AN ACTION ARCADE WEB BASED GAME-SLIME ATTACK PLUS (Slime Invader)

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DECLARATION OF ORIGINALITY

I declare that this report entitled "**AN ACTION ARCADE WEB BASED GAME SLIME ATTACK PLUS (Slime Invader)**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : _____

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Date : ____25th August 2017____

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ABSTRACT

"Slime Attack Plus!" is an action arcade web based game. "Slime Attack Plus" is a game prototype provide an opportunity for the children or adults more ease to do reaction training. It uses mouse and keyboard to control the character to attack the "slime monster" and avoid the block to get the high score in the "Slime Invaders". Nowadays, a lot of game can help user to do some training such as "Elevate" is help user to read and comprehend faster. Those game only training the user's intelligence quotient, but not train the user's reaction. Therefore, we created the "Slime Attack Plus" to help user to train their reflex while playing the game. The objective of this project is to create a game prototype to allow user to train their reflex through this action arcade web based game. This game prototype will design in desktop version and the user's age range will set at 5 years old and above, because the best learning and training is not limit to the ages. The project will be using mouse and keyboard as the input to control the character. The game prototype will develop in few main pages of website. The main pages of website is our game menu page. Game menu page will show the character status in order to let user read easily and feel interesting. Also, the game menu page have included three options which is "Slime Invaders" (Game 1), "Stack-O-Slime" (Game 2) and "Slime Attack!" (Game 3). The character status can be increase through specific coins which the player can get in the game, and it also means player can grow their main character through upgrading it. The game menu pages are link together to the "Slime Invaders" (Game 1) , "Stack-O-Slime" (Game 2) and "Slime Attack!" (Game 3), there is few existing system which has no this combination and linking, therefore we combined and linking the data together to make the character growth up. This is combine the idea of arcade game and role-playing game to attract the user and continue to play our game's prototype in order to see the different style of the character. The game's prototype will be built, tested, and rework as necessary until an acceptable game is complete. Our expected result in this project will be a game prototype that can run smoothly and user can feel that they are actually training the reaction while playing the game prototype.

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CHAPTER 1: INTRODUCTION

1.1 Project Background

This project is to create a game prototype and it name is “Slime Attack Plus!” .This game prototype provided an opportunity to the player to train their reflex while playing the game. Involves good graphics and training purpose in order to attract the player and make sure the game is fun.

“Slime Attack Plus!” has three different web-based game inside, we define it as “Slime Invaders”(Game 1), “Stack-O-Slime”(Game 2) and “Slime Attack!” (Game 3). This three game are link together with our game menu web page. User need to played game 1 first and the system will unlock game 2 for the player to continue play. For the game 3, we design it as the event of our project. Game 3 will open on every Saturday and Sunday. First two games are using the high score to calculate and it will convert the high score per game to the experience (EXP) and specific coins in order to upgrade the character in the game menu page. Every time the character was upgraded, the character’s status will changed such as health were increased, attack power were increased and unlock some hidden ability in the game.

For the “Slime Invaders”(Game 1) that I develop is something similar like the Google web game “Running T-Rex”, the concept quite similar, it also show a character keep on running and get the high score that depend the player can run how far from the start point. It also have some block appears, the player need use the keyboard to jump in order to avoid those block. The only different from the “Running T-Rex” is this game prototype need use mouse to click on those “Slime monster”. That’s mean this game combining two different input to allow the player to control the character. This game prototype need player to attack the “Slime monster” and no allow them near the character. If the “Slime monster” touch the character, the health bar will decrease one life, after three life was gone, the game will end.

“Slime Invaders”(Game 1) also will built in some animation and music while user playing the game. This will bring to user graphics attraction to make sure they won’t

get boring while playing this game prototype. For example, there will have different color of slime will generated by the game system. For make sure the player won't get boring, i also implemented the magic skill into game 1. For example, the game system will trigger an treasure box event while player playing the game. The treasure box will give player a magic skill to let them kill all the slime on the screen. Furthermore, if the character level reach level 10, the treasure box will have some changed. For example, the power up battery will give to player in order to double their damage in game. Besides, I also mention about the block will appear to interrupt player and the player need to avoid those block to reach as far as possible. This block will appear after some certain level. For example, the player reach some certain high score and distance, the block will appear to increase the game's difficulty. Not only the block will increase the game's difficulty, the number of slime also will increase to interrupt player. Other than that, every slime monster also have their own hit point. For the first 10 waves of slime monster, every single slime have about 1 to 2 hit point. This mean player need to click few time on slime monster to kill it. Not only number of slime will increase, the hit point also will increase while player reach certain high score and distance.

Since i mentioned before this game need to upgrade character through specific coins, therefore i also implement some method to allow player to get those specific coins in game 1. For example, if all the slime monster on screen killed by player, game system will trigger the wave clear event to give player 2 bonus specific coins. Besides wave clear event, the treasure box event also will generate the gold treasure box to the player, and it will give player about 50 coins. This gold treasure box will generate with the rate 0.01% which is want to maintain the game balance. And last method to get the specific coins which is get the best score that player can. The game system will have a calculate system to convert the high score into specific coins.

