3D ACTION-ADVENTURE GAME WITH IMPROVED PLAYER EXPERIENCE

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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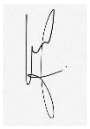

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3D ACTION-ADVENTURE GAME WITH IMPROVED PLAYER EXPERIENCE

LIM YONG SHENG

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

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2016

DECLARATION

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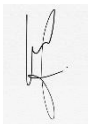

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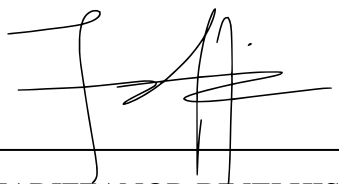

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ABSTRACT

The project is about the development of a 3D action-adventure game named Teleported which is developed on Unity3D and programmed using C#. The target audience of the game are teenagers who aged between 13 and 18. The game is inspired by a Windows game which is Magic Secret Agent. The main objective of the game is to enchance the player's experience which is lacked in 2D game. The game is requires player to control a character to move around in a 3D game world. The character has an ability of teleport which allow him to launch or shoot a magical ball to a position and teleport to the ball's position. The teleportation also can use to avoid the traps and enemies because the character only can run but not jump in the game. Player needs to find keys and solve the puzzles to unlock a portal which can navigate to next level. The literature review has some evidences to support that player's experience in 3D game is better than player's experience in 2D game. The methodology used in this game is agile and it is broken into four phases which are Background Study, Development, Testing and Documentation. The analysis part shows the requirements of the game in the aspect of technical requirements. The design part shows that the architechture, game design and game art of the game. The expected output of the game is a 3D action-adventure game that will be developed to let the players have new player's experience and challenges while playing the game.

ABSTRAK

Projek ini adalah mengenai pembangunan permainan aksi-pengembaraan 3D bernama Teleporter yang dibangunkan dengan menggunakan Unity3D dan diprogramkan oleh C#. Penonton sasaran permainan ini adalah remaja yang berusia antara 13 dan 18. Permainan ini diilhamkan daripada permainan Windows yang bernama Magic Secret Agent. Objektif utama permainan ini adalah bagi meningkatkan pengalaman pemain yang kekurangan dalam permainan 2D. Permainan ini memerlukan pemain untuk mengawal watak untuk bergerak dalam dunia permainan 3D. Watak ini mempunyai keupayaan teleport yang membolehkan dia untuk melancarkan atau menembak bola ajaib ke sesuatu kedudukan dan teleport ke kedudukan bola tersebut. Keupayaan teleport ini juga boleh digunakan untuk mengelakkan perangkap dan musuh-musuh kerana watak hanya boleh berjalan tetapi tidak melompat dalam permainan. Pemain perlu mencari kunci dan menyelesaikan teka-teki untuk membuka sebuah portal yang boleh pergi ke tahap seterusnya. Kajian literatur mempunyai beberapa bukti untuk menyokong pengalaman yang pemain dalam permainan 3D adalah lebih baik daripada pengalaman pemain dalam permainan 2D. Kaedah yang digunakan dalam permainan ini adalah tangkas dan ia dipecahkan kepada empat fasa iaitu Kajian Latar Belakang, Pembangunan, Ujian dan Dokumentasi. Output yang diharapkan dari permainan ini adalah permainan tindakan-pengembaraan 3D akan dibangunkan untuk membiarkan pemain mempunyai pengalaman dan cabaran yang baru semasa bermain permainan ini.

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LIST OF ABBREVIATIONS

3D	**-**	**Three dimensional**
2D	**-**	**Two dimensional**
PC	**-**	**Personal computer**
RAM	**-**	**Random Access Memory**
API	**-**	**Application Programming Interface**
I/O	**-**	**Input/Output**
AI	**-**	**Artificial Intelligence**
UI	**-**	**User Interface**
OS	**-**	**Operating System**

CHAPTER I

INTRODUCTION

1.1 Project Background

Teleporter is a three-dimensional (3D) action-adventure game developed on Unity3D and programmed in C#. The target audiences of the game are teenagers who aged between 13 and 18. The game requires player to control a character named Lojo to move around in a 3D maze world. Lojo has an ability of teleport which allow him to shoot a magic ball and teleport to the ball's position. The ability of teleport can be used to avoid traps in the game. There are also some puzzle games in the maze that require Lojo to solve it.

1.2 Problem Statements

Teleporter is actually inspired by a two-dimensional (2D) Windows game named Magic Secret Agent which the game character also has an ability of teleport. However, there are some problems with the Magic Secret Agent. The problems are player is lack of experience when playing the Magic Secret Agent because the game is in 2D. There is also lack of actions in Magic Secret Agent and exploring is limited in the game because the game has a full map view.

1.3 Objectives

The first objective of the game is to study the differences of player's experience in 2D and 3D action-adventure game. The second objective is to develop a 3D action-adventure game with a proposed interaction. The third objective is to evaluate the player's experience in a 3D action-adventure game.

1.4 Goals and Genre

The goal of the game is for entertainment. The ability of teleport can let the player has fun when playing the game. Player can experience the fun of exploring and teleporting in a 3D maze which filled with traps and puzzles. The genre of the game is action-adventure because the game requires player to move around the game world by using ability of teleport to find the keys and solve the puzzles to unlock the portal which will navigate to next level. The sub-genre is adventure because the game world is big enough for player to explore.

1.5 Game Features

The target players of the game are the players who like to explore and who are willing to spend their time in exploring the game. This is because the game needs to take quite long time to finish so this game is not suitable for those people who are casual gamers.

The rules of the game are very simple. Player has to use the ability of teleport to avoid the traps in game. Once the player has touched the traps, the player will back to the start position. The game does not implement life system, that means the game does not end even the game character has die for many times.

The advantage of this game is that the game is provided save system. Even the game character will back to the start position when he touched the traps but the player can save anytime to prevent the loss of progression in game. Player can collects keys or solve puzzles in a level to unlock the portal which can navigate to next level. Player has freedom to choose whether to collect keys only, solve puzzles only or both. The victory condition is player completes all levels in game and there is no loss condition in game unless the player starts a new game and discards the previous progression.

1.6 Conclusion

By completion of this project, a 3D action-adventure game with improved player's experience compare to existing 2D action-adventure game is developed. Teleporter is developed for Personal Computer (PC) platform and its goal is for entertainment. Teleporter is developed by using Unity3D and programmed by C#.

The target audiences of the game are teenagers who aged between 13 and 18. The target players are the players who like to explore and who are willing to spend time in playing game. The game has no loss condition and it provides save system. The victory condition of the game is player completes all levels in the game. The following chapter will discuss about the literature review and methodology of the project. The literature review will show the existing game in the market which has similar gameplay with the project.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter shows the literature review of the project and also describes the project methodology that used in the project. The literature review covers the comparison of existing game with similar gameplay in the market.

2.2 Genre

The genre for this project is action-adventure. Action-adventure is a genre that combines two genres which are action and adventure. According to Oxford (2011), Action Games, who is Nintendo DS Expert said that video games in the "action" genre typically put emphasis on challenging the player's reflexes, hand-eye coordination and reaction. She said that today's action games are typically more complex even though the genre's core mechanics are still the same. Action games typically give the player multiple means of attack, though there's almost always a shared theme at work.

According to Bronstring (2012), What are adventure games? Adventure games are all about unraveling stories, exploring worlds and solving puzzles. Adventure games have been the most story-driven computer game genre for over 30 years. Adventure games found to have a true immersive quality that can be compared

to reading a book or watching a movie. Adventure games focus on puzzle solving within a narrative framework, generally with few or no action elements.

According to Swain (2011), What is an Action-adventure Game? Adventure games are about exploration and big worlds too look through while action games are fast paced games, with multiple button presses per second. Action-adventure game genre is a game genre that combines elements of the action game and adventure game genres. It is perhaps the broadest and most diverse genre in gaming. Platformer, sandbox, survival horror, stealth, first and third person shooters are all genres that fall under the action-adventure banner. According to Bronstring, Marek (2012), What are adventure games? Puzzle solving is clearly a secondary focus in action-adventure games.

2.3 Existing Games

There are two existing games that have similar gameplay and game features with Teleporter. They are Magic Secret Agent and Portal. According to Windows Central (2015), Magic Secret Agent is a Windows game that player plays the role of Agent Stephen Karsch and the mission is to navigate the various gaming levels and find evidence to send a collection of wanted criminals to the big house. The game includes dozens of levels filled with traps and goons to avoid, as well as switches to open secret doors that will lead you to the next level. The secret agent moves around by magically teleporting around the game.

According to The Orange Box (2007), Portal is a single player game that is designed to change the way players approach, manipulate, and surmise the possibilities in a given environment. The game character has equipped a device that can create inter-spatial portals between two flat panels. Players must solve physical puzzles and challenges by opening portal to maneuvering objects and themselves, through space.

Teleporter is a game that has both game features of Portal and Magic Secret Agent. Teleporter has the unique movement of Magic Secret Agent and it requires portal to navigate to next level. Teleporter is also filled with traps which similar with Magic Secret Agent and unsolved puzzles which is similar with Portal. Therefore, Teleporter is different in the aspect of gameplay and game features compare to Portal and Magic Secret Agent.

According to Windows Central (2015), Magic Secret Agent is deployed on Windows phone, Windows tablet, Windows laptop and Windows desktop. Magic Secret Agent is developed using Microsoft XNA and supported operating systems is Windows 8.1 and above.

According to The Orange Box (2007), Portal is developed using Source Engine and deployed on Windows PC, PlayStation 3, Xbox 360, OS X, Linux, Shield Portable and Shield Tablet.

Teleporter is developed using Unity3D as it is very famous engine and easy to use. It can also easily deploy the game to the platform such as PC, mobile and console but for Teleporter only deploy to PC with Windows.

2.3.1 Comparison of Existing Game

According to Silva, Marinho, Differences Between 2D and 3D games, She said that the player's experience in 2D and 3D games is not same. One of the most apparent differences between 2D and 3D games is their visual quality. Although 2D games oftentimes demonstrate excellent artistic design, 3D games are better at simulating reality.

