

The research from existing games information that been collected shows difference in gameplay, mechanic and also the features that include the game development itself. Each of this game contribute to player attention while playing and also helps player to improve their skills whether for thinking, eye-hand coordination and many more.

There are three games that been found as the references for this project development. This three games highlighted difference mechanic, gameplay and game features.

2.3.1 Comparison of Existing Games

(i) Roblox Speed Run 4

Roblox Speed Run 4 is a 3D adventure game that consist of 3d animation for character and graphic of interface in the game. Based on Figure 2.1 shown, the interface of this game is simple and the environment in game is use as background of this interface. The gameplay for this game is the same for each level when the players spawn in exact copy of environment like first level of the game. In addition, once the level is completed, player consider finishing the game when they found the portal to the next level. Figure 2.2 described the environment of the game in certain level that player go through while playing. In this game, player need to run as fast as possible to the end of the map when they start stepping the

platform that boosts the character speed. Player will go to the next level when they complete the level before it, also for another level of this game has different environment based on Figure 2.3. The player also will achieve a reward after completing the level. This game can be downloaded on certain website and player need to use browser for playing this game. This game have a features to help player for controlling their action while playing.

Figure 2.1 The interface of Roblox Speed Run 4 (Source: Google Image)

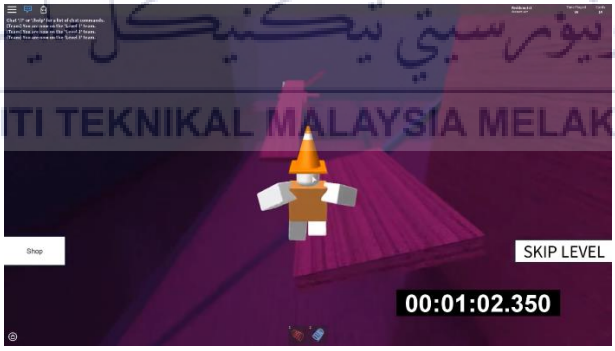


Figure 2.2 One of environment for certain level (Source: Youtube)

Figure 2.3 Different environment for each level in game (Source: Youtube)

(ii) Road Race 3D

Road Race 3D is an arcade game which been visualised to mobile phone platform. Based on Figure 2.4, the game shows main interface of game and also the situation on the highway with a lot of cars pass by and player need to cross the road for arrive at the finish line across the street. In this game, player need to cross the road first against other players to win the game. They need to hold longer to make the character run and release it to make the character stop. If player get hit by a car, they need to restart from the last spot they standing and crossing the road again. Player lose if they fail to reach first at the finish line and they need to restart the level again. Player will achieve a coin that will be used to buy a new skin and any other design for the character. Figure 2.5, shown the player succeed to the next level after finish to cross the road while in Figure 2.6, shown the player against another player to win the game. Next, this game can be purchased form Google Play Store for Android users and App Store for iOS users. This game helps player for concentrate and give an attention when crossing the road.

Figure 2.4 Main interface when player start the game

Figure 2.5 Player succeeded to cross and arrive at finish line

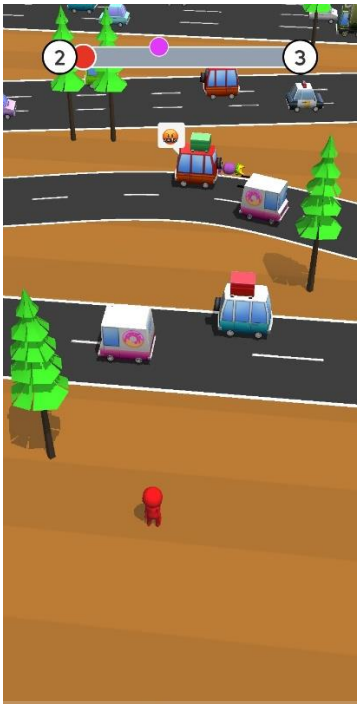


Figure 2.6 Player against another player to cross the road

(iii) Tricky Test 2: Genius Brain

Tricky Test 2: Genius Brain is a puzzle games but use other alternative to solve the question where the player need to have creative thinking skills for answering trick question. In Figure 2.7, the main interface for this game is simple and compatible with mobile platform. The gameplay of this game is for player not easily get tricked by the question given for example in Figure 2.8 shown one of the level that player need to go through. They need to think outside the box where it can help to test their in logic and math abilities. Based on Figure 2.9, the trick question is same as a level which the more level player achieve the more trick and maybe hard question that player need to solve with the time given. This game is on mobile platform, so it can be purchased from Google Play Store for Android users and App Store for iOS users. This game helps player to think and improving their IQ with their creative thinking skills.

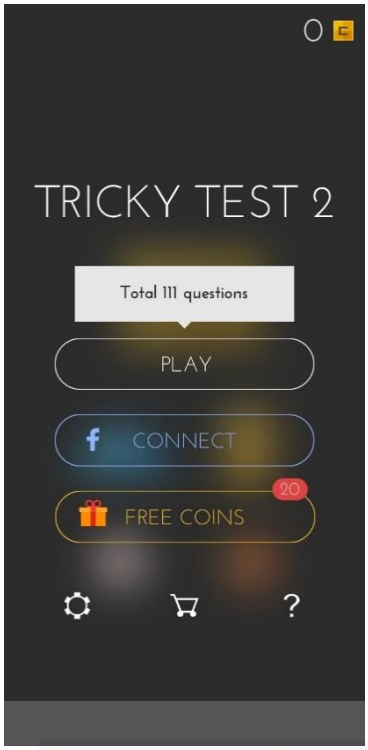


Figure 2.7 2D interface of the game Tricky Test 2

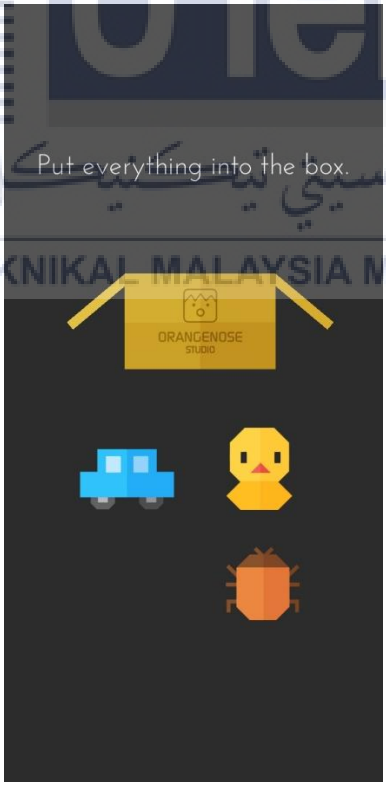


Figure 2.8 Trick question is the same as level

Figure 2.9 Level of the game with the trick question

2.4 Project Methodology

For this project, game development life cycle as shown in Figure 2.10 is to help developers in progress work and also support the development for this puzzle strategy game design. The work phase is been divided to several stages which are from initiation phase until release phase.

Initiation Phase: For this phase, include the documentation of concept idea and described the rough framework by using sketch for game work. Then, choose the theme that related with the genre chosen, think about the gameplay, mechanic framework and mentioned about features should have in game. Furthermore, in this phase, will deciding the main goals that related with the purpose for developing the game.

Pre-Production Phase: Planning the gameplay in more details and further develop the framework. In addition, find a factor to enhance the development of

project build to make game more fun. Next, decided the gameplay and mechanic that suitable for development progress. The work progression is ensure done with the guideline and following the given timeline.

Production Phase: In this phase, the start of production to begin which have an input such as game assets, the mechanic for playable and features for games. Also, ensure the game have a rewards, put the rules and make the user interface interactive in games. Then, the game must running well for this phase.

Testing Phase: In this phase, testing the game is conducted to find any error and bug from game mechanic, and to test the design and features of the game. In this phase, developer should find a solution for solving the bug and improvement the mechanic and change the game features if needed.

Beta Phase: For this phase, required the third party where the testing game is done with other people to find the bug and get a feedback from them. The feedback from these groups of people helps for any change of development and improvement of game build.

Release Phase: In this phase, the game will be launch, releasing to the suitable marketplace. After the releasing of complete product, the project development will be closed.

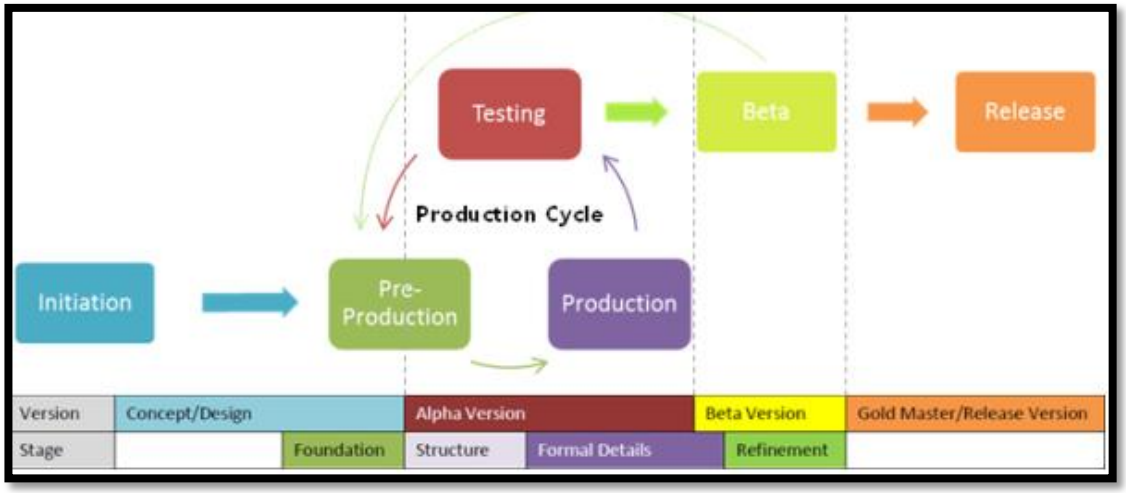


Figure 2.10 Game Development Life Cycle (Source: Google Image)

2.5 Conclusion

In the conclusion, this chapter explained about the literature review from article research finding and related with the project objective. In fact, from literature review, it can be concluded that speed reaction can be observed by using video game. Next, the existing game has similarity in the platform they used but difference in terms of gameplay, mechanic and features. The speciality from each of this existing game helps player in cognitive abilities, hand movement and concentration while playing. For this chapter, highlighted about project methodology which use Game Development Life Cycle (GDLC) that have several stages from the beginning until the end of product development. Also, it helps developers for planning and organize the workflow in project development process.

Therefore, in the next chapter mentioned about requirement analysis which consist of project requirement, and specific tools use in the project development. Furthermore, explanation about project schedule and milestone is use as the guideline for the development work progress.

CHAPTER 3: ANALYSIS

3.1 Requirement Analysis

3.1.1 Project Requirement

In this project findings, there are three games that used as reference and been related to the planning build of project development. For this analysis, these three games have differences in terms of mechanics, gameplay and features in their games. Moreover, there is a difference of perspective in terms of how players control to think and anticipate every movement they make.

Table 3.1 give a detailed about the differences of mechanic and design between these games and discussed about the features with the genre that been choose for the project.

In addition, all the games mentioned below are compatible with mobile platform and show the different environment and design for each level. In every level for each game has its own uniqueness. Most probably, these games have simple goal and achievement that makes player feel easier to play it and win the game. From Table 3.1, shown the different player perspective while playing these game either include the action or just use player mind thinking skills to finish the level.

Table 3.1 Requirement analysis from existing games

Game Title	Roblox Speed Run 4	Road Race 3D	Tricky Test 2 : Genius Brain
Player roles	Player need to run fast as soon the stepping at the platform that boost their speed.	Player need to help character avoid the cars, overcome the obstacle while crossing the road and go to the finish line.	Player need to think and find the solution to solve the tricky question with time limit given.
Victory condition	Player complete the first level and proceed to the next level.	Player success to cross the road and arrive at the finish line.	Player get a reward after complete the tricky question before the time end.
Game mechanic	➢ The collection of obstacle are from the level itself. ➢ Level progression are 30 levels and include with bonus level. ➢ There is no change in bonus level, so the number of unique level can rises to 211.	➢ Level progression up to 150 and above ➢ Player against others player to cross the road ➢ Player action to avoid the obstacle while cross the road.	➢ Level progression up to 111 levels as it can considered the same with the 111 trick question ➢ Interact with mobile phone such as can shake the phone or tilt to any direction.
Level Progression	Level design are 30	Level design more than 150 levels	There are around 111 trivia questions which

			is the same as the levels.
User interface features	➢ Simple and interactive interface game ➢ Realistic 3D graphics and cool animation ➢ Highly addictive and immersive Gameplay	➢ Simple 2D user interface that shows player level progression ➢ 3D graphics and animation for the cars on the roads and other player action.	➢ 2D graphics for user interface ➢ Time limit given when solving the question ➢ The gameplay is abnormal but funny

3.1.2 Technical Requirement

This project development combined the software and hardware for every part of game builds which for each part of mechanic and design are require from this important elements. The software that been used for the build of game is Unreal Engine as the game engine that include mechanic and to construct the gameplay in this software. Then, the used of Blender for designing every assets and environment for 3D mode. In addition, Adobe Illustrator also are worked for designing the user interface or create the icon in the game. Then, for audio element from the used of Audacity to import, create a new sound and exporting the audio.

The hardware that contribute in this project is a laptop with mouse as the main source for build the games. Next, used of Wi-Fi connection for internet to find information and look for reference video such as tutorial video.

3.1.2.1 Software Requirement

List of software that used in this project are below:

- Unreal Engine 4.19.2
- Blender 2.90
- Adobe Illustrator CC 2019
- Audacity 2.3.2

3.1.2.2 Hardware Requirement

List of hardware that used in this project are below:

- Laptop
- Mouse
- Wi-Fi connection

3.1.2.3 Other Requirement

Another requirement tools that been used during this pandemic and Movement Control Order (MCO) for online meeting and materials such as listed below:

- Google Meet
- UTeM Official Learning Management System (ULEARN)
- Microsoft Teams

3.2 Project Schedule and Milestone

The development of this project throughout the timeline is been guided by project milestone. Hence, it can be as a reference for the progression of project.

Next, there is a Gantt chart which used to ensure the progress work helps to finish the project by the date stated for every week.

Table 3.2 below shows the project milestone throughout the development period of this project.