After player end their game 1, they can choose to restart the game or back to game menu page. If player choose back to game menu page, the game 2 will unlock and player can continue process to next story. Furthermore, player also can upgrade their character in game menu page through the specific coins. For the game 1, the player only use the damage characteristic as the click damage to slime monster. And

other characteristic will used in game 3 such as health and defend. With those function to increase the game's difficulty is want to make sure the game prototype more look like a real arcade game. In addition, if the game's difficulty was increased, the player also can train their response frequently while playing the game.

After player finish their game 2, every Saturday and Sunday will unlock the "Slime Attack !"(Game 3) for player to complete the last story. The game 3 will required game 1 character and game 2 character to fight the final slime boss. Player cannot finish the game 3 easily because the boss hit point and damage is higher than player. Therefore, player required to replay the game 1 and game 2 to upgrade their character time to time in order to defeat the final slime boss.

1.2 Problem Statement

We figure out that user can train intelligence quotient through brainstorming game, but user cannot train reaction and response with the brainstorming game. Therefore, this project provides an opportunity for the user to training their reaction and response through this interesting game. This game will auto increase the game's difficulty to make sure the player can get fully training while playing the game prototype.

Nowadays, a lot of arcade game only have one type of gameplay or training, it will lead to players feel boring and quit the game as soon as possible. Therefore, this project will created in two different gameplay and training to keep the player's interest while they playing the game. But there also have some challenge on building the connection within this two different game, because in the game 3 are using both character. The character growth is based on game 1 and game 2, therefore we need to get the data carefully in order to growth the character between this two different games.

1.3 Motivation

The motivation of creating this game prototype is to provide a new training platform to the young player or above. Nowadays, a lot of game can help user to do some training such as "Elevate" is help user to read and comprehend faster. Those game only training the user's intelligence quotient, but not train the user's reaction. Also, those games only have one method to train the player, this will lead to player lost their interest after a few hours or days. Therefore, "Slime Attack Plus" have two kind of game with different gameplay in order to give player having different game experience and training, this can make sure the player no get boring while they playing the game. Besides, we want to bring some good gaming experience to user, therefore we built the character growth system. We use the arcade game idea to allow user keep getting the high score and break it. At the same time, game system also use those high score to calculate character's experience and specific coins to the user in order to let them upgrade their character after they finish the game. We found out some of the role-playing game (RPG) can attract more user than arcade game. This is because inside role-playing game, user can keep on training their character to unlock some hidden ability or achievement. Therefore, we combine the idea of arcade game and role-playing game together to attract the user interest while playing our game's prototype.

1.4 Project Scope

The purpose of this project is to create an action arcade web based game prototype using the HTML5 canvas element and rendering by WebGL. The game's prototype will develop in the desktop version, therefore this game's prototype can run in desktop web browser. It is an action arcade web based game, therefore the target user will set at young players to elder players about 5 years old and above.

In this project, we will use mouse and keyboard as our input in order to allow players to control the character to click the "Slime monster" and avoid those block in the "Slime Invaders". After playing any game in "Slime Attack Plus", the high score will convert to experience (EXP) and coins to upgrade their character in game menu page. This feature will allow player to see different status of the character. For

example, player can see their character's level, health bar, attack power and defend value. And also the character reach some certain level will unlock some hidden ability in game 1. For example, when character reach level 10 in game 1, game system will generate power up battery for player to increase their click damage. The best result of the game prototype will be a game can run smoothly, user can feel that they are actually training the response while playing the game prototype. Lastly, user can get attraction by this game prototype and keep on playing to unlock more hidden achievement.

1.5 Project Objective

The project aim to create a training game's prototype allow user to train their response while playing the game. In today technologies and gaming area, a lot of training game birth in the world, but not all the training game will training the player reflex. In our project, it can really training the player reflex while they playing our game, this is because we setup the game that it will automatic update the game's difficulty. Increase game's difficulty can help user keep on training their response frequently while they playing the game. Besides, it also can attract the user keep on playing the game and won't get boring. In addition, this game's prototype request player to use mouse and keyboard to play the game, that's mean user reach certain high score, both hand will get busy on clicking the slime and avoid those block in order to reach far distance and get higher score. This kind of gameplay actually can bring effective and efficiency response training to user.

Moreover, this project also will add in character growth system, and this idea is come from role-playing game (RPG). In the gaming area, role-playing game always is one of the famous game type to the player. Player can easily get attraction by this kind of game. Player like to play role-playing game due to they can grow the character to unlock hidden achievement or ability in game. Besides, role-playing game more focus on the story and content, hence user can see a lot of beautiful story and content through the role-playing game. But this is different from the arcade game, because arcade game more focus on gameplay instance of story or content. The arcade game only can allow user to keep on challenge to break other people high score. Therefore, we get the idea from role-playing game to add in the character growth system in our

arcade game. This combination can allow user get different gaming experience while playing our game's prototype. When user finish one of the game in our project, the game system will auto convert the high score to specific coins for the player to upgrade their character in game menu page. In other word, the character can level up and get more powerful ability to allow them in next game.