As a result, many games that strive for realistic visuals choose a 3D game engine. Movement is also a difference between the player's experience of 2D and 3D games. 3D games allow players to move in a 3D world, meaning that players can move closer and deeper into the screen. On the other hand, 2D games restrict player movement to a flat plane, usually left and right, but may include various other directions as well. There is an example of Super Mario Bros which asks players to navigate a 2D world, moving from left to right until the goal is reached.

Since a game's dimensions determine the players range of movement, 2D and 3D games use different ways to control their characters. 3D games use joysticks to control their avatars. Joysticks allow players to move around in a 3D space and are tilt sensitive to control a character's speed. On the other hand, 2D games use digital pads that allow players to press up, down, left and right. Table 2.1 shows the comparison of existing games with similar gameplay in the market while Table 2.2 shows the comparison of existing games there are changed from 2D to 3D in the market.

Table 2.1: Comparison of Magic Secret Agent and Portal

Magic Secret Agent	Games	Portal
Touch screen, mouse	Controls	Joystick, mouse, keyboard
Move by using magical orb to teleport, avoid traps and goons and find evidence to send wanted criminals to the big house.	Gameplay	Move by open the portal by a portal device and solve physical puzzles and challenges by opening portal to maneuvering objects and themselves, through space.
Windows Phone, Windows PC	Platform	Windows, console, iMac, Linux
Requires Windows 8.1 and above	Operating System	Vary between platform
Microsoft XNA	Development Tool	Source Engine
Two-dimensional	Dimension	Three-dimensional

Table 2.2: Comparison of game that change from 2D to 3D

Comparison	**Donkey Kong**		**Grand Theft Auto**	
	2D	**3D**	**2D**	**3D**
Movement control input	Buttons	Analog Stick	Buttons	Analog Stick
Game world visibility	Able to see the whole layout of the game world at once	Third person view in a 3D environment that requires players to explore the game world by themselves	Top down view that can see the layout from a part of game world but still needs to explore	Third person view in a 3D environment that requires players to explore the game world by themselves
Movement	Only able to move left, right, up and down	Able to move in all directions	Able to move in all directions	Able to move in all directions
Gameplay	Control the character to avoid obstacles and save princess	Able to walk around, swim, dive in the game world and needs to beat bosses to win the game.	Able to fight, drive all kinds of vehicles and needs to avoid from get caught by police.	Able to fight, drive all kinds of vehicles and needs to avoid from get caught by police.
Game mechanics	Score, life, powerup	Collectables, powerup	Score, powerup	Score, powerup

2.4 Project methodology

The project methodology that is selected for this project is agile development process. This project is broken up into four stages. The stages are background study, development, testing and documentation. Figure 2.1 below shows the flowchart of the project activities in this project.

2.4.1 Stage 1: Background Study

This stage involves brainstorming to get idea of the game. Research and study about the game idea will be done after getting the idea. A proposal will be prepared at the end of this stage.

2.4.2 Stage 2: Development

This stage includes the pre-production and production process. Game assets preparation will be done as well as the defining of the gameplay, game mechanics, user interface, and victory and termination condition during the process of pre-production. Design of the game world and implementation of code into the game will be done in process of production. Self-testing is also done during the code implementation to make sure that the code is run properly without errors.

2.4.3 Stage 3: Testing

A prototype will be created for the game to let game testers to test the game and get the feedbacks from them to find out and fix the bugs. This process may repeat a few times to make sure that there is no bug in the game. A final version of the game is deployed at the end of this stage.

2.4.4 Stage 4: Documentation

This stage involves preparation of final report and thesis of this project. Further research and study about the game will be done before the thesis writing. The facts of the research and study are then written into the thesis until the thesis is finished and submitted.

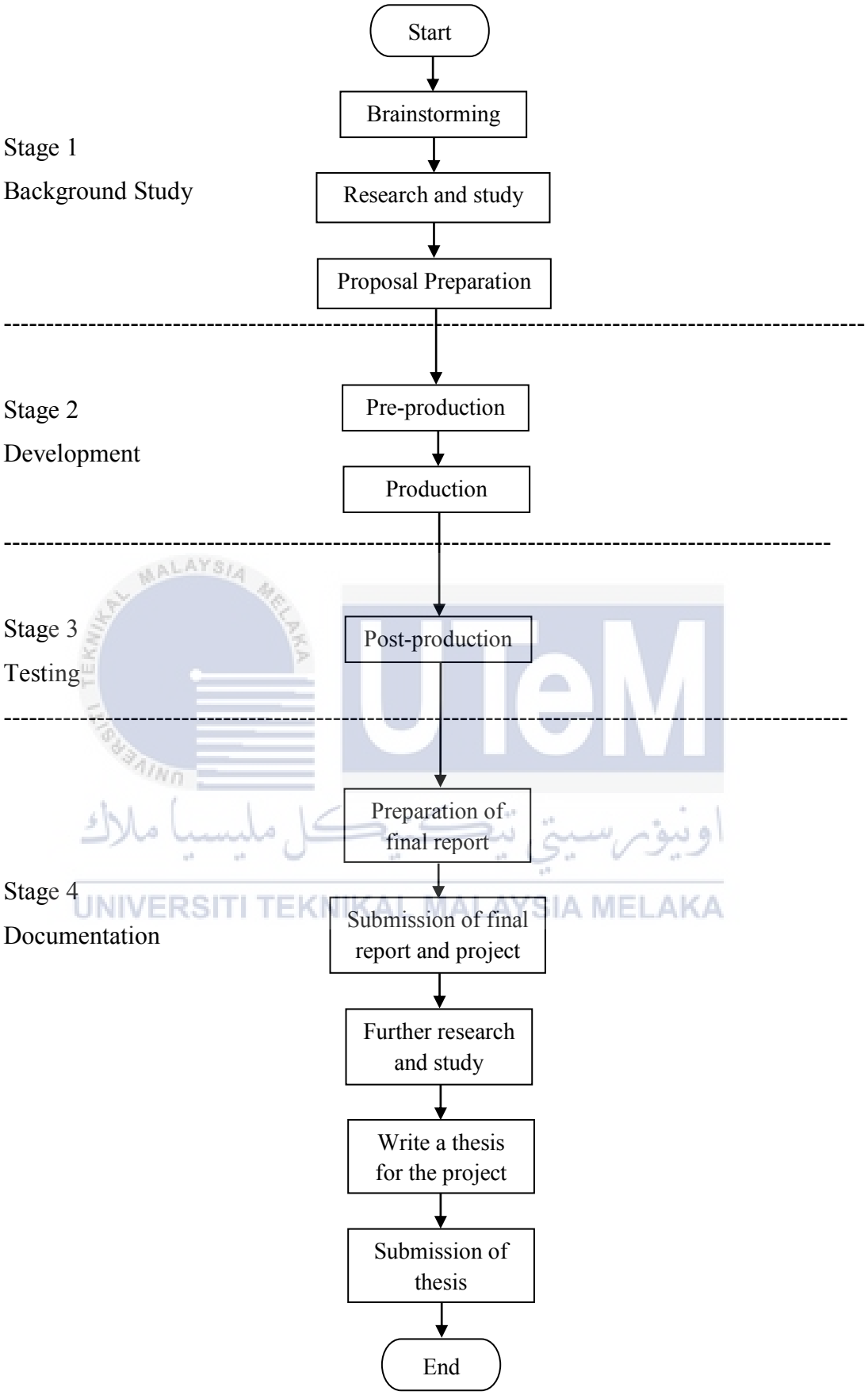

Figure 2.1: Flowchart of Project Activities

2.5 Conclusion

The genre that used for the project is action-adventure. There are two existing games which have similar gameplay with the project. The methodology that used in the project is agile development process and it is broken down into four stages which are Background Study, Development, Testing and Documentation. The following chapter will discuss about the analysis of requirements for the project. The project schedule and milestone will also discuss in the following chapter.

CHAPTER III

ANALYSIS

3.1 Requirement Analysis

This section will discuss about the requirements of the project. The requirements are project requirement, technical requirement, hardware requirement and software requirement. The further descriptions of the requirements will be explained at sub-chapter below.

3.1.1 Project Requirement

The similar game that used to do analysis is Magic Secret Agent. The game genre of Magic Secret Agent is action-adventure and it is a 2D game. The following Table 3.1 shows that the differences in term of game features between Teleporter and Magic Secret Agent.

Table 3.1: Comparison of Magic Secret Agent and Teleporter

Magic Secret Agent	Games	Teleporter
Player plays the role of secret agent and the mission is to navigate the various gaming levels and find evidence to send a collection of wanted criminals to the big house.	**Player Roles**	Player plays the role of a futuristic person and the mission is to navigate the gaming levels and escape from the maze.
Move by using magical orb to teleport, avoid traps and goons and find evidence to send wanted criminals to the big house	**Gameplay**	Move by using magical ball to teleport, avoid traps and find keys or solve puzzles to unlock the portal which can navigate to next level.
Find all the evidences and send all the wanted criminal to the big house to win the game	**Victory Condition**	Find all the keys or solve puzzles in all levels to win the game
Projectile force and switch of doors	**Core Mechanic**	Projectile force, find keys and solve puzzles,
Simple user interface with icon based button	**User Interface**	Simple and easy understand interface with word based button
Two dimensional side view	**Camera models**	Three dimensional third person view

3.1.2 Technical Requirement

The hardware used for this project is a Windows 7 64-bit PC with a graphic card of Nvidia Geforce GT 520M and also the Random Access Memory (RAM) of 4GB. The game engine that will be used for this project is Unity3D.

3.1.2.1 Software Requirement

Game Engine

- Unity 5.3.4f1 (64-bit)

  Unity is a cross-platform game engine developed by Unity Technologies and used to develop video games for PC, consoles, mobile devices and websites.

Programming Language

- Microsoft C#

  C# is a multi-paradigm programming language encompassing strong typing, imperative, declarative, functional, generic, object-oriented, and component-oriented programming disciplines.

Game Art

- Adobe Photoshop CS6

  Adobe Photoshop is a raster graphics editor developed and published by Adobe Systems for Mac OS and Windows.