Table 3.2 Project Milestone and Schedule for the project development

Week	Date	Activity
1	15 /3/2021	Brainstorming the idea for concept and genre for the game proposal and identify the objectives and problem statement in project development.
2	22/3/2021	Do some research about game that related with proposal title
3	29/3/2021	Discover the Unreal Engine and component that include in the game engine.
4	5/4/2021	Understanding the requirement been used for documentation report and find some research paper based on the title project.
5	12/4/2021	Find article that related with title and understanding the aim, problem statement and method used in every research paper and learn the format for do literature review.
6	19/4/2021	Find the good keyword for a good research paper and make comparison between all research papers.
7	26/4/2021	Understanding the purpose for research and learn the format to summarize literature review.
8	3/5/2021	Finding a research paper and discover game engine element
9	10/5/2021	State the claim and evidence from research paper
10	17/5/2021	Do comparison between existing game and as reference for project build
11	24/5/2021	Develop project using Unreal Engine and create some asset
12	31/5/2021	Designing the level and include some mechanic for game
13	7/6/2021	Improve the mechanic of game and solve the bug
14	14/6/2021	Implementation for game
15	21/6/2021	Present the project build and submit the documentation

Table 3.3 below explained the detail about the development with Gantt chart during the development period of this project.

Table 3.3 Gantt Chart for the project development

	Week														
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Game Idea and Concept															
Discover Game Engine															
Research paper finding															
Literature Review															
Data Analysis															
Developing project															
Creating assets															
Solving bug															
Play testing															
Final presentation															
Submission final report															

3.3 Conclusion

In conclusion, this chapter explained the detailed about the similarities and differences between the existing games that used as a reference for the project build development. Then, described about tools of hardware and software that been priority of project to the designing level, creating the project, and as main requirement used for started the development process. Next, discuss the detailed about project milestone and Gantt chart as a guideline for work progress and development levels have been separated into several sections by week.

Therefore, in the next chapter will be elaborated about the design of project and a description for “big picture” of project build.

CHAPTER 4: DESIGN

4.1 Introduction

In this project, for the detailed of game design for game build is important as it can helps to bring fun environment and entertaining experience for player. Also, the mechanic of game can show the framework or flow the game that playable. Storyline and gameplay is an important factor that can strengthen the build for project development because it include with sound effects, features of graphics and the plot to show the way the game is played. Moreover, with this complete element in a game helps player to interact with it and having a control for any gameplay activities.

Furthermore, more elements from developer perspective also include the level progression to increase the challenge and difficulties to make the player feel immersive in the game while playing. In puzzle strategy game genre are consist of rules, the accessible gameplay, a good graphic and challenges level.

4.2 Game Architecture

The overview of the game workflow would be explained in this section. This is the important part of the game for showing how the game work and been built.

i. Player Score

For each level, player require to solve the mission given and every mission that been succeeded will increase the number of score. The score for

each level is different and based on the mission that has given to player for complete it. Figure 4.1 explain the mechanisms of player get a score in this game.

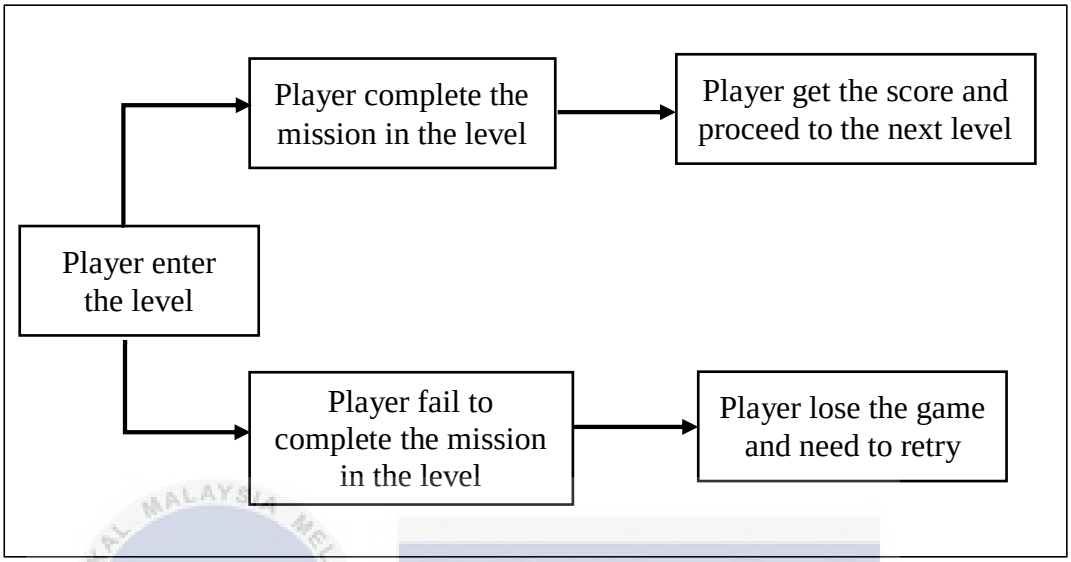


Figure 4.1 Player get a score from completing the mission

ii. Player health

For each level in the game, full health bar will be given to the player. In level 1 mission, player will be given the option to find the truth or false. Based on Figure 4.2 explained that if player get the truth, the score will be increase. On the other hand, if player make a wrong choice the health will decrease little by little. If player fail to survive and run out of health, they will lose the game. Hence, in Figure 4.3 point out another factors that make player lose is when player collide with the obstacle in the level. If player run out of time while finishing the level, it does not effects player health bar. The damage from the obstacle in each level is different and can make the health bar decrease drastically or decrease slowly.

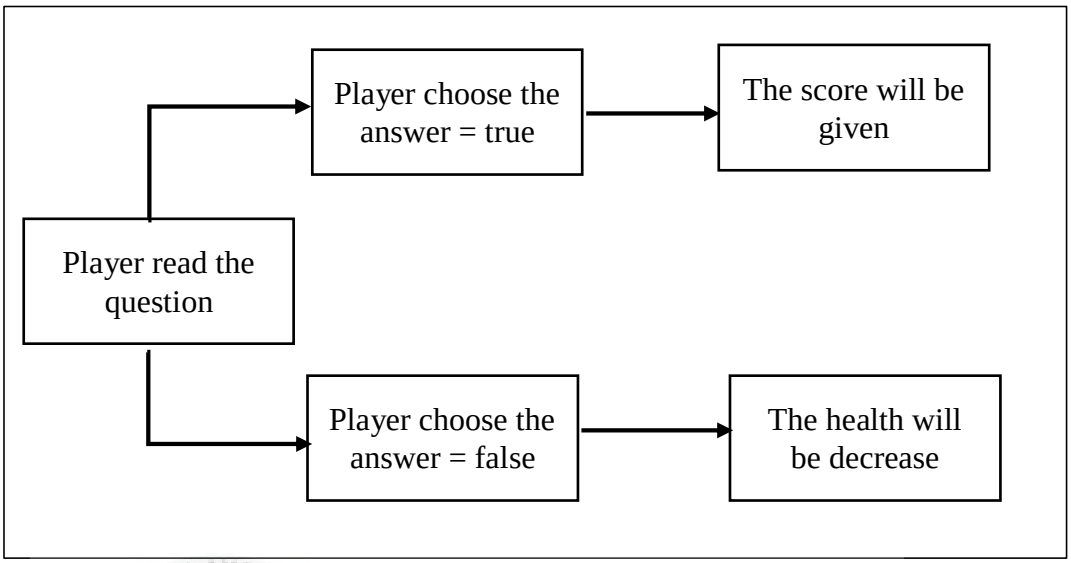


Figure 4.2 Player health based on mission trick question

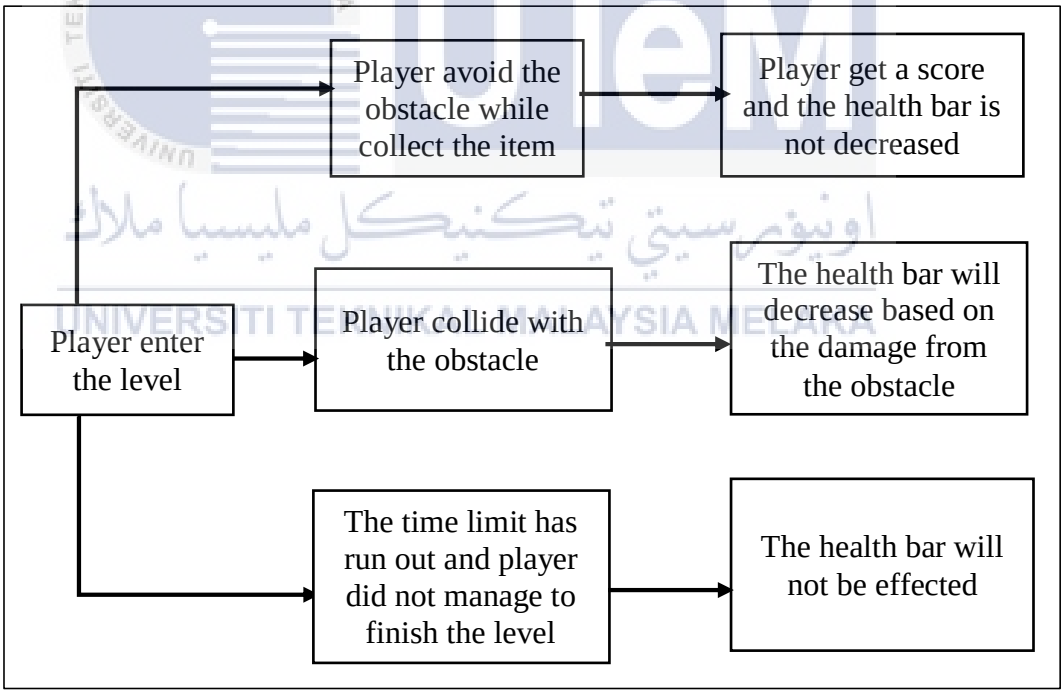


Figure 4.3 The state of health bar in each level

iii. Pickup item

In this game, the object that can interact with the player is known as collectable item. The item helps player for settle the mission. Moreover, there is

another item that can give player a score, if they success to achieve it. In addition, this collectable item also used as a checkpoint for player to proceed into the next level. The mechanisms of this collectable is shown in Figure 4.4.

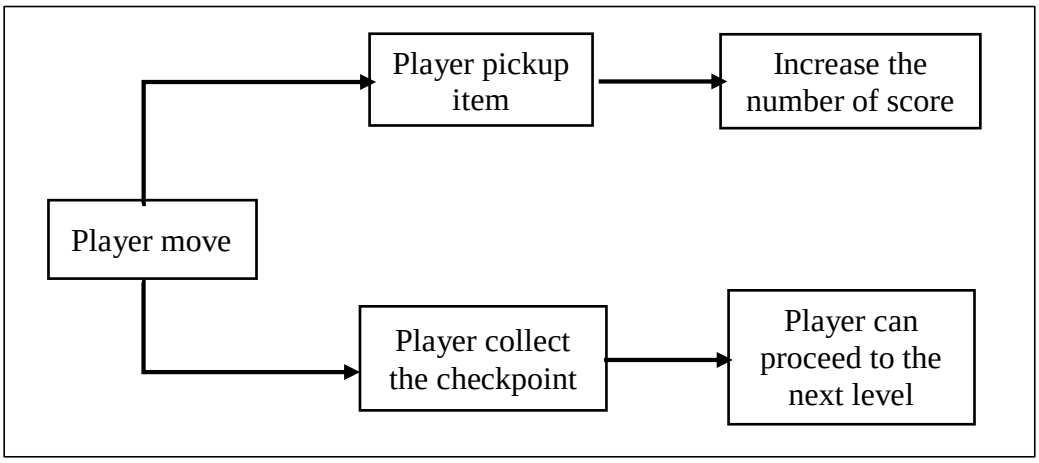


Figure 4.4 Pickup Item

4.3 Game Design

In this game design, explained about the gameplay and core mechanics of the game. The visualized of storyboard and flow of the game been showed in the rough design of sketch that described the level, the environment and any assets involve in the game.

4.3.1 Gameplay

- Player roles: Player need to finish the mission in every level of the game. The mission will be different based on the level and difficulties.
- Games rules are listed below :
    - Player need to complete the mission in every level.
    - The time limit will be given based on the difficulties of level.
    - Player will lose the game if they fail to complete the mission before time end or their health bar decreases.

- Every mission that player complete in the level will increase their score.
- Player need to pick up item because it helps player to get a score.
- Player win if they finish all the mission in every level of the game.

- Victory/ Termination conditions: Player get a score if they done the mission in every level. Also, the collectable item helps increasing player score.
- Level of difficulty: The time limit for each level is based on the difficulties of mission that player can done and finish it.
- The challenges for each level is explained on the Figure 4.5 below.