- Autodesk Maya 2014

  Autodesk Maya is a 3D computer graphics software that runs on Windows, OS X and Linux.

- Audacity

  Audacity is a free open source digital audio editor and recording computer software application.

- Adobe Premiere Pro CS6

  Adobe Premiere Pro is a timeline-based video editing software application.

3.1.2.2 Hardware Requirement

Hardware for Development and Player Interaction

- Windows PC with Windows 7 and above

  Windows PC used to install the softwares stated at 3.1.2.1. As the game is developed in Windows PC so a Windows PC is needed to develop the game.

- Mouse

  Mouse is used in the development because the gameplay required to use mouse. Mouse is also important in using the softwares. There is a lot of functions that required mouse cursor to click on that.

- Keyboard

  Keyboard is used in the development because the gameplay required to use keyboard. There is a lot of functions in the softwares and the functions can be performed immediately by pressing hotkeys. Time of the game development is saved by using keyboard.

3.2 Project Schedule and Milestone

Table 3.2: Gantt Chart for Final Year Project

Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Brainstorming and discussion with supervisor																						
Research and background study of game idea																						
Proposal Preparation																						
Constructing flowboard																						
Design level and user interface																						
Design game rule and game mechanics																						
Constructing the hierarchy of challenges																						
Game asset preparation																						
Setting up the game world or game level																						
Code implementation																						
Testing and fix the bugs																						
Deploy or export the game																						
Preparation of final report																						
Final Presentation																						
Submission of final report and project																						
Further Research and Study																						
Writing Thesis																						
Submission of Thesis																						

Table 3.3 Project Milestone

Start Date	End Date	Milestone
22 FEB		Project Start
23 FEB	28 FEB	Brainstorming and do background study about the game idea Prepare proposal
29 FEB	6 MAR	Constructing flowboard Design the level and user interface
7 MAR	13 MAR	Design game rule and game mechanics Contruct the hierarchy of challenges
14 MAR	20 MAR	Game asset preparation
21 MAR	3 APR	Set up the game world
4 APR	1 MAY	Code implementation
2 MAY	15 MAY	Test the game and fix the bugs
16 MAY	22 MAY	Deploy the game
23 MAY	29 MAY	Preparation of final report
30 MAY	3 JUN	Final presentation
3JUN		Submission of project and final report
27JUN	26AUG	Completion of thesis

Based on the Table 3.3, the project is start from 22nd February with the first stage of Background Study. The Background Study is last for one week and then continues to the second stage which is Development. Development stage which included pre-production and production is last for eight weeks which is from 29th February to 1st May and then continues to the third stage which is Testing.

During the Testing stage, prototype for the game is created and tested by game testers. Bugs which found based on the feedback from the game testers are fix and second prototype is created for second test. This process is repeated for several times until there is no bug found in the game and it is ready to be deployed. This stage is last for two weeks which is from 2nd May to 22nd May. The final stage which is Documentation stage start from 23rd May to 26th August, the final report and thesis will be done at the end of this period and the project is finished.

3.3 Conclusion

This chapter has discusses about the analysis of the requirements of the project. The requirements are technical requirement, hardware requirement and software requirement. The Gantt chart and Milestone of the project is also shown in this chapter and they are listed down all the activities to be done during the period of finishing the project. The next chapter will discuss about the overall design of the game.

CHAPTER IV

DESIGN

4.1 Introduction

This chapter covers all the designs of the game. The designs divided into game architecture, game design and game art. Game architecture shows how the game works and interacts with users. The game designs of the game includes gameplay, core mechanics, flowboard, level progression and user interface. The game art includes the design of game world, design of character, camera model and audio that used in the game.

4.2 Game Architecture

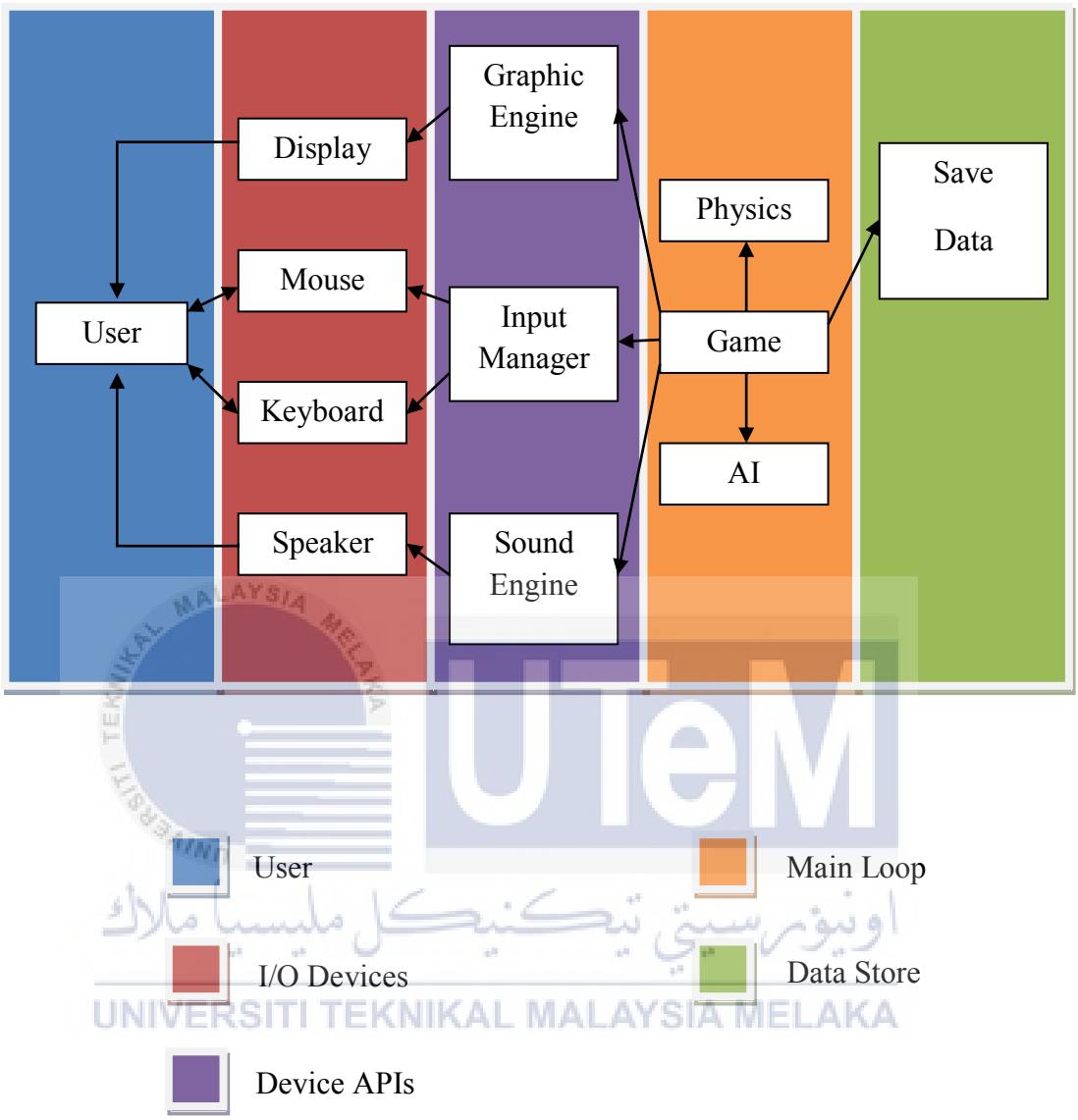

Figure 4.1: Game Architecture

Figure 4.1 shows that the game architecture for Teleporter. Users have to use mouse and keyboard as the input devices for the game while speaker and display are as the output device of the game which shows users the display and audio in game. The Input Manager in Device APIs managing the input device, the Sound Engine managing the audio output of the speaker and the Graphic Engine is managing the display of the game.

The main loop of the game included game, physics and AI. The main character and most of the game assets are applying physics such as rigid body, gravity, collision detection and etc. Some of the enemies are having Artificial Intelligence (AI) which when the main character enter the Collider of the enemies then the enemies will move towards and attack the main character. The Game World Data in Data Store is storing the data of the game world such as the variables in the scripts while the Save Data is storing the data when the player press Save in the game.

4.3 Game Design

The game design of Teleporter which includes gameplay, challenges, mechanics, assets and game world are explained in this sub-chapter. The gameplay is how the game is interact with player. The challenges are the difficulties of the game in each level. The assets are the art works that used for the character and game world.

4.3.1 Gameplay

Teleporter is a 3D action-adventure game that requires player plays the role of a futuristic person and the mission is to navigate the gaming levels and escape from the maze. The player has to control the character to move around the maze by using the ability of teleport to avoid traps. The rule is player needs to avoid the traps from touching them. Once the player touched the traps then the player will back to the start position.

The goal of each level is to find all the keys located in the maze or solve all the puzzles in the game to unlock the portal which can navigate to next level. The victory condition of the game is to collect all the keys or solve the puzzles of all the game levels to win the game. There is no loss or termination condition of this game because the game does not implement the life system. There is a feature that player can save the game progress anywhere and anytime. Therefore, the game will not over

as long as player has saved the game unless the player wanted to start a new game and discard the previous progression.

The level of difficulty of Teleporter is high skill because the game does not have time limit so there is no stress of time in the game. Teleporter is high skill because it requires player has fast reaction where some of enemies or traps will instantly move towards player when player nears them. Teleporter also requires player to make decision in a short time and able to get a good timing when doing teleportation.

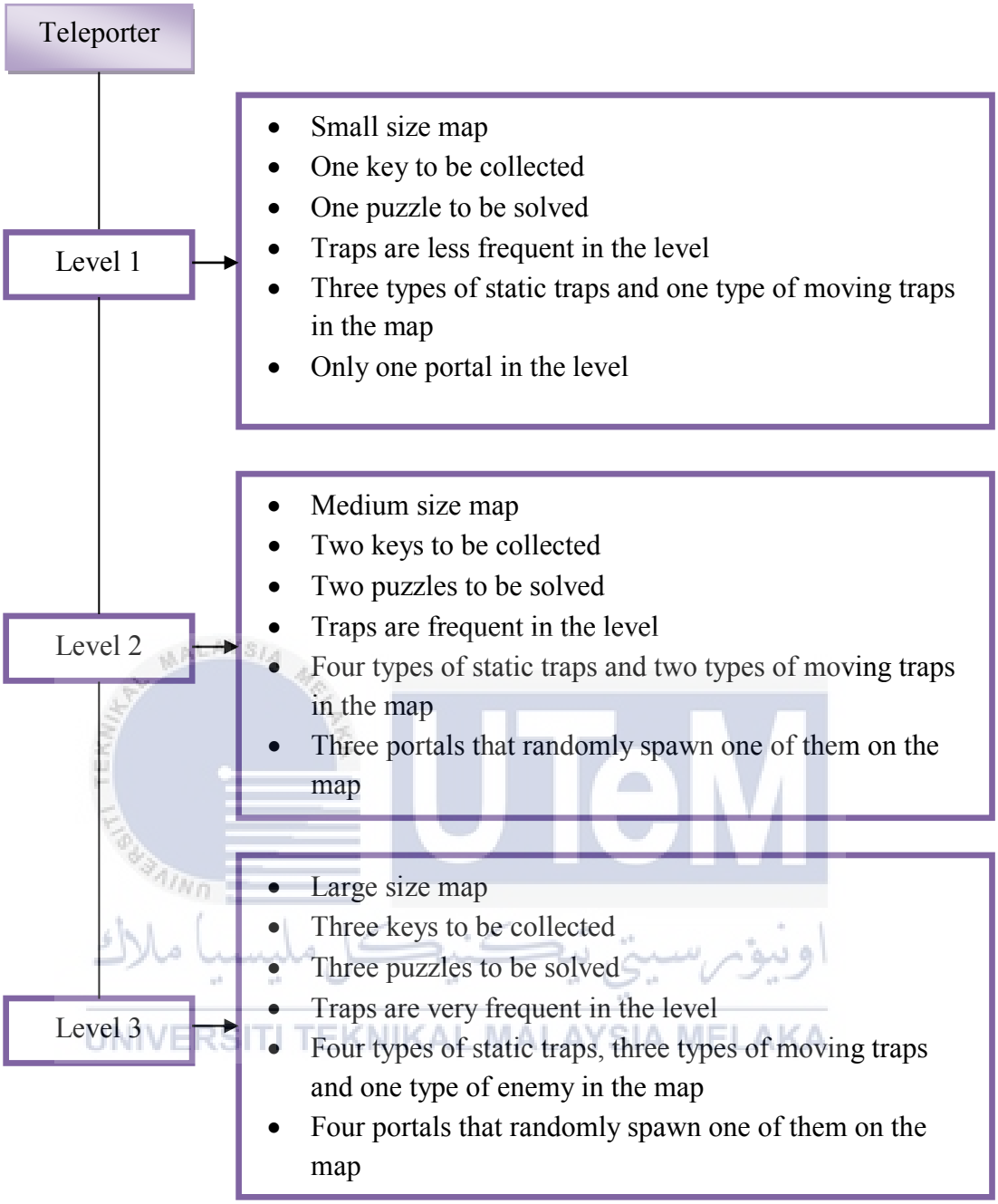

Figure 4.2: Hierarchy of challenges

Figure 4.2 shows the hierarchy of challenges of Teleporter. There are 3 levels in the game but all the difficulties of the levels are different. The difficulties are different at the size of the map, number of keys, number of puzzles and number of traps.

4.3.2 Core Mechanics

The core mechanics of Teleporter are projectile force, collect keys and puzzle solving. Projectile force is the force that applies to the magic ball when player shoot the magic ball. The projectile force is in charge form which the player has to press and hold the key to increase the force and release to shoot the magic ball with the current force.

Player has to collect all keys in order to unlock the portal which can navigate to next level. In alternative solution, player can choose to solve the puzzles instead of collect keys to unlock the portal. Both of them can be combined for example level two in game, there are two keys and two puzzles in the level. Player can choose to collect two keys, collect one key and solve one puzzle or solve two puzzles in order to unlock the portal.

4.3.3 Flowboard

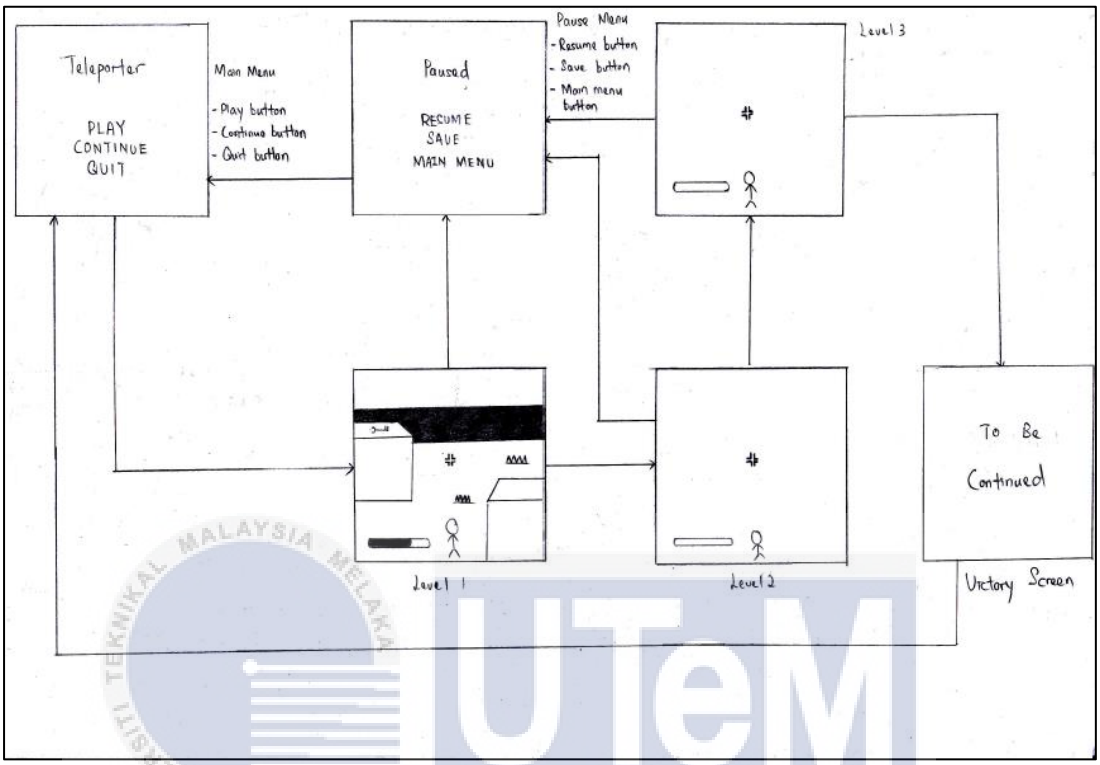

Figure 4.3: Flowboard

Figure 4.3 shows the flowboard of the game. The flowboard shows the flow the game obviously on how the scene will navigate to each other.

4.3.4 Level Progression

The difficulty of game is increases as the level progress. Figure 4.2 shows that every levels in Teleporter has different challenges and difficulties.

Difficulty = Level 1 < Level 2 < Level 3

Level 1 is the easiest level and Level 3 is the hardest level. In Level 1, player requires low skill to pass the level. The traps in Level 1 are less frequent and they are easy to be avoided. While Level 2 requires player to have higher skill compare to

Level 1 because the traps in Level 2 are more frequent than Level 1 and there are new traps that are placed in Level 2 that will increase the difficulty of the game. Level 3 requires player to have higher skill compare to Level 2 because the traps in Level 3 is very frequent compare to Level 2 and there are AI enemies that are placed in the level and they are obviously increase the difficulty of the game.

4.3.5 User Interface / Interaction Model

There are only a few scenes in the game. The scenes are Main Menu, Tutorial, Level 1, Level 2, Level 3, Pause Menu and Victory Screen. There is a maze background and the main character is holding the magic ball standing beside the maze at the Main Menu. Main Menu has three buttons which are New Game, Continue and Quit. At the first start of the game, Main Menu only has two buttons which are New Game and Quit. When the player press New Game button, the scene will be navigated to Tutorial scene.

Player can be skipped the Tutorial scene by pressing the Skip button at the top right corner of the screen. After the player has finished or skipped the Tutorial scene, the scene will be navigated to Level 1. There will be a force bar and minimap at the bottom right corner of the screen in Tutorial, Level 1, Level 2 and Level 3. The shape of minimap represents the shape of the maze while marker in the minimap shows where the player is in the maze.

There is also an aim image at the center of the screen to let player shoot the magical ball from the aim. If player has found all the keys or solved all the puzzles in Level 1, Level 2 and Level 3, then the portal will unlock and once the player enter the portal the player will proceed to the next level. In Tutorial, Level 1, Level 2 and Level 3 also have the function of Pause game. If the player pressed one specific button, the Pause Menu will be activate and there are three buttons in the Pause Menu. The buttons are Resume, Save and Main Menu.

If the player pressed Resume button then the game will be resumed. If player pressed Save button and the game will be resumed and the text “Saved” will appear

on the screen. If the player pressed Main Menu button then the player will be navigated to the Main Menu. If the player has pressed Save button then the Main Menu will come out with the Continue button. If the player pressed Continue button then the player will back to the position where he pressed Save. If the player has finished Level 3 then a scene with text of "To Be Continued" will come out and then automatically navigate to Main Menu.

The game in deployed on Windows PC platform. Player needs to use mouse and keyboard to play the game. Table 4.1 shows the controls of the game.

Table 4.1: Controls of the game

Controls	Functions
W	Move forwards
E	Take back the magical ball that already shoot
R	Interaction with treasure box that containing puzzle game
P	Activate Pause Menu
Mouse Left Button	Hold and increase the force of shooting magical ball
Mouse Right Button	Teleport to the position of magical ball
Mouse X-Axis	Turn left or right
Mouse Y-Axis	Move camera up and down

The idea on paper is transformed into digital by doing research and learning with the game engine. Suitable assets that suit with the game can be found by doing research. The techniques that can implement the assets into a real game can be learned by learning and exploring the game engine. The game plan can be turned in to reality when the assets and techniques are combined.