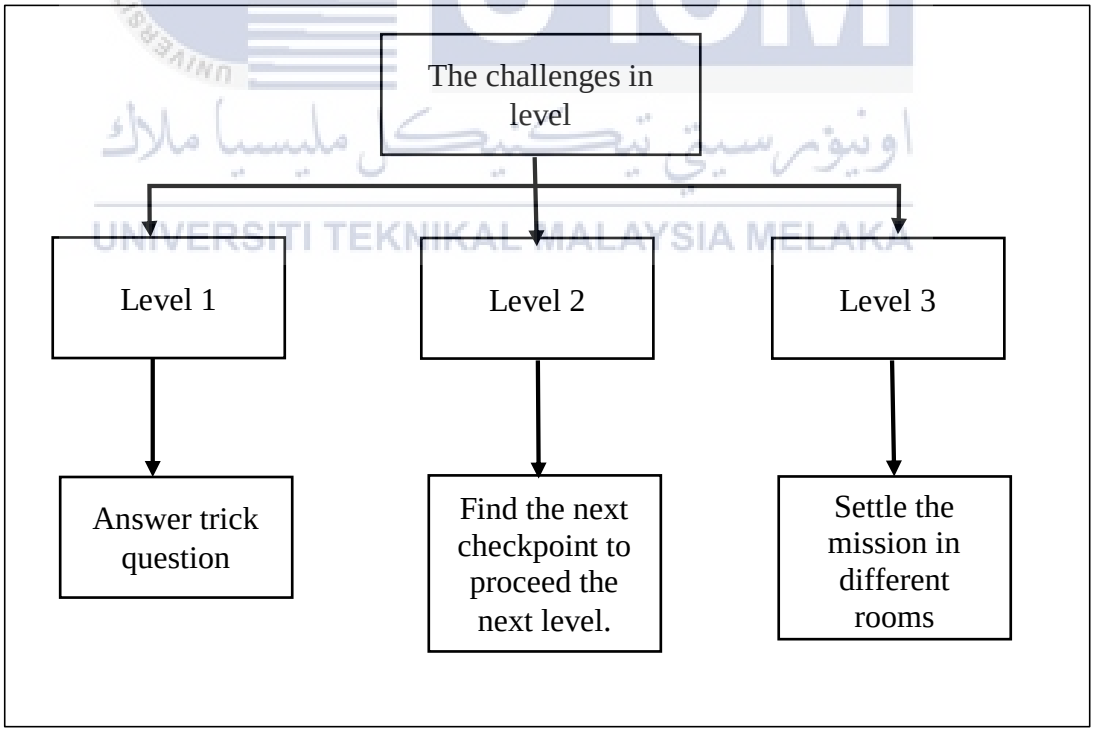


Figure 4.5 Hierarchy of Challenges

4.3.2 Core mechanics

The mechanic that imply on this game development are the challenges of level which is time limit. The time limit is set whether in a minute or second and according to the difficulties of mission in the level. The mechanics of time limit works in game is shown in Figure 4.6.

i. Time limit

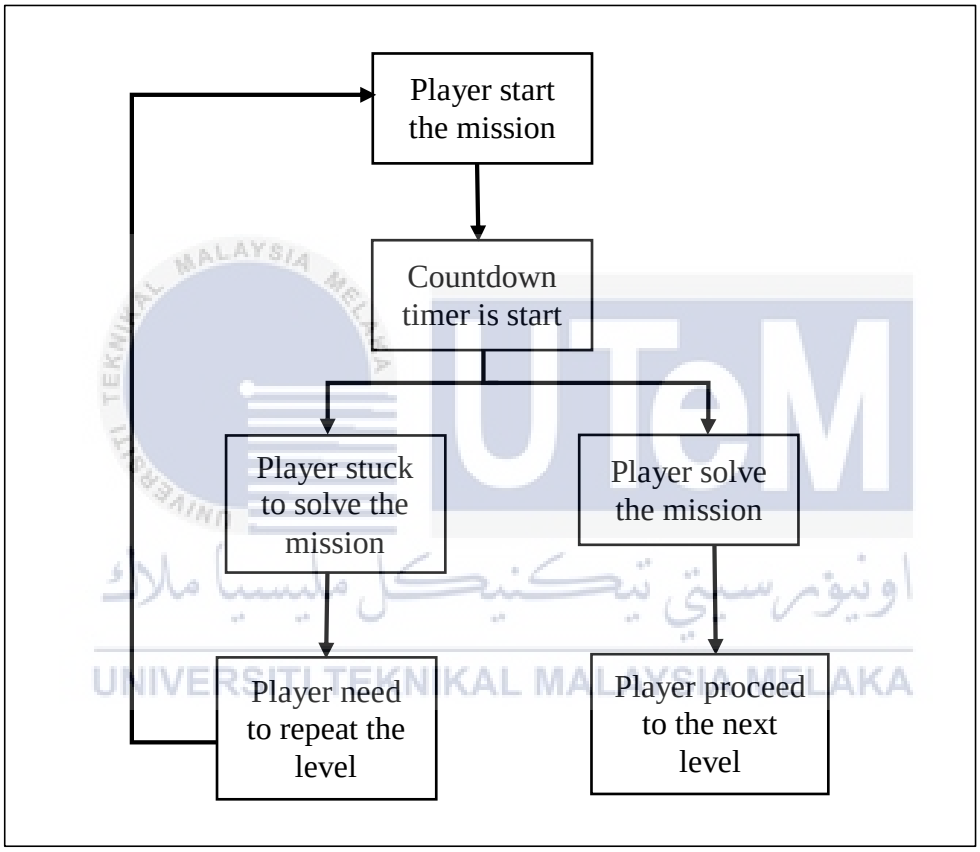


Figure 4.6 Time limit work in game

4.3.3 Flowboard

The flowboard of this project started when player enter the level and complete as many tasks as possible while collecting items that can increase player's score. Based on Figure 4.7 below, player enter the level 1 to settle down the mission. The mission in level 1 consist of trick question, beware with the obstacle while collecting the item and pick up the item as a checkpoint for

proceed to the next level. Next, the environment in level 2 are using dark theme as player's difficulty level. In addition, player need to avoid the obstacle that bring damage to the player health. There is a hidden path that player needs to find to reach the checkpoint. Player can proceed to the next level, if player success to collect the checkpoint item. Furthermore, in last level which is Level 3, player need to settle the mission in different rooms. The challenge in this level is the damage of obstacle or speed movement of obstacle and puzzle pattern that been design to make it difficult for player. Player need to repeat the level again if they fail to survive with their health bar and they did not finish the mission within the time limit.

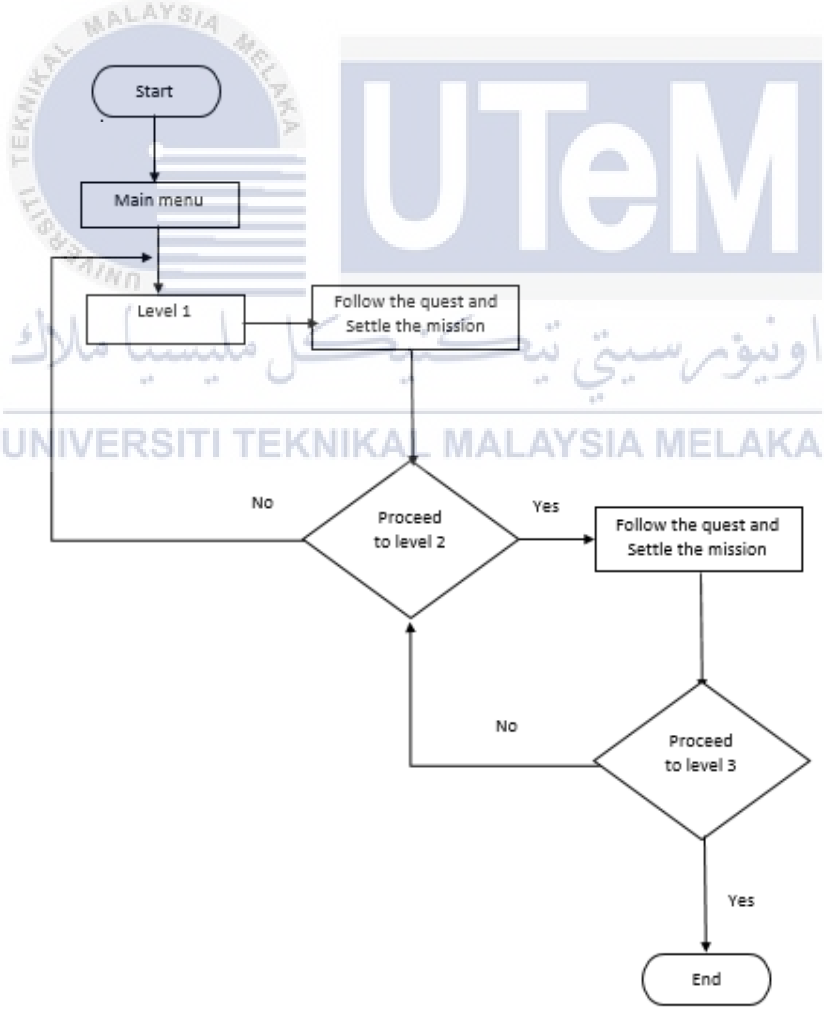


Figure 4.7 The flowboard of the game

4.3.4 Level Progression

The level is held in different place which the environment is around the house that consist of yard, living room, kitchen and different rooms in the house. The beginning of the game is started in yard area which outside the house. Then, to proceed the next level, player will be place to the indoor environment in the house. The progression of the player is from the easiest level until the hardest level that their facing.

4.3.5 User Interface / Interaction Model

a) Main menu

Figure 4.8 below show the interface in game as main menu. The beginning of interface before player start to play the game. These button are functional and can interact with player when click it.

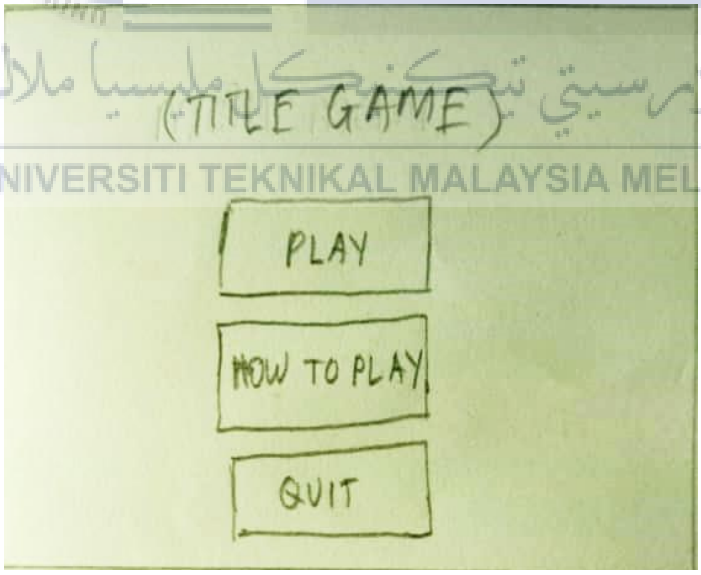


Figure 4.8 Main menu of the game

b) In-game interface

For the game interface, there are score and time limit shown on the top right of the screen while player health bar is down middle of the screen. This interface helps player to know their health and score. Figure 4.9 below described the interface that occurs during the game.

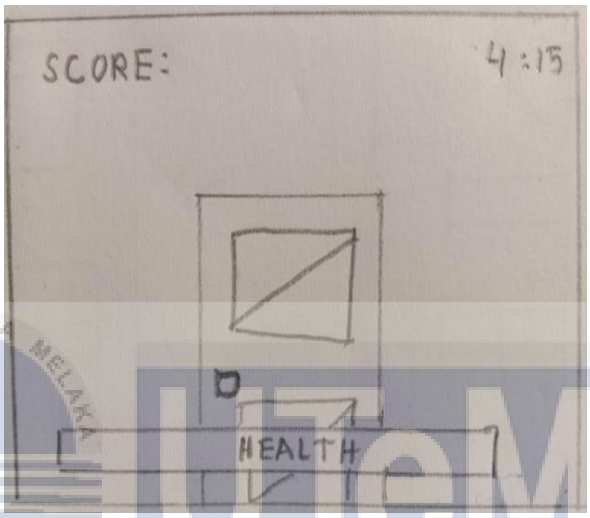


Figure 4.9 The score, health bar and time limit showed in the level

c) Lose Interface

Figure 4.10 below showed the interface when player lose the game. There are two button which consist of choice for player to choose to repeat the same level or just going back to the main menu.

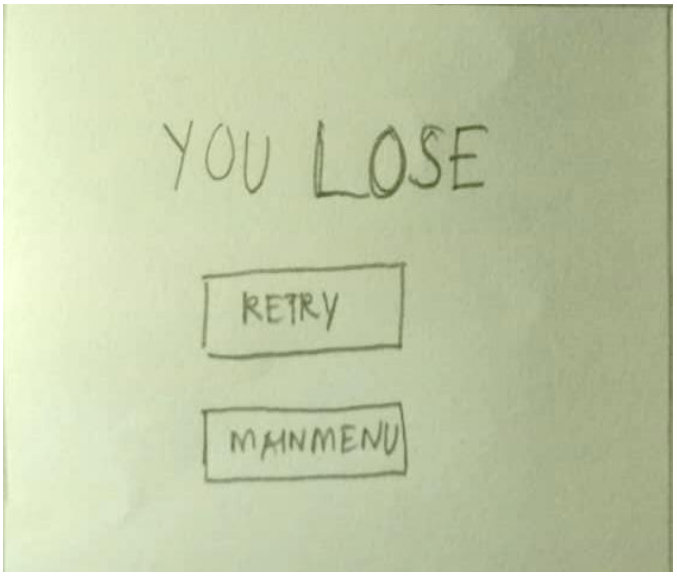


Figure 4.10 This is interface when player lose the game

4.4 Game Art

4.4.1 Game World

The environment in this project was takes place in house area, where the level in the game been separated to different place and the mission for every level is difference based on the environment. Figure 4.11 below showed the look of the environment from the top view. Moreover, the plan for level is different from outside and inside the house area.

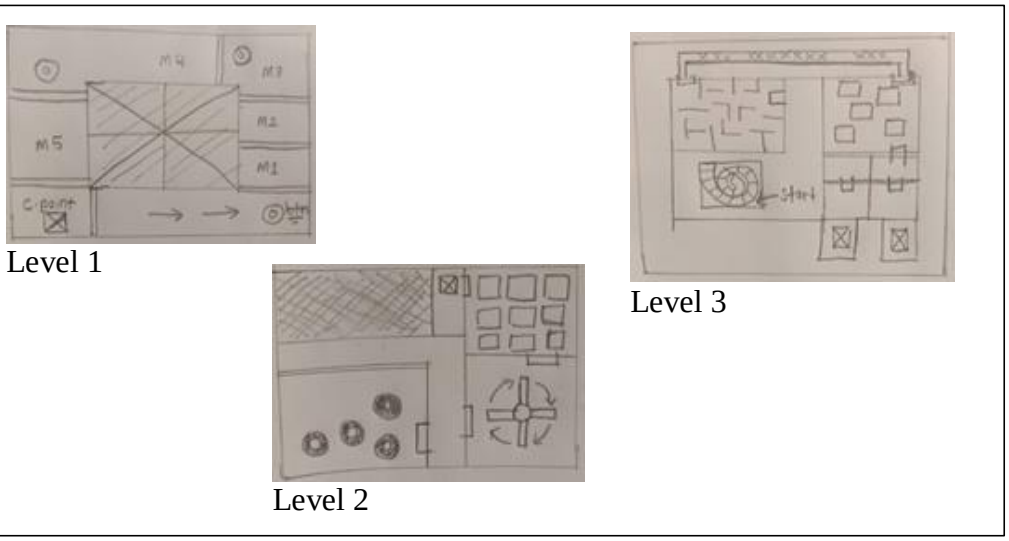


Figure 4.11 The house area for the level of game

4.4.2 Camera Model

The camera model in this project is from the first person perspective view. The camera acts as the main character view where it move forward and can turn left and right direction. Then, the camera model also follow the first person character in the game environment.

4.4.3 Audio/Sound Effect

Audio and sound effect are mostly downloaded from a free website, others audio effects are from the modification by using Audacity which the audio tools to imply and adjusting the effects with background sound in game. The format of audio are MP3, OGG and WAV, but the sound file that can import into Unreal Engine only with format WAV as the engine only allowing this type of format.

Next, the sound effects that applied in the game is for the sound of hit object, sliding door, background music for the environment and other else.