4.4 Game Art

Most of the assets that used in Teleporter are downloaded from Unity Asset Store. Some of them such as background images are downloaded from another site. The marker use in minimap is created by using Autodesk Maya. Some of the images that are needed to be edited are editing by Adobe Photoshop CS6 to make sure they are perfectly suit with the game.

4.4.1 Game World

The game world that use in the Teleporter is at medieval age. The location is in the maze of a dessert. The game world is in 3D and the theme is dessert. Figure 4.4 is the sketch of the maze for Level 1 in the game. Figure 4.5 is the sketch of the maze for Level 2 in the game. Figure 4.6 is the sketch of the maze for Level 3 in the game.

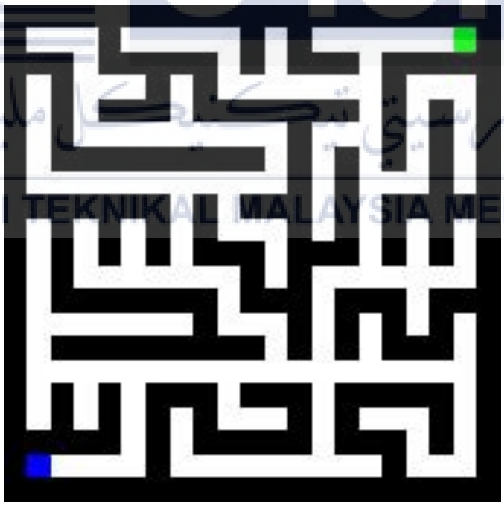

Figure 4.4: Sketch of maze for Level 1

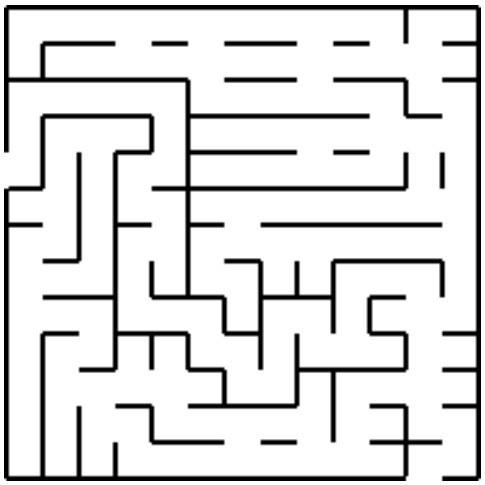

Figure 4.5: Sketch of maze for Level 2

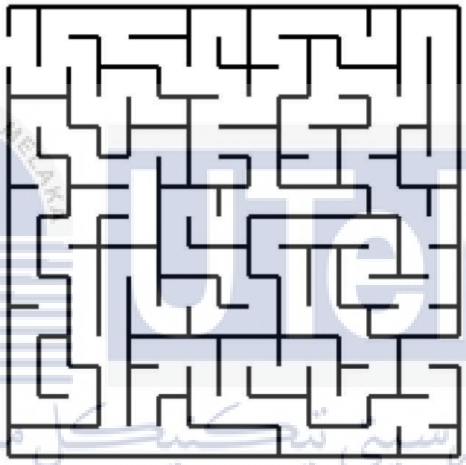

Figure 4.6: Sketch of maze for Level 3

The game world is first sketched in top down view then only implement to digital form in 3D. Assets that are suit to the theme of the game need to be found before start to build the game world in game engine. Techniques of how to use the game engine need to be learnt so that the game world can be built easily in the game engine. After the game assets are found and techniques are learnt, then the process of building game world can be started. Assets need to put one by one in the game engine by referring the sketches of figures above to build the 3D maze map for the game. By this way, the sketches on paper can be transformed into digital.

4.4.2 Character Design

The character that I used in Teleporter is a male and he is also downloaded from Unity Asset Store. He is around 20 years old. He is wearing like a futuristic person because he is come from future. He is a slim guy and wearing sunglasses. Figure 4.7 is the front view of the character. Figure 4.8 is the side view of the character and Figure 4.9 is the back view of the character. The reason of this character is selected because the main gameplay of the game is the ability of teleport, the character needs to have futuristic look to match with the ability.

Figure 4.7: Character's front view

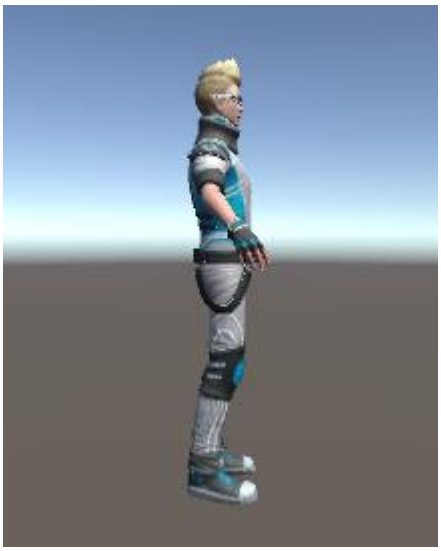

Figure 4.8: Character's side view

Figure 4.9: Character's back view

4.4.3 Camera Model

The camera model that used in Teleporter is third person perspective. Third person perspective is allowed player to view the game in third person view. Third person perspective is chosen for Teleporter because it can shows the actions of the character.

4.4.4 Audio / Sound Effect

The type of audio that will be used in the game is background music and sound effect. The audio is in stereo form because Teleporter is a 3D game that needs stereo audio to increase the reality of the game. The stereo audio also helps to let the player immersed in the game. The audio format that will be used in Teleporter is .WAV because it is supported by most game engines and the quality of the audio is good.

4.5 Conclusion

This chapter has discussed the overall design in the game especially on game architecture, game design and game art. In this chapter, the gameplay and game art is clear and it is time to start the code implementation of the project. Gameplay and game art will implement into game engine by using programming skills during the code implementation.

CHAPTER V

IMPLEMENTATION

5.1 Introduction

This chapter discuss about the implementation phase of the project. There are a lot of different productions such as graphic, audio, video and animation in this phase. There are explanations on how the assets and game components will be integrated. By end of the implementation phase, a playable game prototype with integration of assets will be deployed to test by testers.

5.2 Creation of Game Art

Most of the assets in the game are downloaded from Unity Asset Store. There are also modification of the assets such as resize, change the colour, and create the new animation for the assets. The explanations on how to create and find the assets for the game will describe later on following sub-chapter.

5.2.1 Productions of Graphics

The game character that used in the game is downloaded from Unity Asset Store. He is a 3D future-look male character. The game world is filled with traps and walls. Each trap and wall is downloaded from different publishers and there are integration between traps and wall to build a game world. Most of the assets that used in Teleporter are 3D but there are also some pictures in 2D use for User Interface and puzzle game.

5.2.2 Productions of Audio

The audio in the game are downloaded from different sources from internet. There are also some audio editing on those downloaded audio. The genre of the audio that used for the game have to determine before the job of searching the audio is started. The genre of the audio for Teleporter is Adventure and Mystery. The audio that are needed to be searched are background music and sound effects.

The audio format that is used for the audio of game is WAV. The reason that WAV format is picked because of it is accurate and lossless format. The quality of audio that imported into the game will not reduce easily so the audio quality of the game is guaranteed.

5.2.3 Productions of Animation

There are a lot of animations that used in Teleported. Most of the animations in the game are self-created except the game character's animation. The game character has complete animations such as walk, run and jump since it is downloaded. Other assets such as traps and portal are also downloaded but there is no animation in them.

The method that is used to create the animation is changing the position, rotation and scale of the asset frame by frame and set the frame rate of the animation. Therefore, the moving and rotating traps with animation can be used in the game.

5.3 Integration of Game Components

There are a lot of integrations between art components and programming in implementation phase. Most of the works of integration use the Game Object in the Unity 3D. The game programming part is then control the game objects in the scene. There is a few of examples that can show how the programming interact with game object. A game object named “goal” can be set to active of not active when the game is running by programming. The “goal” can also set to active or not based on the selection of code.

Figure 5.1 shows one of the selections that use in the game. The meaning of the codes is if the key game object is not active in the hierarchy then the goal game object in the hierarchy and the game object which attaches with this script will set to active.

```
if (key.activeSelf == false) {
    goal.SetActive (true);

    gameObject.SetActive (false);
}
```

Figure 5.1: Example of selection

There are a lot of things that programming can control. Input key or mouse button also can be tested and perform actions in programming. Programming also can instantiate a new game object into any position in the game easily. The components of game object also can be enabled and disabled by using programming.

Figure 5.2 shows an example of testing key pressed in the game. The meaning of the codes is if key R is pressed then the puzzleCanvas game object is set to active, pressR game object is set to inactive and mouse cursor is set to visible.

Figure 5.3 shows the example on how to instantiate a game object from assets folder into the game scene. The first line of the code is play the audio source of deathsound game object which is in the hierarchy. The second line of the code is instantiate a deatheffect game object into the scene from the Prefab folder.

StartCouroutine in third line is used to call a function that will only execute after a default set time. The fourth and fifth line of the code are used to disable the script named player1 and player2 which attached on a game object. The sixth and seventh line of the code is use disable the SkinnedMeshRenderer which located at the child of the game object which attached with this script.

```
if (Input.GetKeyDown (KeyCode.R)) {
    puzzleCanvas.SetActive (true);
    pressR.SetActive (false);
    Cursor.visible = true;
}
```

Figure 5.2: Example of input button

```
deathsound.GetComponent<AudioSource> ().Play ();
Instantiate (deatheffect, new Vector3(transform.position.x,1f,transform.position.z), transform.rotation);
StartCoroutine (deathEffect ());
player1.enabled = false;
player2.enabled = false;
transform.GetChild (0).GetChild (0).GetComponent<SkinnedMeshRenderer> ().enabled = false;
transform.GetChild (0).GetChild (1).GetComponent<SkinnedMeshRenderer> ().enabled = false;
```

Figure 5.3: Example of instantiate and disable a component of a game object

The audio source that put in a game object also can be played by using programming. The text of a text box in the scene also can be changed by using programing. Figure 5.4 shows an example of changing a text of a text box in the scene. The meaning of the codes is if key Return is pressed, the audio source in a game object is played and the text of tutorialText will be changed to equal to text that is store in the array text[i] and the variable i will increase by 1.

```
if (Input.GetKeyDown (KeyCode.Return)) {
    clickSound.GetComponent<AudioSource> ().Play ();
    tutorialText.text = text[i];
    i++;
}
```

Figure 5.4: Example of playing an audio source and change text of a text box

5.4 Game Configuration Management

The following content of this sub-chapter will describe how the game will be published as a viable product on market. The steps of how the game will be published will be explained one by one in the sub-chapter. There is also version control procedure and the implementation status of the game that will explained in another sub-chapter.