4.5 Conclusion

In the conclusion, this chapter give a detailed explanation of game mechanic and gameplay of the game. The game architecture are to show the backbone of the workflow that occurs during the process in the game. Then, level progression in the game is include the gameplay for giving the player more experience and feel immerse while playing. Moreover, designing for the user interface and the object with environment to helps player for interact and playable. The used of camera model and sound or audio effect are for the impact of the game and the immersive feeling of player.

Therefore, in the next chapter will elaborated about the production and implementation for the project development.

CHAPTER 5: IMPLEMENTATION

5.1 Introduction

In this phase, implementation is the most important part for production process. All the framework and draft created from previous process are used as reference to be implemented in the game. In addition, the explanation about the complete product is been described based on the design work that been marks from the previous chapter. From chapter previous, it highlighted the element from game art are the most require in the production of game. Moreover, for this implementation progress, the conversion and intergration of game art is been identified as the adaptation from sketch to 3D world in game.

Next, the work of audio effect, the designing of game world and system input for camera model and movement in the implementation of game will be explained in detail in this chapter.

5.2 Creation of Game Art

5.2.1 Production of Graphics

The first production is creating asset that been used in game as a decorations for game world or as collectable item for player to interact. The creating for this 3D model is done in Blender where it included with input the material or do some texturing for the 3D model. Then, after completed it, the 3D model will be imported to the Unreal

Engine for ready use. Based on Figure 5.1, shown the environment of indoor for the house while in Figure 5.2 is the outdoor design of the house in the game. The creation of game world are based on the provided content on Unreal Engine for easily build the level design in the game world. Some of the asset are from the trusted sources for free downloading 3D Model.

Figure 5.1 The environment of game which is indoor

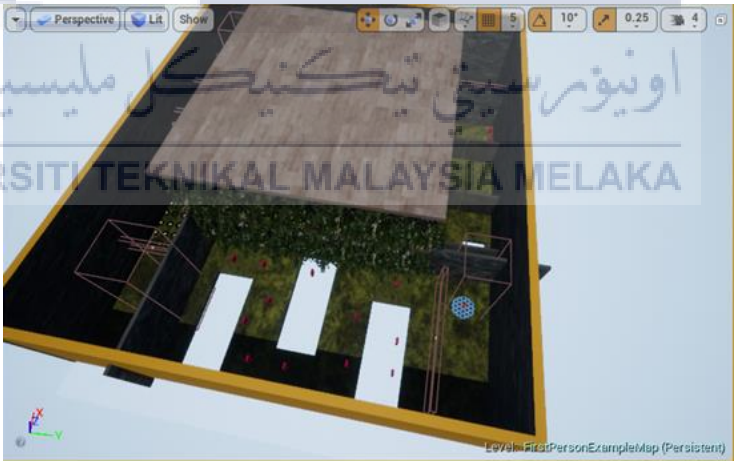


Figure 5.2 The environment of game which is outdoor

5.2.2 Production of Audio

The audio included in this project development is composed of sound effect for mouse clicking button, sound for animation open and close door, sound that used to implement for user interface. Also, there is background music used to increase the

sense of aesthetics and give player sense of immersion in the game. These audio are free audio sources that are available and easily accessible from freesound.org. The audio source that been implemented to the game are in format of WAV file.

5.2.3 Production of Video

There is no video implementation in the game.

5.3 Game Configuration Management

The game can be play in only PC platforms and not in mobile platform. Through the installation of whole file so the player can click on the game to play. The input devices for this game are the mouse and keyboard to play.

5.3.1 Configuration Setup

This project is published using Unreal Engine 4.19.2 for 32 Windows-bit. The map setup for the player first interaction is main menu. This configuration is done in the project settings of Unreal Engine.

5.3.2 Version Control Procedure

The version of this project is been described in the Table 5.1 based phase for testing.

Table 5.1 Table of testing phase

Testing phase	Procedure	Control
Alpha	The game is test by developer to find out the major bugs that affect the game	The first prototype is playable. Focusing the mechanics in the game.

		This is the implement for Final Year Project 1.
Beta	The game is tested by the third party, include the feedback and questionnaire. From the play testing methods, data is collected from the target group opinion for better improvement in the future.	After the Final Year Project 1 presentation. The game is enter the Beta phase which the game has an improvement. Moreover, the remaining process is done in Final Year Project 2.
Release Candidate 1	The version of the game is already been export. Considered as a demo, so player will get a teaser about the game is before get publish into the market. In addition, player also can identified if have any issue with the bug to be solved.	The game will have another improvement and will be done after Final Year Project 2.

5.4 Implementation Status

Based on the Milestone Table and Gantt chart from analysis chapter, the element during implementation phase will be explained in the Table 5.2 below.

Table 5.2 Table of implementation status

Element	Description	Duration of Completion
Creation of asset for game world	Modelling, and texturing or put material on 3D Model in Blender.	2 Weeks
Game world: • Level 1 • Level 2	Creating the environment using the provided content in Unreal Engine. Start from develop the level 1. Then proceed to the level 2	3 Weeks
Interface and Implementation	Designing the user interface in the game using Adobe Illustrator. After that, imported in the Unreal Engine.	1 Week
Game world design : Level 3	Creating the environment using provided content in Unreal Engine. Also, include some asset that been created in Blender.	2 Weeks
Mechanic Implementation	Input the system for action in the game. Implement all the blueprint in Unreal Engine for the mechanics inside the game.	5 Weeks
Polishing the implementation	Polishing the product such as setup the configuration in project setting before exporting the game.	1 Week

5.5 Conclusion

Therefore, this chapter elaborated about the implementation work that has been done referring the design that already been mentioned in the previous chapter. From the design part in project development, all the level design is done by using game engine which is Unreal Engine 4. The user interface used for player interact is done in Adobe Illustrator before been implement to the production of game. In addition,

this chapter helps to arranging the work flow of implementation in production process based on earlier planning.

In the next chapter, will be explained the details about testing conducted and the method use for the testing. Moreover, all the result and data collected from the testing is been analyse.

CHAPTER 6: TESTING & EVALUATION

6.1 Introduction

In testing phase, analyse the game and identifying any logic error in documentation programming are the crucial part for developers to discover. Furthermore, in the testing procedure will focuses on usability of the game. Also, the playability to find out the quality of graphics and sound and see how well the features are maintained. However, the opposite impact on these features will have bad and negative influence the playability of game. In addition, the main objective of this testing phase is to test player skills, collecting the qualitative data and observe the data from participant point of view about the game that they are playing.

Therefore, the explanation about the method and testing procedure will be stated and described. Hence, it will help in the conducted test that be done.

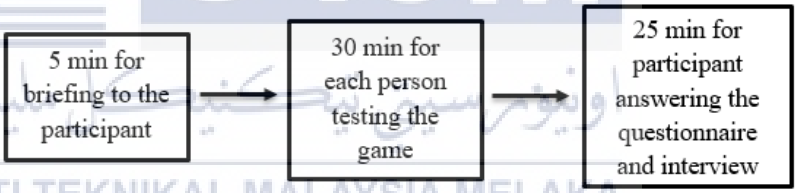
6.2 Test Plan

For testing conducted, the plan is done to organise the numbers of participant and state the duration for each participants to contribute in the testing. In Table 6.1 shows the number of participants and the main objective of this testing been conducted. The usability of this test also will be explained through this topic.

During the testing, the developers in charged to handle and organize their preparation for conducting the test.

Based on the Table 6.1, stated the information of the testing plan being conducted but the date and times is change depending on the participant availability to perform the test.

Table 6.1 Table of testing plan for When I'm Alone game

PLAN TESTING (WHEN I'M ALONE) Nur Syafina Binti Nizan	
Testing Objective	To test player speed reaction when playing the game.
Participants	10 participant which consist of: • 5 female • 5 male
Equipment	• Laptop and mouse with power adapter
Test Task and Duration	Duration 1 hour per person • Player finish each level in game • Player need to answer the questionnaire given • Player having interview with the person in charge
Location and Dates	• 20th of August until 25th of August • Kolej Kediaman Satria (UTeM)
Procedure testing	

6.2.1 Test Schedule

The purpose for this test to be done for test player reaction while playing puzzle strategy game. In the Game Development Life Cycle (GDLC), this phase is consider as beta test which required the third party to participate and give an opinion or feedback about the game. The method used for the testing is play testing which approaches a group of people and allow them to play the game.

In the Table 6.2 below described how the testing is been conducted based on the schedule to a group of people which is among youth. The duration of test for each

participant been estimate around one hour per participant. Also the test is done by face-to face or online meeting with the participant.

Table 6.2 Table of schedule testing

Pre- testing	Face- to face (Testing) • Setting up the laptop and power adapter • Briefing about the intention of participants for this project Online meeting (Testing) • Set a date and time for an online meeting with the participants • Use Microsoft Teams or Discord to handling the meeting • Briefing about the intention of participants for this project
Testing	• Explaining to the participants what they should do in the testing process. • Participants able to start playing the game
Post-testing	• Ask participants for answering the questionnaire • Ask a few question to participants based on the questionnaire given • Thank the participants for their cooperation in this testing

6.3 Test Implementation

For this project, the method use is play testing where it focusing on the target groups of people which is among youth from the age 15 until 24 years old. In this project, only 10 participants are chosen which 3 of participants are range from age 15 until 19 years old. In other hand, 7 participants are range from age 20 until 24 years old. Both of this range group of youth is equal in gender between 5 female and 5 male. All participants have the experience for playing video game. However, the time spent for each of them is different based on the result collected. There are two participants that spent the long hour for playing video game. Meanwhile, other participant choice for time spent of player is equal with the same percentage on the graph.

The testing is conducted in two ways which are face-to-face for participant that live in the same area or having an online meeting with the participant that stay away from place of testing been conducted. Moreover, for online meeting, Microsoft teams or Discord is used to set the time and date based on participant availability. From the online testing, starting from the briefing of the project intention to the participant, after that player can start to test the game and the remaining duration time of testing is used for answering the questionnaire and do some interview with participants. In online testing, there is some problem that been faced by participants such as lack of connection. Overall, for the questionnaire and interview session is went well. For the face to face testing, participant use the computer and mouse to play the game. After the test is done, the questionnaire will be given to the participant for them to answer. Next, proceed to interview session face to face. All the interview session has been recorded as additional information.

The test data documented by used questionnaire to clarify the more information about participant perception about the game that they play. The questionnaire is based on three main categories which are cognitive abilities, psychomotor skills and attention control. From this three section, the questioned is done as semi structured question in which participants give their opinion about their general knowledge and any feedback that can relate with the game. Moreover, there are a likert scale question for participants to answer based on their experience while playing the game. The scale is specific from scale 1 until 5 (Strongly disagree = 1, Strongly agree = 5). In addition, the interview question that been asked to the participants are the strength, weakness that been found while they playing this game. Also, their explanation about their answer in the questionnaire that they answered. The question for interview session is

used as an additional information for the documentation. In addition, any participants opinion will be consider for the better improvement in the future.

6.4 Test Results and Analysis

Based on questionnaire and testing conducted, there are three categories that been observe such as cognitive ability, psychomotor skills and attention control. The explanation of this will be stated in detailed that refers to survey testing. Moreover, theme will be explained according to the categories discussed to show the authentic results of the data collected.

(a) Cognitive abilities

(i) The level challenge helps player to quick thinking

In this project, cognitive is one of the important part for players to use when they playing the games. From the testing activity, player brain activity will be observed based on their cognitive abilities. Based on the questionnaire, Figure 6.1 shown the data collected from question (3) and Table 6.3 is the descriptive statistic data from the same question. From descriptive statistics, the mode from the question (3) is 5. In bar chart, the highest scale is from number 5 which 90% of participant strongly agree that the game they have played is quite challenging. In addition, mean from the descriptive data statistics is 4.9, it can be said that on average of participants thinks that puzzle strategy game is quite challenging but they still have a sense of fun to play and it also helps them for quick thinking. The median of question 3 is equal to 5.

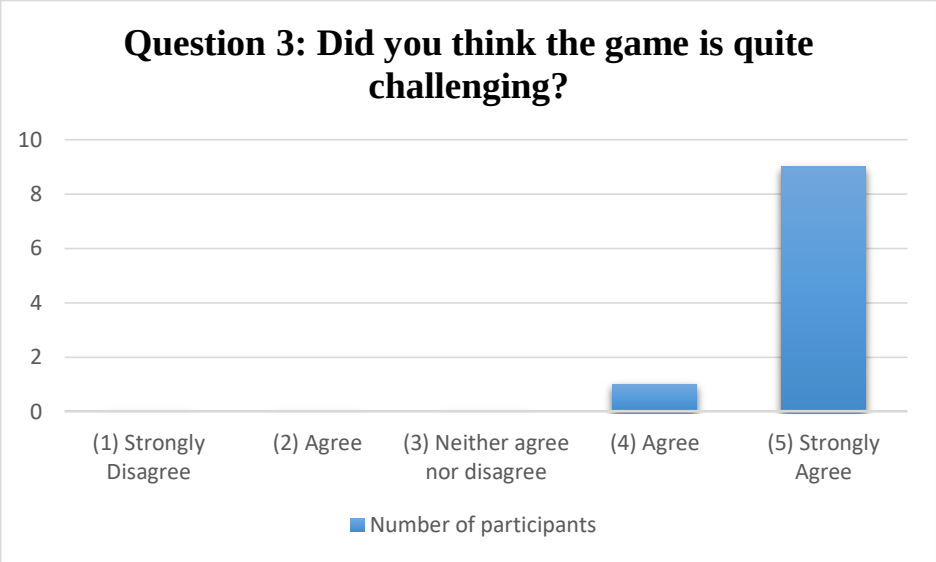


Figure 6.1 Bar graph of Question 3

Table 6.3 Descriptive statistics for Question 3

	Data
Mean	4.9
Median	5
Mode	5

Figure 6.2 shown the number of participants that choosing a level that they think is the most challenging. From data analysis, 90% of participants stated that level 3 is the most challenging for them to encounter while 10% of participant choose level 2 as the most challenging level to play. Based on the interview session, participant 2 choose level 3 as the most challenging level to finish and this participant agree that level 3 helps they for quick thinking of action that they should take while playing and in the interview participant 2 clarified that they did not finish the game because they give up in the middle of play. Participant 2 said *"I don't have enough passion to think and wait for the right moment to act in this level."*- Participants 2. From this participants statement, it can be said that participant have a reason of why they choose not to

finish the level because they lacks of passion while playing the game. Moreover, this participants is struggling to finish the level 3 for several times but it did not work and this participant choose not to retry the game.

Furthermore, participant 1 choose level 2 for the most challenging level as the participant stated that the darkness in that environment of level make her difficult to move and look around. Participant 1 also said in the interview that she is not a quick thinker person and she takes a time to think while trying to finish the level. *"I have a hard time to think about the action that I should take while go through this level because it is too dark."* – Participant 1.

In Figure 6.3, is an example of participant that contributed in the testing for observing their cognitive abilities, also the sensitivity of them with the surrounding in the game while they are discover it.

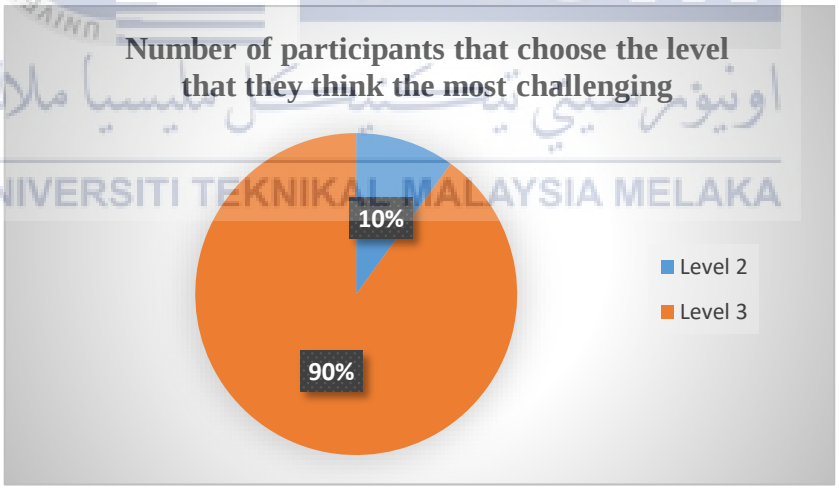


Figure 6.2 The data of participant that choosing the level they think is most challenging

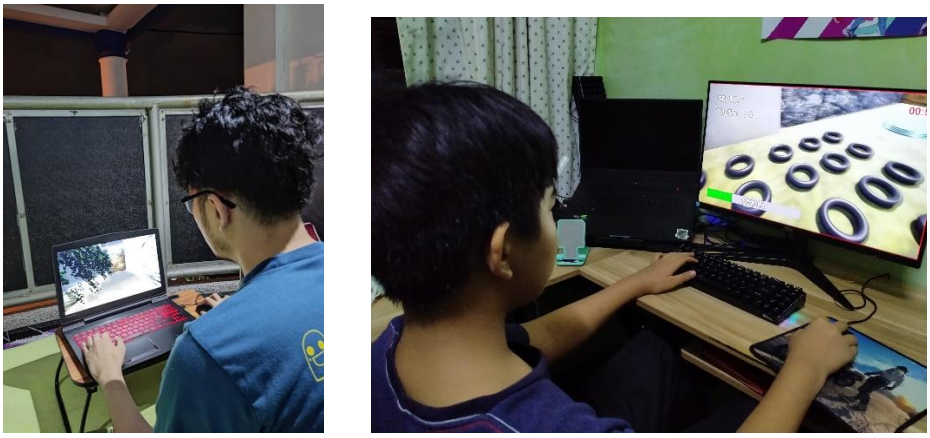


Figure 6.3 Example of the test of participant's cognitive abilities when playing the game.

(ii) Player require an effort to planning the strategy

Figure 6.4 described the scale of question (8) and the Table 6.4 is the descriptive statistics data for question (8). Based on the questionnaire, the highest number of scale is number 5 (Mode = 5). From the data collected 50% of participant put their much effort while playing the game while 30% of participants agree that they do have an effort while playing but not excessive when playing this game. Moreover, 20% of participants from the data choose number (3) as they did not think that they put too much effort and either they have an effort to playing this game. Next, the average of participants (Mean = 4.3) from descriptive statistics shown that participants still consider that some effort is necessary for playing the game but based on their own perspective to interpret their style of playing the game. The median from descriptive statistics of question (8) is 4.5. (Median = 4.5)

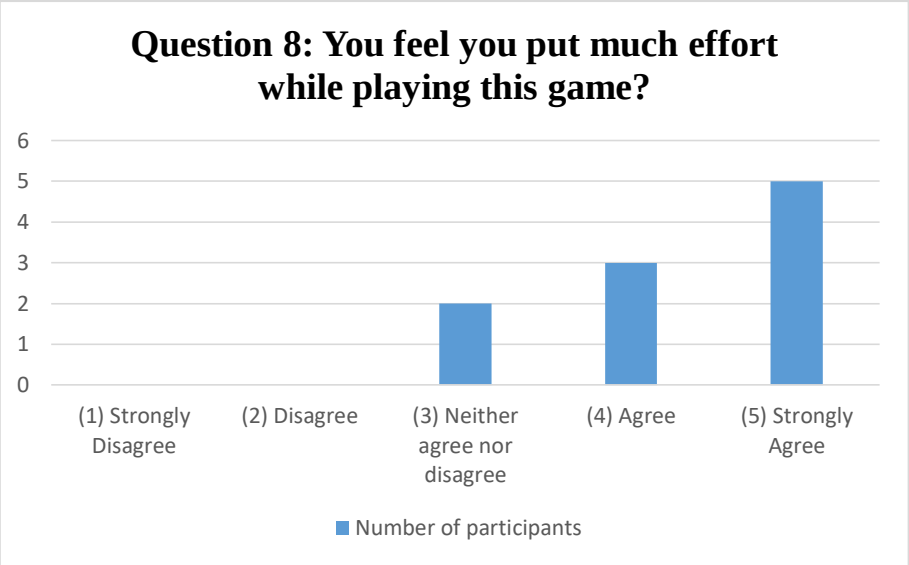


Figure 6.4 Bar graph for question 8

Table 6.4 Descriptive statistics for question 8

	Data
Mean	4.3
Median	4.5
Mode	5

The chart shown in Figure 6.5 stated that 90% of participants agree that planning a strategy require much effort to finish the game. However, only 10% disagree and did not plan any strategy while playing the game. Based on this result, 4 participants has said in the interview that they planning a strategy by observing the gameplay, analysis the level design and estimate player movement or action in the level. One participants give his thoughts about the strategies planning require much effort to be done, but to him personally, he is the person that don't consider to plan much while playing game. In other hand, only one person choose not to plan any strategy in game, because the participants stated in the interview that the planning should be done after playing the game. *"I always learn from my mistake when playing*

the game. Because of that, I am not take too much effort while playing this game."- Participant 3.

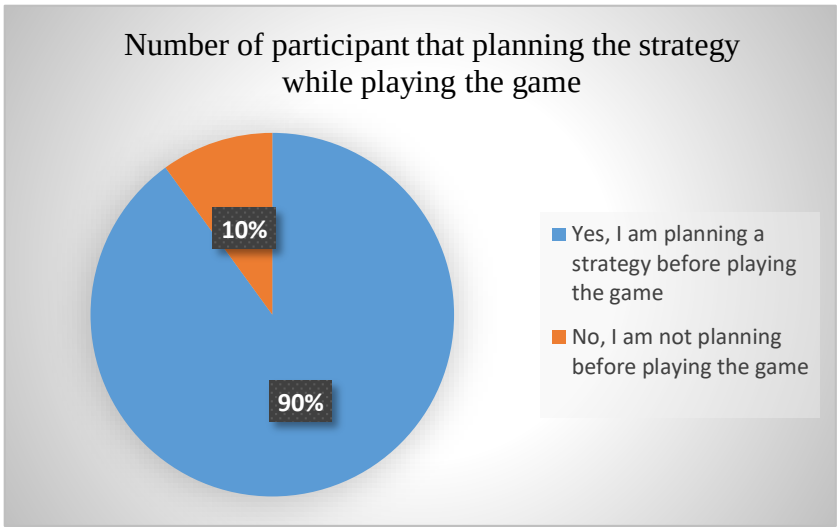


Figure 6.5 The data of participant that planning strategy while playing the game

(iii) Explore activity helps player to focus in performing

In the cognitive category, exploring is the major activity that requires the player's sense of sight to be used while playing the game. From the questionnaire, the mode for question (5) is 4 which 60% of participant agree that the graphic and visual in game make them enjoyed playing it. This statement is based on Figure 6.6 which shown the graph of participant that majority choose agree as their main choice. Next, the average of participants is 4.2 based on the descriptive statistics data from Table 6.5. Moreover, the participants think that a good graphic and visual make the game look more interesting to play and bring excitement for them to try. The median for question (5) is 4.

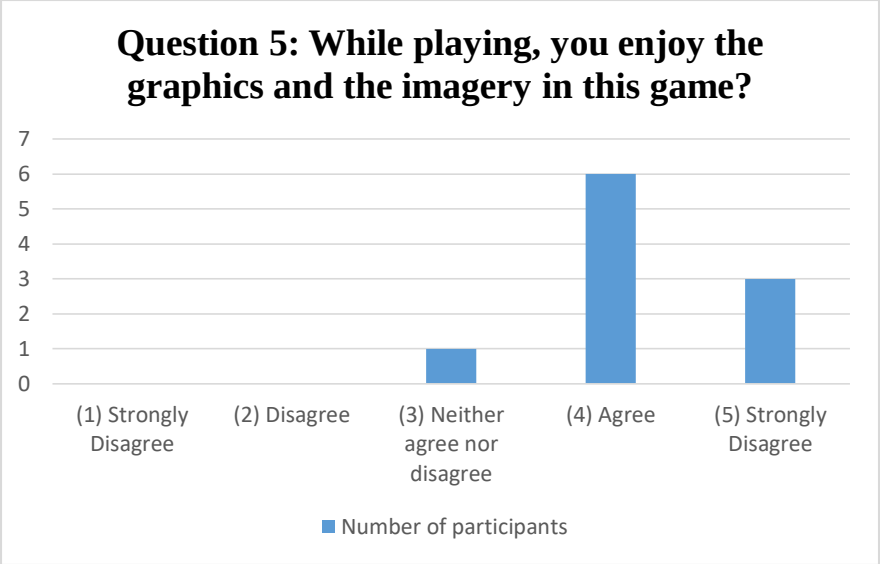


Figure 6.6 Bar graph for question 5

Table 6.5 Descriptive statistics for question 5

	Data
Mean	4.2
Median	4
Mode	4

Based on Figure 6.7, from the data result shown that 70% of participants feel satisfied while exploring the game while 10% of participant feel satisfied playing the game because of graphic and they think the game need to have some more improvement in the future plan. In contrast, another 10% of participants stated that they not satisfied with what they saw in the game but this participant agree the exploring is a good activity for make them focus while playing the game. From 90% of participant perspective, it can be concluded that they satisfied exploring the game because it helps them to find a way out and also discover the environment of game world. In contrast, participant 6 stated that they not satisfied exploring the game because

participant 6 want some improvement for character movement and add another details in game to make it look more interesting.

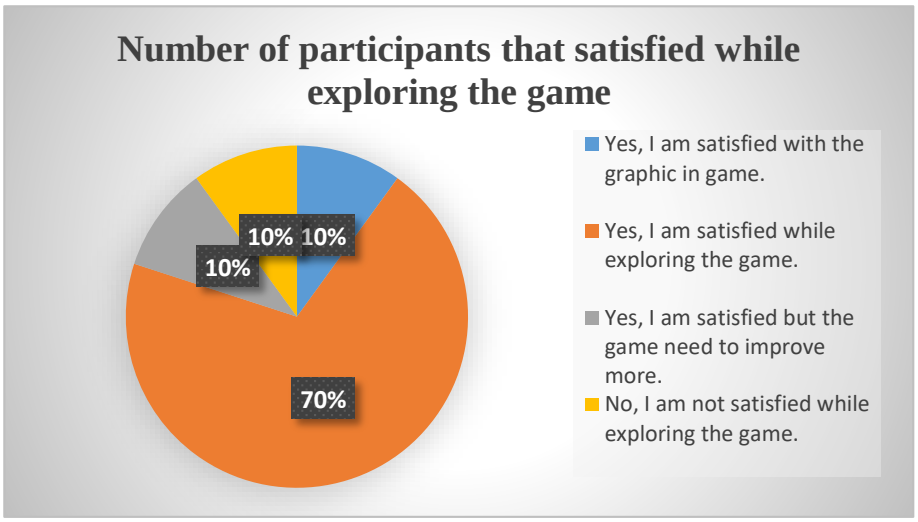


Figure 6.7 Data of participant that feel satisfied while exploring the game

(b) Psychomotor skills

(i) Puzzle strategy game helps player to enhance their eye-hand coordination

Figure 6.8 shown that result from question (6) which the highest number for scale is the number 3. Based on the descriptive statistics data from Table 6.6 for question (6), the mode is 3 which 6 out of 10 participant claimed that they feeling uncertain about their performance while playing the game. Meanwhile, 2 participants strongly agree that they performed well in the game. In other word, other participants thinks that they not really perform well in the game and also they only agree that they did their best while playing the game. From descriptive statistics, the data shown the mean for the question (6) is 3.4. In addition, the median for question (6) is 3.

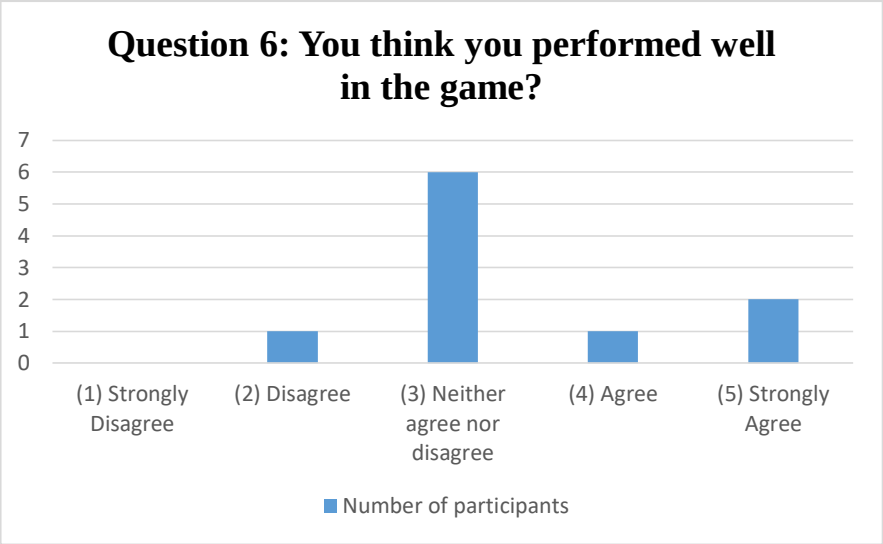


Figure 6.8 Bar graph for question 6

Table 6.6 Descriptive statistics for question 6

	Data
Mean	3.4
Median	3
Mode	3

In this project, beside the cognitive abilities been tested, the other categories that been prioritise to observe is player psychomotor skills. Based on Figure 6.9 shown, all the participants agree that puzzle strategy game can enhance their eye-hand abilities. Also, 10 of this participants skills for eye-hand coordination is move synchronously. In fact, all of them state the same opinion which they really didn't have any trouble for balancing their eye hand coordination while playing this game. Moreover, certain of participants claimed that they have play the game with the same genre and some of them also have an experience playing a video game. From Figure 6.10 is the example of participants that have their own style of action to play the game. Also, it is benefits them for testing their psychomotor skills in balancing their eye- hand coordination.