5.4.1 Configuration Setup

First of all, Teleporter will be published at Steam Store. Steam is the best online distribution, it would be really awesome to sell a project via Steam. First step is to submit the product information at Steam Greenlight. Steam Greenlight is a system that enlists the community's help in picking some of the new games to be released on Steam. Information, screenshots, and video of Teleporter are posted and seek a critical mass of community support in order to get selected for distribution.

Teleporter is submitted to Steam Greenlight in various stages of completion. Once Teleporter has been Greenlit, Valve will reach out to me to determine the timeline for finishing Teleporter and launching on Steam.

The installation of Teleporter is very simple. An installer for Teleporter will be created for player to download and extract the files. Tool that is used in creating the installer named Inno Setup. The actual build of Teleporter will then compress into the installer by using the graphical wizard of Inno Setup. Players only need to download the installer then they can install and play the game.

5.4.2 Version Control Procedure

First of all, Teleporter is deployed in alpha version. Play testers are required to play the game to try out is there any bug in the game. After feedbacks are collected and there are modification to the game. Teleporter is then come out with

beta version and start to publish to market for free download. Feedbacks from players are also collected at beta version and the official first version of Teleporter is then publish on the market with a certain price.

Teleporter will keep improving based on the feedbacks from the players and newer version of installers are then available for players to download. Every version has its own update and new gameplay and feature will also add into the version.

5.5 Implementation Status

The progress of the development status for each of the activity based on the Gantt chart is shown on the following table. The status shows that each of the activity is finish on time or delayed.

Table 5.1: Progress of Development Status

Activities	Status
Brainstorming	Finish on time
Construction of flowboard	Finish on time
Design level and user interface	Delay
Design game rule and game mechanic	Finish on time
Construction of hierarchy of challenges	Delay
Game assets preparation	Delay
Setting up of game world	Finish on time
Code implementation	Finish on time
Testing and bug fixing	Finish on time

Table 5.1 shows that the progress of the development is delayed in a few activities. There is delay in designing the level because of the level doesn't looks attractive and there is modification on it and it takes time to finish. There is delay in constructing the hierarchy of challenges because the difficulty of each level has to consider properly so that the level will not too hard for player to play. If the level is too hard to play then the player will feel frustrated and boring and the game is failed to have fun.

There is delay in game assets preparation because it takes time to find the assets to match with the theme of the game. Every asset such as character, building, background sound and sound effect should match with the theme of the game so the game will become more attractive and fun.

5.6 Conclusion

The overall process of the implementation is quite smooth although there are some delays in certain activities but the delays do not affect the implementation. There are a lot of works that are done in implementation phase, most of them are the integrations between programming and game assets.

Testing and evaluation of Teleporter will be done at next chapter. There are descriptions on how the test plan is conducted and how the test is implemented. The results of the testing will be recorded and analyzed so that the game can get improvement based on the results of testing.

CHAPTER VI

TESTING AND EVALUATION

6.1 Introduction

The first activity in the testing phase it to conduct a testing plan for the game. The testing plan has decided which testing methods are used to test the game. The testing methods are playtesting, usability testing and bug hunting.

6.2 Test Plan

The purpose of the testing plan is to test the functional part of the game. There are several methods that are used to do the functional test. The test is conducted at production phase. The target groups of the testing plan is 30 teenagers who aged between 13 and 18. The testing methods used are bug hunting, playtesting and usability testing. The features that are tested are user control, user interface and mechanics in the game.

6.3 Testing Implementation

There are three methods that used to conduct the testing and evaluation. Bug hunting requires 5 playtesters to play and test the game to determine is there any bug in the game. Playtesting and usability testing require 20 players to play the game and answer the questionnaire. The results are recorded and analyzed.

6.3.1 Bug Hunting

Bug hunting is a method to determine is there any bug in the game such as user control, user interface and mechanics. If bug is found then the bug will be fixed immediately based on the feedbacks from playtesters. Table 6.1 shows the process of bug hunting. The test aspects of bug hunting are divided into user control, user interface and mechanics.

Table 6.1: Process of bug hunting

Test aspect	Things to do by tester
User control	Tester requires to test the character movement such as walk and teleport continuously to find if there is any bug when performing those movements. Expected result: 1. Player can only use W key to move the player forward. 2. Player can only use mouse to rotate the camera view. 3. Player can only use left mouse button to shoot magical orb. 4. Player can only use right mouse button to teleport. 5. Player can only use E key to take back the magical orb. 6. Player can only use R key to interact with Treasure box.
User interface	Tester requires to test the user interface such as buttons and menus. Tester needs to click or press a fix times for each button to know if there is any bug that the button is not working properly. Expected result: 1. New Game button at start menu can navigate to Tutorial level correctly. 2. Quit button at start menu can terminate the game. 3. Press P key in game to activate Pause Menu correctly. 4. Press Tab key to activate or deactivate Controls Menu. 5. Press Resume button on the Pause menu can resume the game correctly. 6. Press the Main Menu button on the Pause menu can navigate to the start menu correctly. 7. Press the Save button on the Pause menu can save the game correctly. 8. Make sure go back to start menu and check if there is a Continue button appear after pressed the Save button. 9. Press and make sure the Continue button continue the saved game correctly.

	10. The buttons at start menu and Pause menu is highlighted correctly when it is currently selected. 11. Make sure the indicator on the minimap move when the character is move. 12. Make sure the force bar increase by time when the left mouse button is holding. 13. Make sure the instruction message box is pop-up correctly when the character is interacted with treasure box. 14. Make sure the Yes and No button on the instruction message box work correctly when player pressed it.
Mechanics	Tester needs to collect keys in game for a fix times to make sure the key can unlock the portal properly. Tester also needs to solve the puzzles in game for a fix times to make sure it can unlock the portal. Expected result: 1. Collect a key in Level 1 to unlock portal or solve a puzzle in Level 1 to unlock the portal. 2. Collect 2 keys or solves 2 puzzles in Level 2 or collect 1 key and solve 1 puzzle to unlock one of the portals in the level. 3. Collect 3 keys or solves 3 puzzles in Level 3 to unlock one of the portals in the level. Any 3 combination of the keys collected and puzzles solved can also unlock the portal.

6.3.2 Play Testing

Playtesting is the process of determine the balancing of the difficulty of the game. Testers have to provide feedbacks after they played the game. The feedbacks have to list down which part of the game is considered as unfair or too hard for players.

6.3.3 Usability Testing

Usability testing is the process of find how the players interact with the game. Usability testing also can test whether the control and interface are easy to use or not. Table 6.2 shows the activities during usability testing.

Table 6.2: Usability testing

No.	Activities of usability testing
1	To test is there any problem when the player use keyboard and mouse to control the character.
2	To test is there any problem when the player use W key to move forward and use mouse button to perform teleportation.
3	To test where the players did more mistakes.
4	To test the information provided on the game screen is too much or too less.
5	To test the information provided is easy to understand by player or not.
6	To test the P key on the keyboard is suitable to use to activate Pause function or not.
7	To test the Tab key on the keyboard is suitable to use to activate Controls function or not.
8	To test the satisfaction of the player when using the interfaces.
9	To test if the player needs any extra functional button such as disable the background sound or sound effect.

6.4 Test Results and Analysis

The testing results are separated according to three different methods which are bug hunting, play testing and usability testing. The results are then analyzed and the game can be improved based on the feedbacks from the players and testers.

6.4.1 Results of bug hunting

There are five playtesters who are involved in bug hunting. The results of bug hunting are divided into three categories which are user control, user interface and mechanics. All of the testers found that there is no bug with the controls of the game, every key and button is functioned properly and all of these prove that there is no problem in user control.

All the playtesters found that there is no bug with the interfaces. The buttons on the menus all functioned correctly. Every interface appear correctly when button pressed. The prompt message also works correctly without bug. All of the feedbacks and results show that there is no problem with the function of user interface.

Most of the mechanics in the game work fine and do not have bug. Every key can collect properly and every puzzle can be solved. The portal is also unlock properly by collecting the keys and solving the puzzles. Unfortunately, the navigation between levels has bug when the game is finished and replay. The feedbacks from the playtesters show that there is a problem with mechanics of level's navigation.

6.4.2 Results of Play Testing

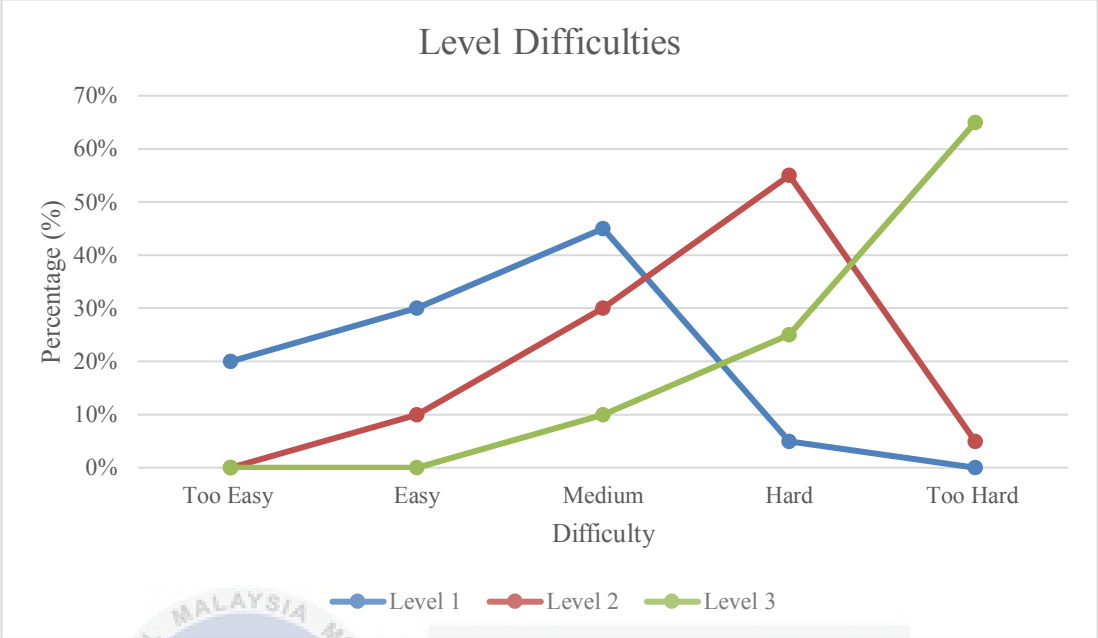

Figure 6.1: Level Difficulties

Figures above show that the difficulties of each level of the game. Figure 6.1 shows that most of the players think that Level 1 is medium level to play, Level 2 is hard level to play and Level 3 is too hard to play. The results not really good because players should feel easy at Level 1. Although the difficulty of the game is increasing by level but it is too hard for player to play. The difficulties of the game should be reduced so that the players will not frustrated because of the game is too hard.

6.4.3 Results of Usability Testing

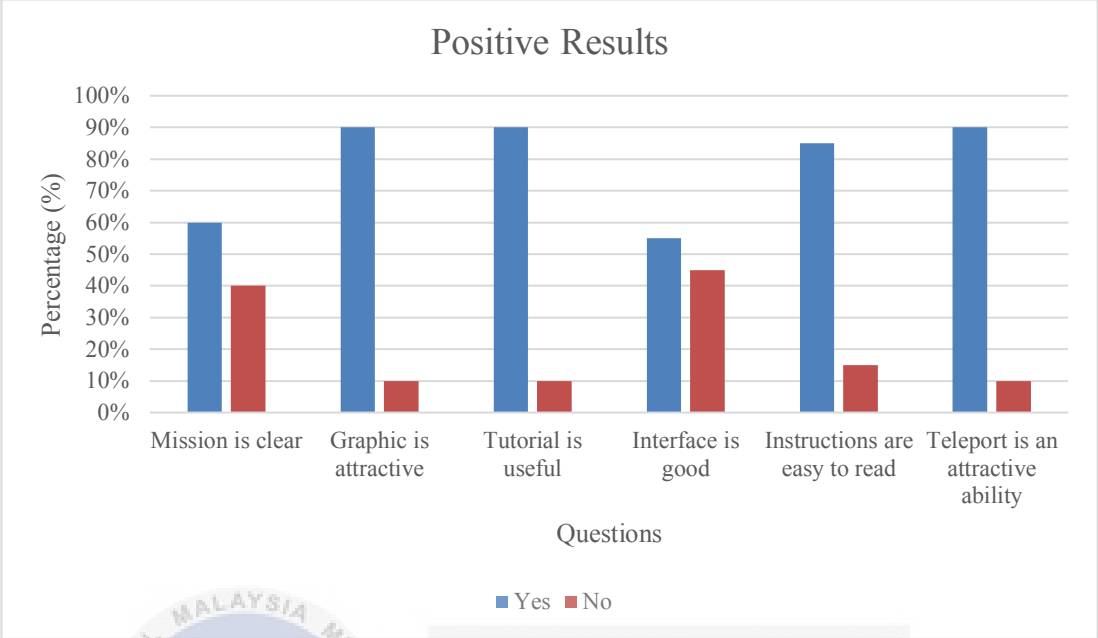

Figure 6.2: Positive results of questionnaire

Figure 6.2 shows that the positive results from testing which is conducted on 20 respondents or players. Most of the respondents gave positive results in the aspect of graphic, interface and gameplay of the game. The results indicate that Teleporter is success in term of gameplay and graphic. The results show that Teleporter gives good player experience to players and players are satisfied with it. The project objectives are achieved. 3D action-adventure game with a proposed interaction is developed and the player experience in a 3D action-adventure game is evaluated.

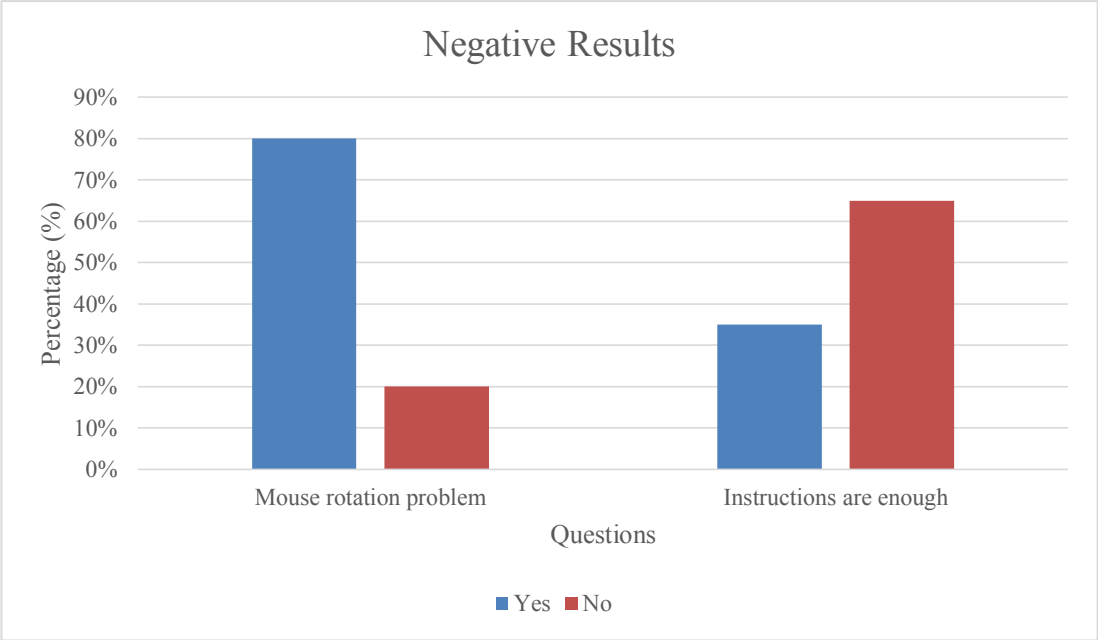

Figure 6.3: Negative results of questionnaire

Figure 6.3 shows the negative results of testing which is conducted on 20 respondents or players. The results show that most of the respondents said there is mouse rotation problem when playing the game. 65% of the respondents also said that the instructions in the game is not enough. The mouse rotation problem needs to be fixed and more instructions need to add into the game from the results of the testing.

6.5 Conclusion

Most of the results that get from testing are good but there is also some parts of the game need to be improved. The cooperation of players to finish the questionnaire is appreciated because the game can get improvement based on the results of questionnaire.

Next chapter is the final chapter of this project. The final chapter describe the conclusion of the project. The conclusion included strength and weakness of the project, proposition for improvement and contribution of this project to the community.

CHAPTER VII

PROJECT CONCLUSION

7.1 Observation of Strength and Weaknesses

Teleporter which allows player to teleport anywhere in the game world is a great feature and gameplay. The element of finding keys and solving puzzles also improve in term of gameplay. The limitation of Teleporter is the interface is not interactive enough and the instructions given are not clear. The most important thing is the mouse is too sensitive to play the game.

The biggest challenge in developing Teleporter is the integration of multiple puzzle games with the game. The solution that I take to overcome the challenge is keeping do research and study with the programming code, finally I managed to put the puzzle games into my game without bugs. The thing that I learned from this challenge is never give up.

7.2 Preposition for Improvement

The game should include a storyline to attract players to play the game. The pace of the game also needs to be improved so that the difficulties between levels is balanced and not too hard. The environment every level should be changed so that the game looks more attractive and replayable. The interface and instructions of the game also have to improve so the quality of the game will increase. Last but not least, self-created assets will be used in the future to replace the downloaded assets.

7.3 Contribution

The project indicates that 3D is more suitable in developing action-adventure game because of the exploration and player experience in 3D is not same as in 2D. Although the gameplay is same but the experience is different in 2D and 3D. The players who play the game will also improve their speed of reaction due to the gameplay of the game. Players have a new choice on 3D action-adventure game and new game will bring to the market of the game.

7.4 Conclusion

The project has meets the objectives conclusively. The player experience of the existing 2D game is obviously has been improved because of the new mechanics and new 3D world for the game. Teleporter which has completed mechanics and gameplay will then create its own market value in the future.