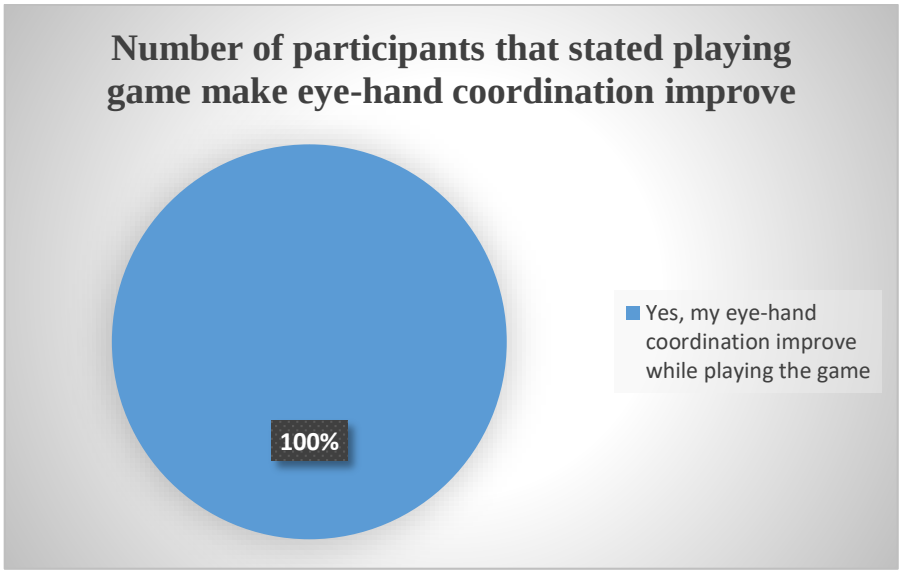


Figure 6.9 The data of participants that stated their eye-hand coordination improve by playing game

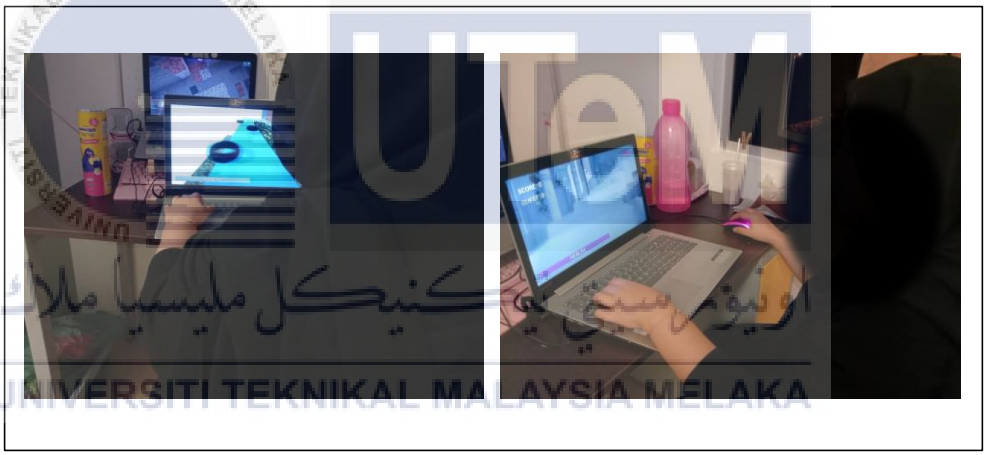


Figure 6.10 Example of participants test for their psychomotor skills while playing the game

(ii) Element in puzzle strategy game bring excitement for player to play the game

In Figure 6.11, the result shown the graph of question (9) which classified that highest number of scale is number 5 which participants strongly agree that they have enjoyed playing the game. Meanwhile, 2 participants choose agree that they having fun while testing this game and another one participants choose number 3 as they could not decide if the

game brings an excitement or not to them. The mode for this question is 5 (Mode = 5). Then, the average of participants based on the descriptive data is 4.6(Mean = 4.6). Based on Table 6.7, in question (9) all participants agree that puzzle strategy game is an interesting game for them to play but some of participant does not feel enjoyment while playing the game. The median of question (9) from Table 6.7 is 5 (Median = 5).

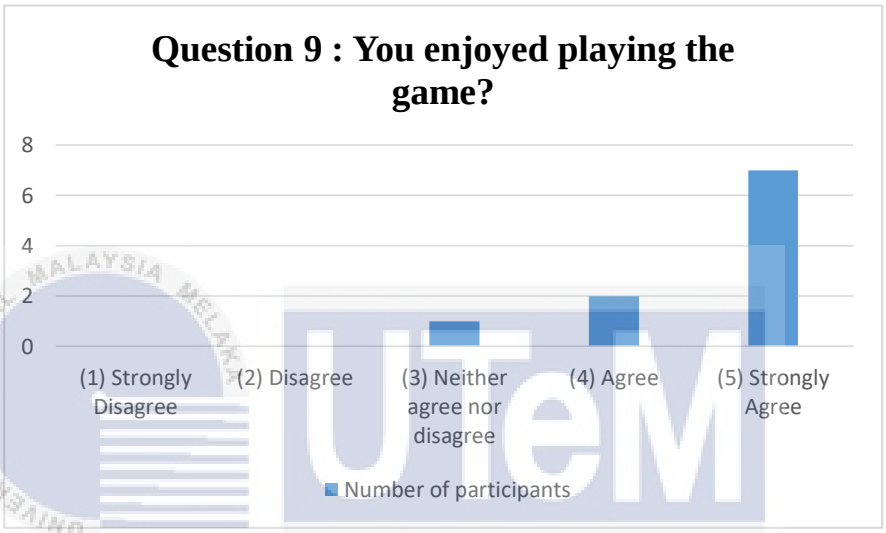


Figure 6.11 Bar graph for question 9

Table 6.7 Descriptive statistics for question 9

	Data
Mean	4.6
Median	5
Mode	5

From the testing, the data collected exhibit the number of participants that state the element that make them feel enjoyed playing the game. From Figure 6.12, 50% of participant said puzzle riddles is the element that make them enjoy while playing game. In the interview session, participant 5 said that element of puzzle riddles is important in game especially for the group of people that preferred game with this genre or like this kind of pattern in game, so participant will expecting the outcome when finishing

the level. In addition participant 6 has said in the interview "*This type of element can train people brain to think especially beside observe their playing skills especially when they encounter the trick puzzle. The more difficulties of puzzle, the better game looks."* – Participant 6. Based on the participant statement, this element also helps participants to make the quick decision in every action that they do, because puzzle game not only require from participant thinking skills but also can come from the physical abilities such as psychomotor skills of participants. Next, 30% of participant state the same opinion which the obstacle movement makes them feel enjoyed playing the game. Therefore, from the difficulties of obstacle movement helps player to estimate their action for run and jump on the platform. Then, 10% of participant has clarified that collectable item is the best element in the game and most important part of enjoyment in the game. Moreover, another 10% of participant choose level design as the element that brings joy while playing the game.

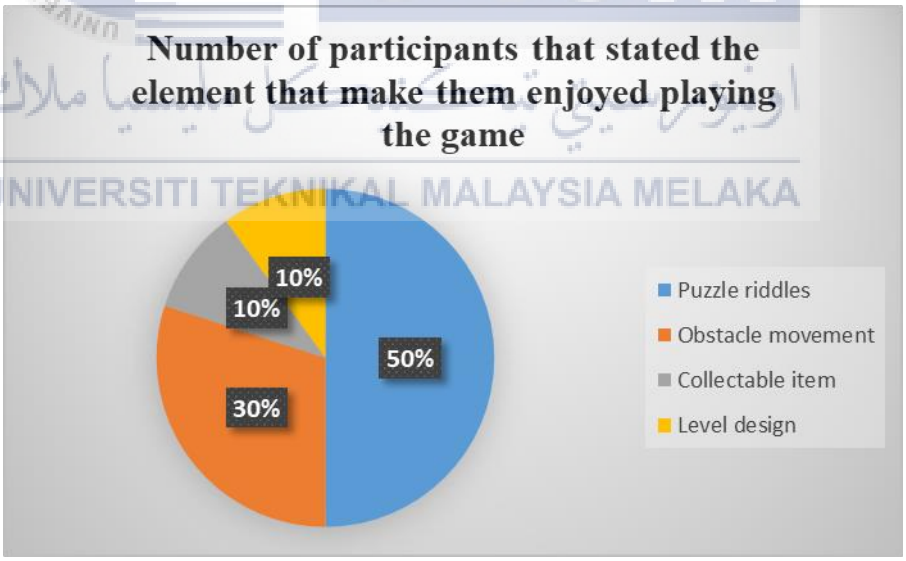


Figure 6.12 The data of participants that state the element in game that make them enjoy playing

(c) Attention control

(i) The challenges in the level game helps player to react quickly

Figure 6.13, the result for question (7) is shown based on likert scale and the number of participants that contribute in this testing. The descriptive statistics data of question (7) are from Table 6.8. From the data collected, the highest number of scale in the result is number 4 in which 6 of participant agree that the game can hold their attention while playing. The mode from this descriptive data is 4. Next, the mean for question (7) is 4.2. From the result, an average of player claim that puzzle strategy game can hold their reaction while playing because of the element that include in the game and the visual of game world that make them focuses on the game. The median for question (7) is 4.

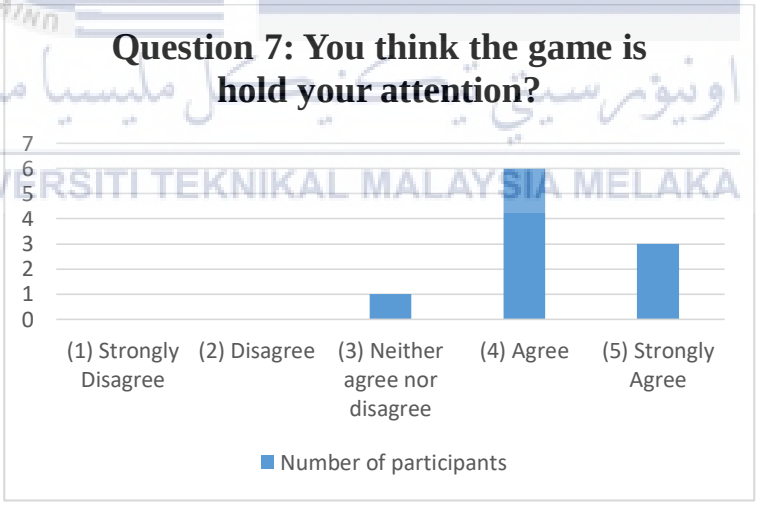


Figure 6.13 Bar graph for question 7

Table 6.8 Descriptive statistics for question 7

	Data
Mean	4.2
Median	4
Mode	4

In the first category which is cognitive abilities, all participants mentioned that Level 3 and Level 2 is the most challenging for them to play. It is quite similar with data of participants that choose level that make them react quickly. From the questionnaire, 90% of participants agree that they can react quickly while playing this game while 10% of participant cannot react quickly in this game. Based on Figure 6.14, 30% of participants clarified the most challenging level is level 3 which make they react quickly. The main reason of participants choose level 3 because of obstacle movement which they feel aware with the obstacle. Moreover, 40% of participants choose level 2 which make them react quickly because they stated in level 2, they hardly to see the environment as they only focus on one light in a dark environment. Next, 20% of participants choose level 1, because this participate feel excitement with the level itself and he like the riddle puzzle in level 1. Furthermore, it can be said that this player has an experience playing puzzle games which is why this participants react quickly in level 1. Lastly, 10% of participant choose Level 2 and Level 3 because of flying obstacle in the air that make the participant react quickly while playing this game.

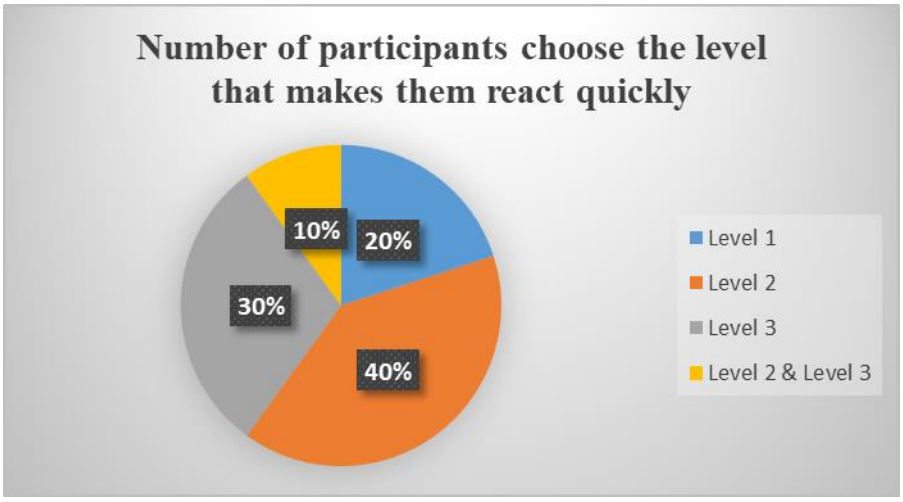


Figure 6.14 The data of participants choose the level that makes them react quickly

(ii) Element in puzzle strategy game make player feel desire to play the game

Based on the questionnaire, Figure 6.15 exhibit the result scale for question (1) that been used for participants to choose based on their preference. Table 6.9 is the descriptive statistics for question (1). The mode from descriptive statistics data is 5. Moreover, participant strongly agree that they feel the urge to see the event that happen in the game. Furthermore, the highest number of scale is number 5 and based on the result collected show that 4 out of 10 participant feel strongly desire while playing the game. In addition, the participant state an opinion that if the game provide a clue for them to make the right decision, the game could be better. For the average of participants based on Table 6.9 stated is 4.1. Next, certain participant anticipating the surprise element in the game which is the strong factor that can help participants for giving any reaction while playing the game. Therefore, the median for question (1) based on the descriptive statistics is 4.