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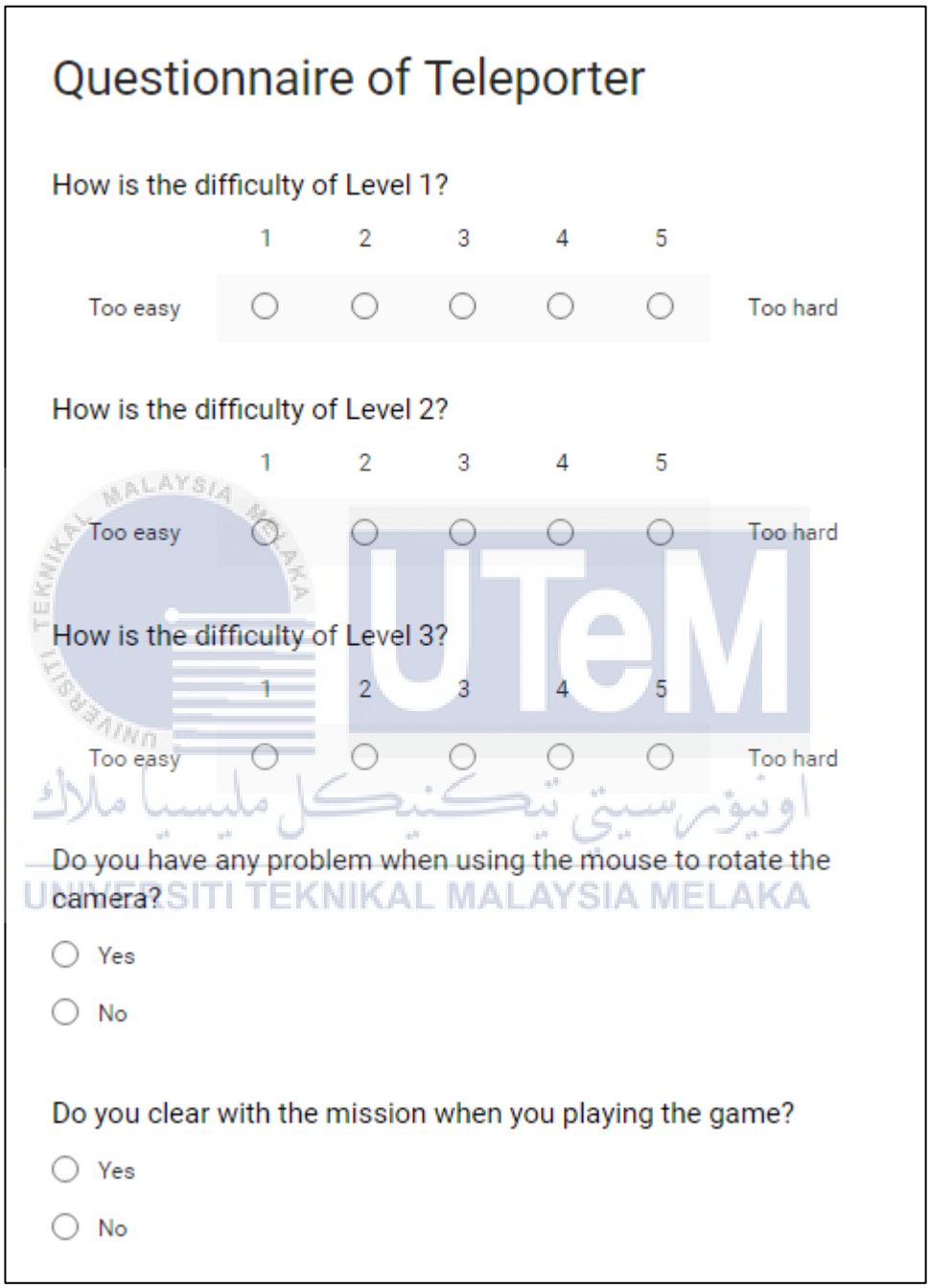
APPENDICES

Appendix A: Questionnaire for testing plan



Questionnaire of Teleporter

How is the difficulty of Level 1?

	1	2	3	4	5	
Too easy	○	○	○	○	○	Too hard

How is the difficulty of Level 2?

	1	2	3	4	5	
Too easy	○	○	○	○	○	Too hard

How is the difficulty of Level 3?

	1	2	3	4	5	
Too easy	○	○	○	○	○	Too hard

Do you have any problem when using the mouse to rotate the camera?

- ○ Yes
- ○ No

Do you clear with the mission when you playing the game?

- ○ Yes
- ○ No

Is the graphic of game attractive enough?

- Yes
- No

Are the instructions in the game enough in each level?

- Yes
- No

Is the tutorial clear enough to help you to understand the controls of the game?

- Yes
- No

Are the instructions easy to read?

- Yes
- No

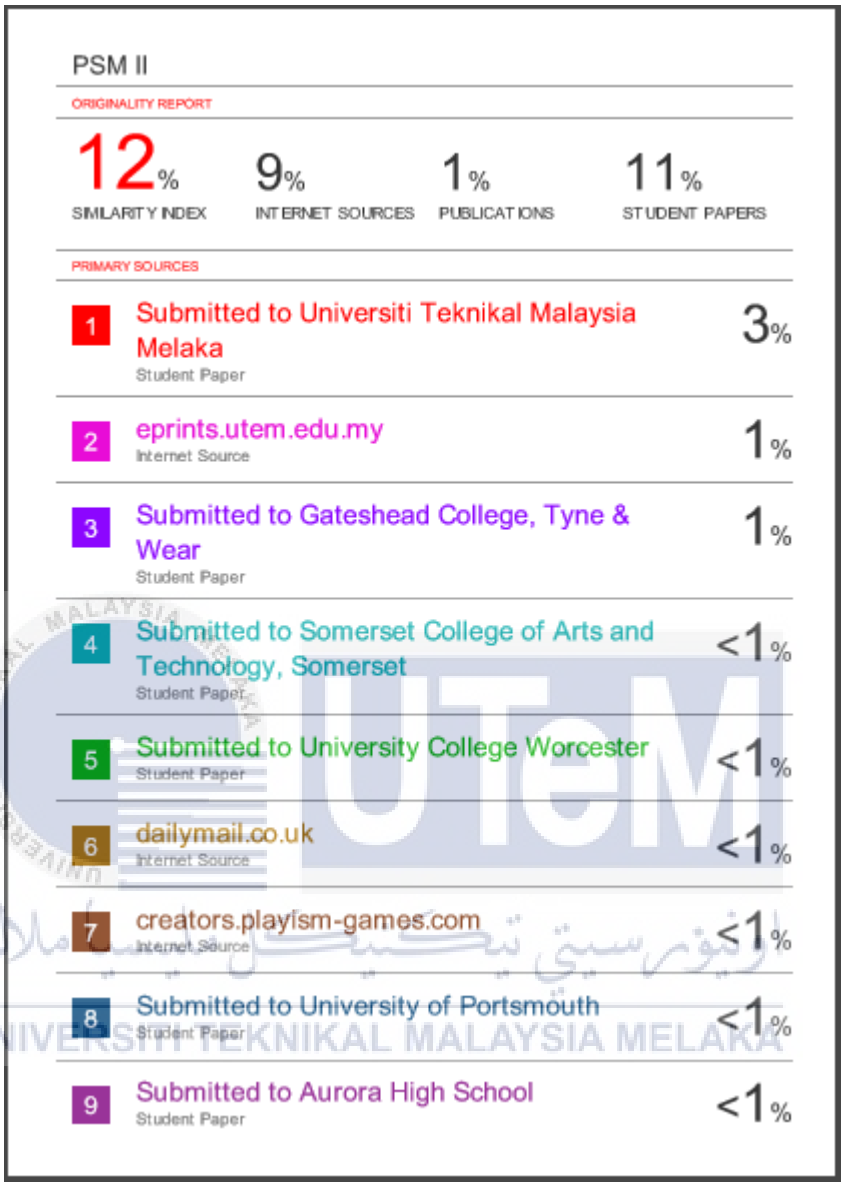
Do you like the ability of teleport in the game?

- Yes
- No

Do you satisfied with the interfaces of the game?

- Yes
- No

Appendix B: Turnitin Orginality Report



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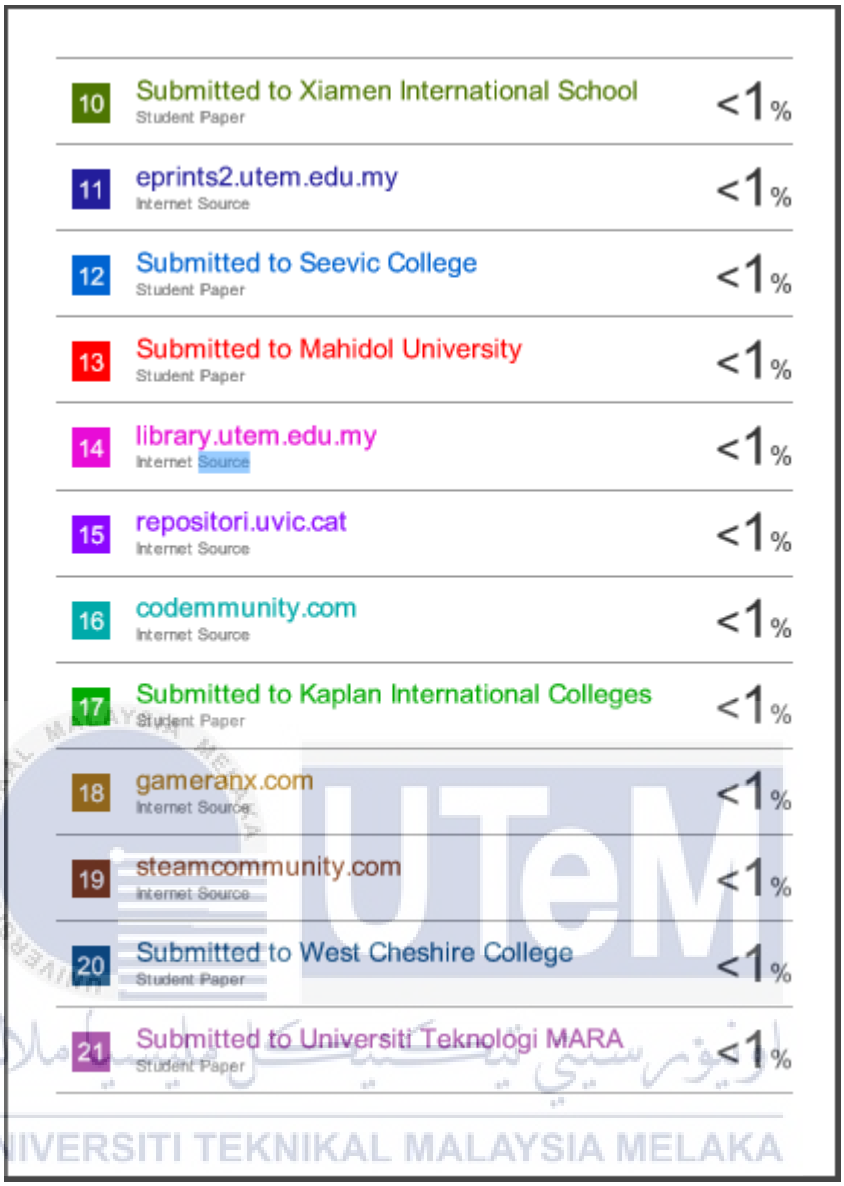

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