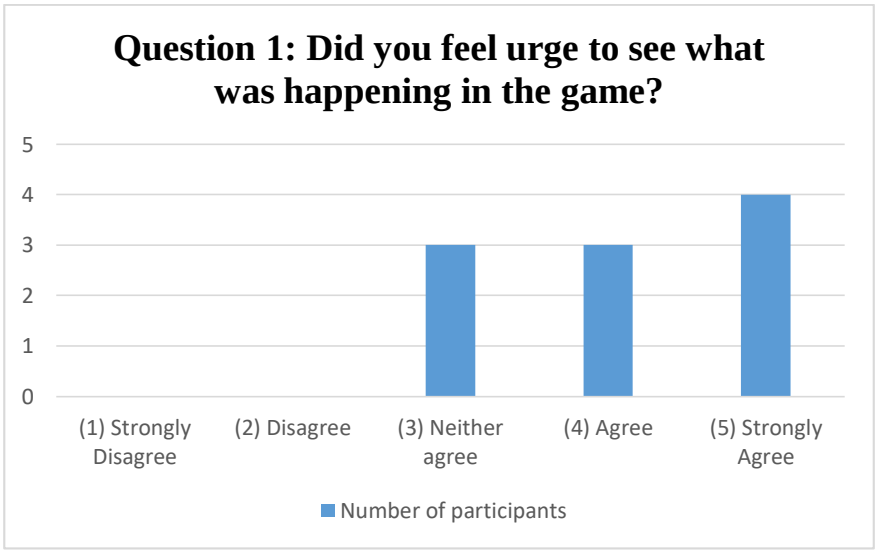


Figure 6.15 Bar graph for question 1

Table 6.9 Descriptive statistics for question 1

	Data
Mean	4.1
Median	4
Mode	5

The data analysis from Figure 6.16 elaborated the percentage of participant that state their own point of view for which element that make them respond quickly. From Figure 6.14 has explained the result for level that participant choose and in Figure 6.16 will tells in detail the other elements in the level that participant mentioned. The highest percentage of participant which 40% stated that obstacle movement is the first element that they pay attention. Hence, they said in the interview session that they need to take a careful step in the game to avoid obstacle movement and the participant estimate the speed of obstacle move. Next, 10% of participant said that door button in level 1 is the first element that they want to interact with because they want to discover the functionality of that mechanisms in the game. Another 10% of participant choose the trick question in level 1 as this element train player for quick thinking and make them give a full attention for solving the question. Moreover, 10% of participants mention collectable item (cupcake) as they said the designing of this element make the participant feel interested while other 10% of participant choose darkness environment because of the concept of that level and providing only one source of light for participants to settle down this level. The 10% of participants give a respond to a locker because they want to interact with it. In the interview session participant 10 said *"I go to the locker because the instruction asked me to go straight to the locker. That is the reason why I respond to the locker."* – Participant 10. Next, 10% of participants have

no respond to any element in the game as the task for each level is easy for them to solve it.

In Figure 6.17, the example of participants playing the game for observing their attention control and know about their speed in respond for every event happened.

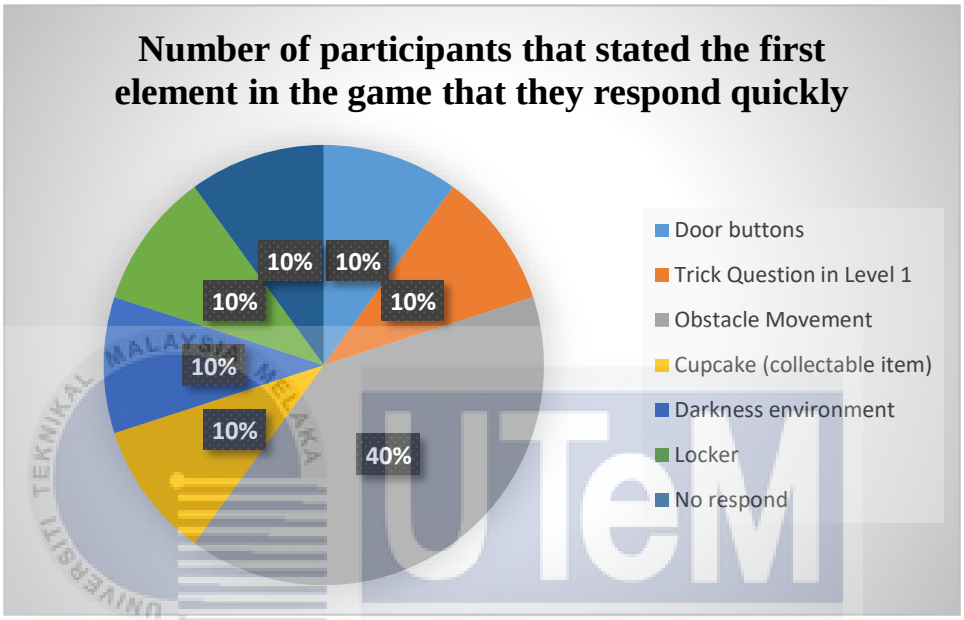


Figure 6.16 The data of participants that state first element that they respond quickly in game

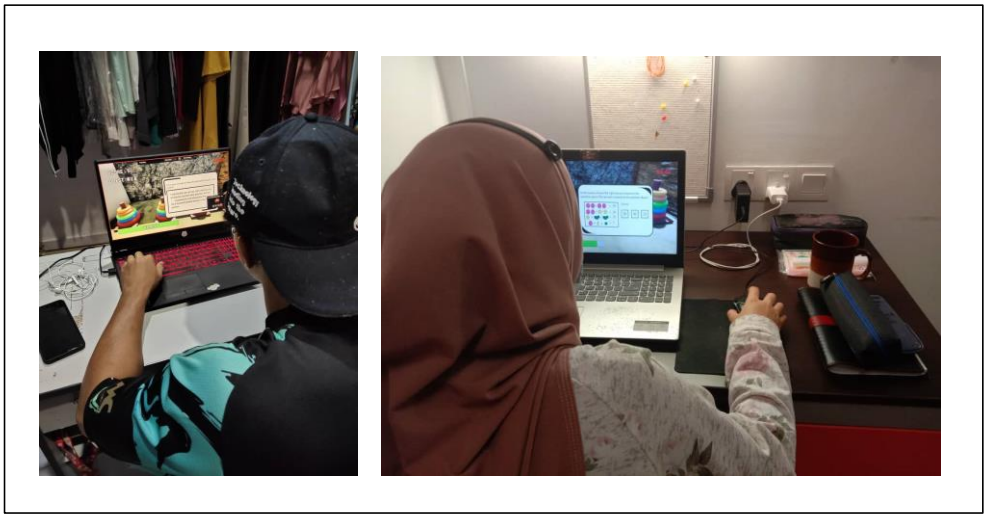


Figure 6.17 Example of participants that test their attention control while playing the game

6.5 Conclusion

In this chapter, it can be assumed that from testing conducted, there are three main categories that been priority to observe player cognitive, player action skills and player reaction. The testing is done based to a plan that has been made in advance to anticipate the period of time required for a respondent to perform the test. In addition, based on testing performed, it can show how the product work well and did the products bring a satisfied for the participants. From the test phase, it can be said puzzle strategy games also can helps player in assisting their speed reaction and enhance their experience of playing video games.

Furthermore, the strength and weakness can be identified from the testing conducted and the improvement of game can helps for a better product in the future.

CHAPTER 7: PROJECT CONCLUSION

7.1 Observation of Strength and Weaknesses

Through the process of development for implementation project, the strength and weaknesses of the final product are observed. Furthermore, it can be said that the strength of game are mostly comes from the world design and level design. From the observation, strength for game world looks more realistic and give a unique aesthetics. From the feedback of participants, they also mentioned about the creativity and decoration of assets in the game world. Also, the graphic of the game looks clear and smooth.

Next, level design is structured completely based on the project requirement for three levels and for each level has their own challenges. The participant opinion for this level design is about the movement obstacle that been used in all the levels bring the different difficulties for every player. Moreover, the participants also felt that they can react quickly with the movement obstacle for them to avoid in the challenge and the design puzzle of game looks tricky and bring enjoyment for them. In other words, can be concluded that this project is suitable to use as a method to find out player abilities in action and their mind thinking skills because it helps them to give a reaction and helps for brain activity to being active while playing the game.

In contrast, the weakness of this game are from audio and player movement in game. In particular, the used of audio effect in this game is less and lack of background

music. One of participants, stated that background music is a must in game for give them the immersion while playing and feel emotional attached to the game. Also, there is certain participants stated in the interview question about the volume of the sound effect which for them is too loud and kind of distract their focus while playing the game.

In addition, for the player movement itself it is quite hard to control especially the action control of jumping. From one participant feedback, the participants stated that the action of jumping it not easy for them to estimate because it can go fast when they jump from a far distance while in the short distance, the jump action is too short for them to step on the next platform. Other than that, other movement for the character can be control smoothly, only the lack of action to jump alone that needs to be improved in the game.

7.2 Proposition for Improvement

In the development process, the weakness in game that already been found and it is a factors that should be changed for a better improvement in game. Besides that, another comment that been mentioned by participants in an interview question also been useful for a better improvement such as the level design and player setting in the game. The first point mentioned from weakness is about character movement where the player cannot estimate the action for character jumping. The solution for this matter is by adjusting the systems and the put the right height position for player to make jumping action look smoothly. Furthermore, another addition of action can also give a good impression for player. For example, add climb and crouch for player to avoid the obstacle.

Next, adding some setting in user interface such as the adjustable volume of audio effect and music. Also, include the quality of resolution for graphic for player to helps them adaptable with the environment of game world according on their suitability. Through the improvement made can facilitate the player to choose their own style to play either required for them to have a sound while play or not. Next improvement that can help this game brings more enjoyment for player is by adding a new level with the new obstacle, so the player feel the excitement to keep playing as they want to keep explore the new level in game. Moreover, for the obstacle in every level also can be improved in terms of speed for movement and the arrangement of collectable item in level is suitable for player position to pick up or collect it.

7.3 Contribution

This final project is contribute to the Faculty of Information and Communication Technology of Universiti Teknikal Malaysia Melaka.

7.4 Conclusion

In conclusion, for this final project, it can be said that there are many shortcomings that possible to be improved for a better product in the future. But, because of time constraints given, only certain part that have a weakness can be fixed. In the future plan, any additional element for a game can be improved to make the product look more valuable and interesting for player. Moreover, these types of games can helps player to knowledge their speed reaction and assist them for a better skills in the future.

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Appendix A

Questionnaire

Section A: Demographic

Gender	Male ☐ Female ☐
Age	15 until 19 years old ☐ 20 until 25 years old ☐
Have you ever played a video game before?	Yes ☐ No ☐
From the question above, if you choose yes, how much time did you spent to play video game?	2 hours until 4 hours ☐ 5 hours until 10 hours ☐ 10 hours above ☐
Which type of video game player are you?	Yes ☐ No ☐

Section B: Three main categories

Categories	**Question**	**Sub-Question**
Cognitive abilities	I felt challenged when playing the game.	1(a) In which level that you think is the most challenging to play?
	I had to constantly keep track of what was going on in the game.	2(a) Do you think necessary for player to read the instruction or rules before play the game?
	I had to think actively while playing the game.	3(a) There is a mathematic calculation in the game, do you solve the problem in a long or short time.
		3(b) Can you clarify the answer why it takes a long or short time for you to solve the question.

	Succeeded in the game required much planning.	4(a) Did it take too much effort to plan your strategies in order to complete the game?
	I had to think several steps ahead when playing the game.	5(a) Based on the question above, are you a person who always plan and consider the action that you should be made in game or vice versa?
	I had a lot things that I want to explore and see in the game.	6(a) Based on the game, are you satisfied with the things that you see while playing it?
		6(b) Do you regret if you didn't have a chance to explore all the things in the game?
Psychomotor skills	I act quickly while playing the games	1(a) From the testing earlier, which level that make you to act quickly?
		1(b) What action did you do to finish the level?
	I had to think possible actions that I should do in the game.	2(a) From question 1(b), do you have another possible action that you want to do in the game?
	I had a lot of different style to complete the mission in the game.	3(a) Based on your experience, did you use other alternative way to finish the game or you just follow the flow of the game?
	Playing the game required me to improve my eye-hand coordination.	4(a) From the testing earlier, did your eye-hand coordination move synchronously or asynchronously?

	The things that happened in the game made me enjoy playing it.	5(a) In which element in the game that make you feel enjoyed playing it?
Attention control	I react quickly while playing the game.	1(a) In which level that make you react quickly while playing the game?
	I had to quickly responding to things that I saw in the game.	2(a) From the game, what the first thing that you respond quickly?
	I had to make a fast decisions when playing the game.	3(a) Did you prefer to take some time for making a decisions or you can make a fast decisions while playing the game?
		3(b) Do you felt regretted with the decisions that you make in the game?
	I had to make difficult choices in the game.	4(a) Based on the question above, what difficult choices that you do in game?
	I think the different outcome to finish the game when I choose other path.	5(a) From the question above, can you explain the different outcome that you do in the game?
		5(b) If not, can you explain what did you do to finish the game?

Section C: Review of the game

1. Did you feel the urge to see what was happening in the game?

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

2. You feel you were trying your best? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
3. Did you think the game is quite challenging? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
4. While playing, you feel emotionally attached to the game? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
5. While playing, you enjoy the graphics and the imagery in this game? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
6. You think you performed well in the game? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
7. You think the game is hold your attention? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
8. You feel you put much effort while playing this game? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
9. You enjoyed playing the game? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree
10. You would like to play this game again? Strongly Disagree ☐1 ☐2 ☐3 ☐4 ☐5 Strongly Agree

Section D: Interview Question

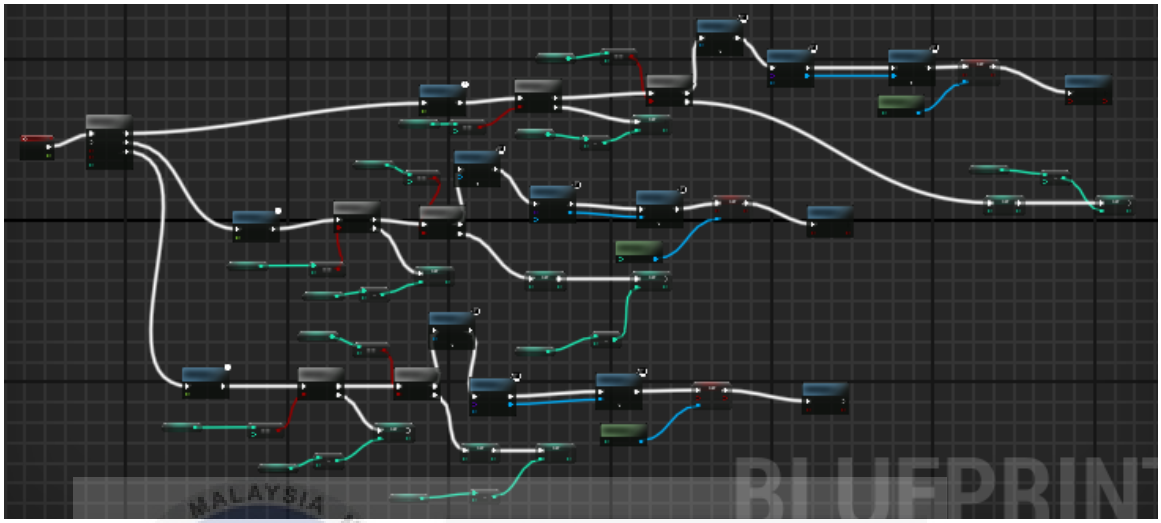
Categories	**Interview Question**
Cognitive abilities	• Why you think the level that you mentioned earlier is the most challenging for you?
	• Based on your answer, how did you plan your strategies while playing this game? Can you justify it?
	• Do you pay a lot of attention when you explore the game environment? Does it

	help you to focus on the activity that you performing?
Psychomotor skills	• Does the task is easy and simple or hard and complicated which make you take such an action? Can you clarify?
	• Did you have any trouble for balancing you're eye-hand coordination while playing the game? Why?
	• Do you think the element that you mentioned earlier is important for the entertainment of the game? Why?
Attention control	• What does the element that you saw in the level you mentioned earlier that's make you react quickly?
	• Why did you take a time to making a decisions? Or how did you can make a quick decisions while playing?
	• From the question 4(a), how you handling the difficulties choice that you made while playing the game?
The strength, weakness and the improvement of the game	• What is the strength of the game that you found while playing it.
	• What is the weakness that you found in the game?
	• In your opinion, what is the improvement should be made for this game to be better in the future?

Appendix B

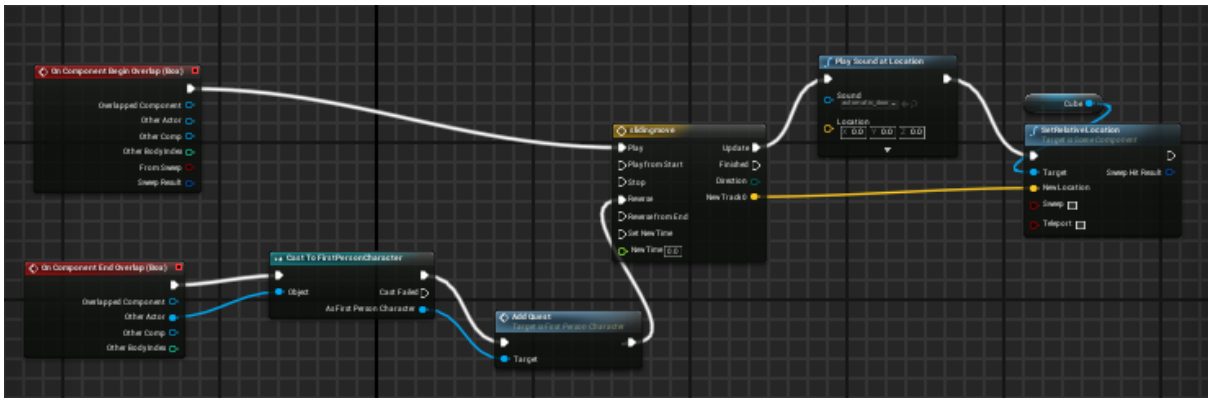
Blueprint of game (Unreal Engine 4)

1. Time limit for each level

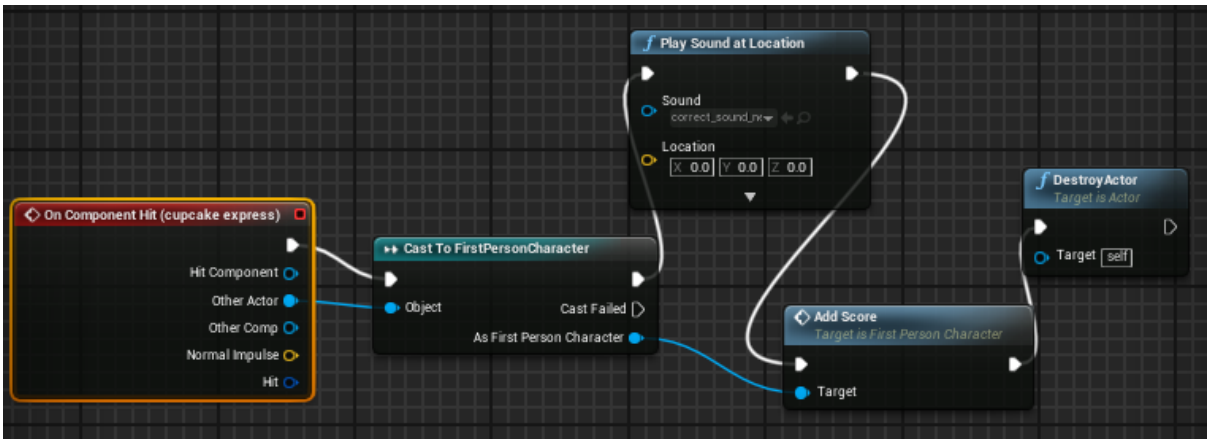


2. Turn on the flashlight

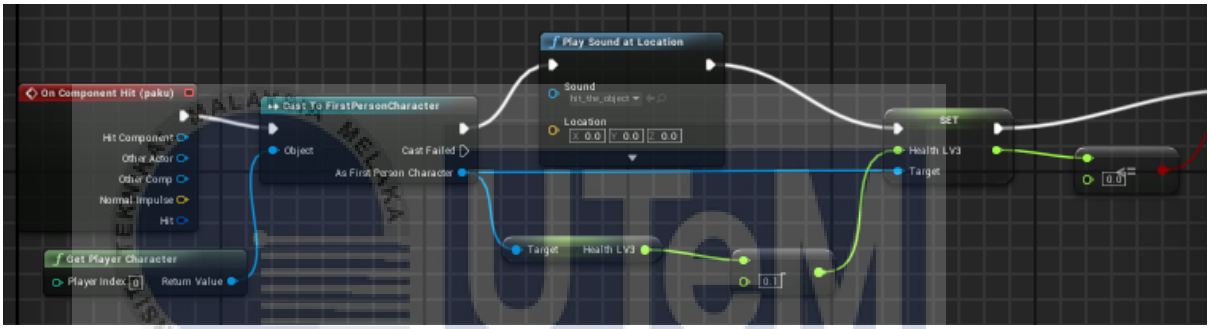
3. Animation sliding door



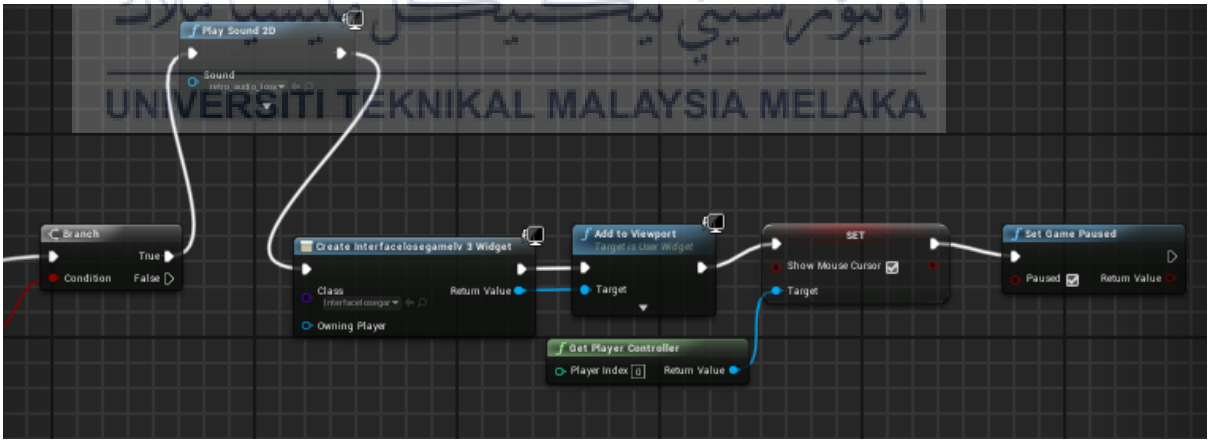
4. Collectable item for score



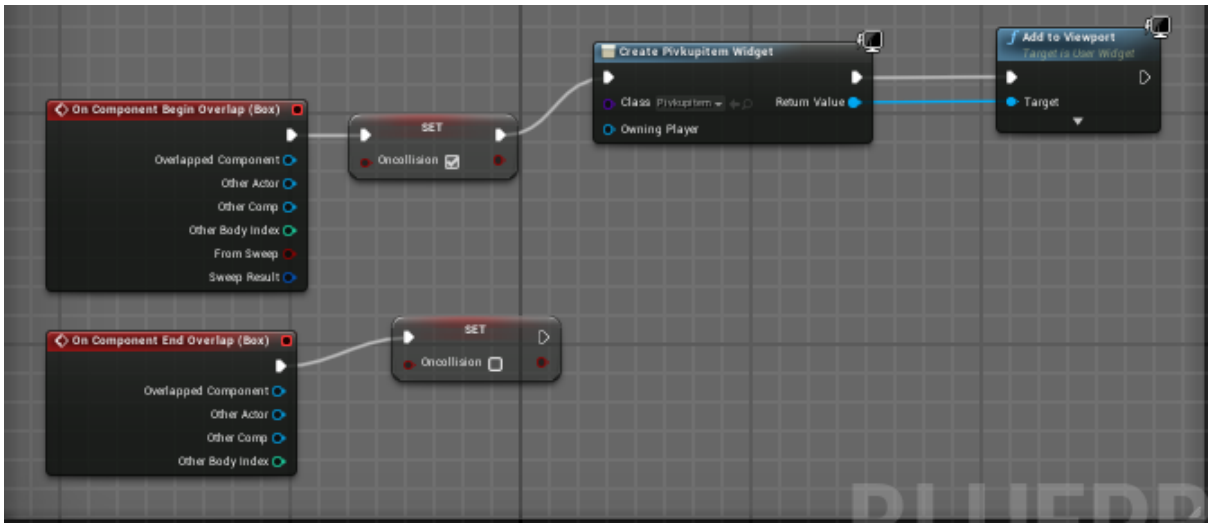
5. Player health



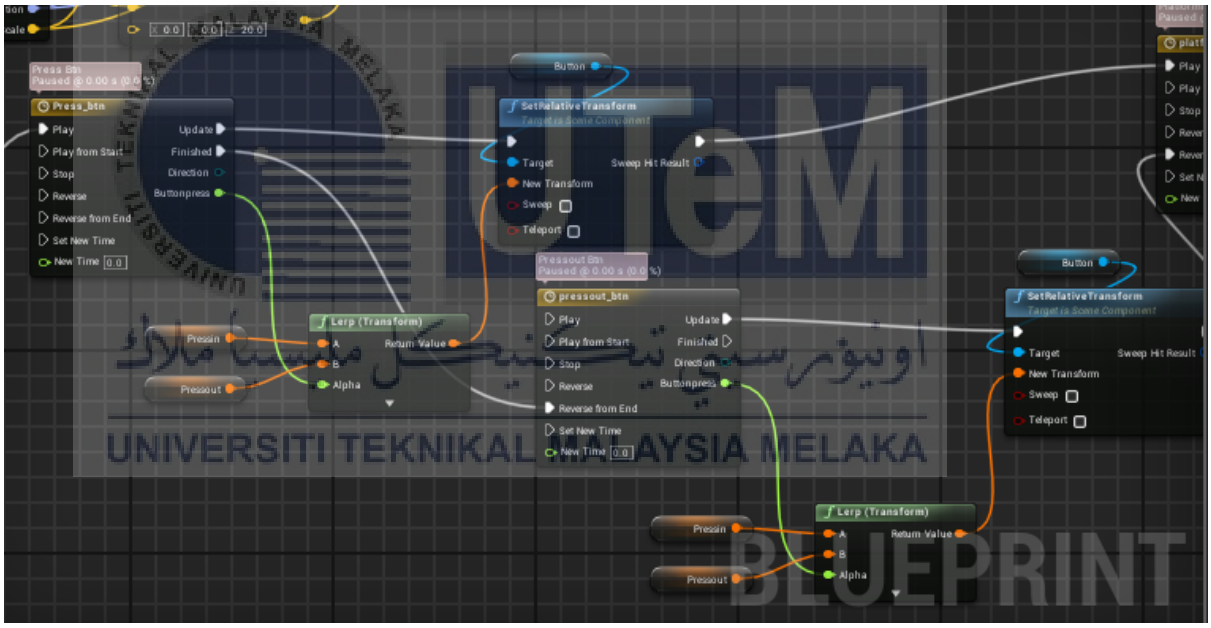
6. Widget interface lose game



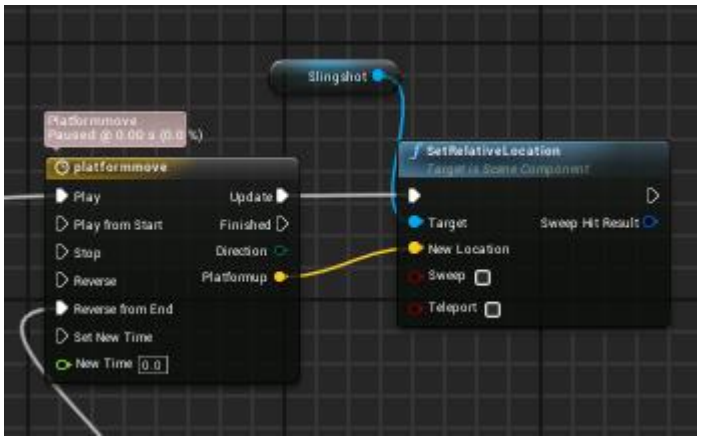
7. Simple user interface



8. Animation for press button



9. Platform move after activate button



10. Pickup item (checkpoint)

11. Animation open door