Lastly, the game's prototype will develop in desktop version, hence the game's prototype can run in web browser. In today technologies, every family almost have one computer inside their house, for this reason they can easily access to internet and play our game's prototype. And also, our target user's age is set on 5 years old and above. Within this age range, they can understand the gameplay easily while they playing the game's prototype.

1.6 Impact, significance, and contribution

This main objective in this project is want to provided effective and efficiency response training to user. Therefore this is one of the contribution of the project. In our life, training is playing one of the important role to us, for example parent send their children to piano class in order to train and build their music ability and interest. And also our game prototype provided training to train their response. This is the example for young player to play our game's prototype, but how about elder player? Our game's prototype is an arcade game that develop for the age of 5 years old and above, therefore, elder player also can play our game's prototype in order to spend their free time and release the stress. In addition, this game also can prevent older player get Alzheimer's disease.

CHAPTER 2: LITERATURE REVIEW

2.1 Literature Review

People will never appreciate the game developer's work, they only care about the fun factor in the game rather than the game developer's work, patience and the technique behind a program. In the article that I review, it show us what is the factor and how it works, and also have some analysis in order to discover the way to make our game become more fun. The fun factor definition itself is very easy to understand, but when come to development process, sometime is difficulty to compute it. Fun factor cannot be mathematically computed, and most of the times player will know if a game is fun just by playing it. How to make a game become fun, first we need to compare the idea's pros and cons in every alternative. For example, simple AI is sometimes better than a very complex one. Besides, we also need to set the target audience to design the fun factor. There have few factor are quite important for develop a fun game, which is creativity, understanding, and power. Creativity always is the important factor for every game design, a creative game can make the players feel fun all the time while they playing the game. Next, understanding is also another part of factor to make the game fun, player need to understand what they are doing, not to understand what developer are doing. We need to provide some simple guide instruction to player in order to tell them what they should do in our game. Lastly, people hate feeling powerless, very gamer like having control over the things. Therefore, we need design a game with most possible control to the player. We believe that, if a game with more interaction, then there have more fun with it. But the interaction has to be limited by the rules of the game, because some of the interaction may make a game become boring. Another point of view we discuss in here which is people don't just love feeling the best, but also feeling they are getting even better. We call this evolution, and there have few kinds of evolution, which is in game, knowledge and skills. Evolution in game is giving the player know his progress in game, for example, changing levels, or score. If game are endless and no changing on it, it will tend to be a boring game. Evolution in skills is quite common nowadays, player need to master some skills before the game become more complex. This kind of evolution need player learn step by step all about the game. It will bring a lot of fun

for player while they playing the game.

2.2 Existing System Review

Running T-Rex is a hidden game from google chrome. This game will appear when unable to connect to the internet. Running T-Rex is a simple game with low graphics and control, it required player to press the space bar in order to perform jump action to avoid those cactus. The score is given to the players due to the T-Rex distance, the distance more far, score more high. According to different high score, the difficult of the levels will increase for example, the speed of T-rex will increase, more bird will come out to stop the T-rex, and some graphics changes like day time turn into night time.

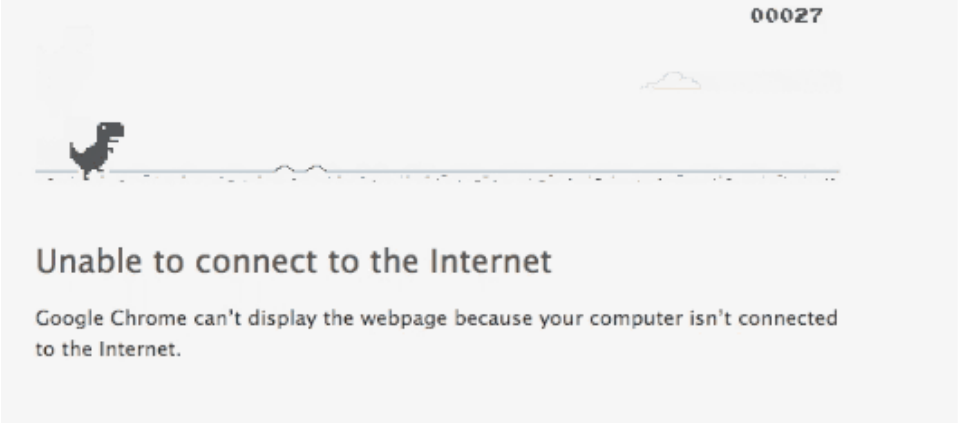

Figure 2.1.1: Running T-Rex game

Strength: The game uses the keyboard as the input in desktop version web browser, if in mobile web browser mode, it used the touch key to perform the action. This game have simple graphics and control, therefore it can attract the players keep on challenge the new high score.

Weakness: This game is a web based game, it appear only when the internet are unable to connect. Therefore, this become the weakness of the game, when the internet are able to connect the game will automatic stop sometimes and direct to website immediate.

Flappy Bird is another existing game which similar to the game that we created. It

is a simple one-button game, the player only need to perform mouse click on screen, the bird will jump according how many times user click it. The game with simple design and simple control. The player only need to let the bird pass through those block in order to get the score.

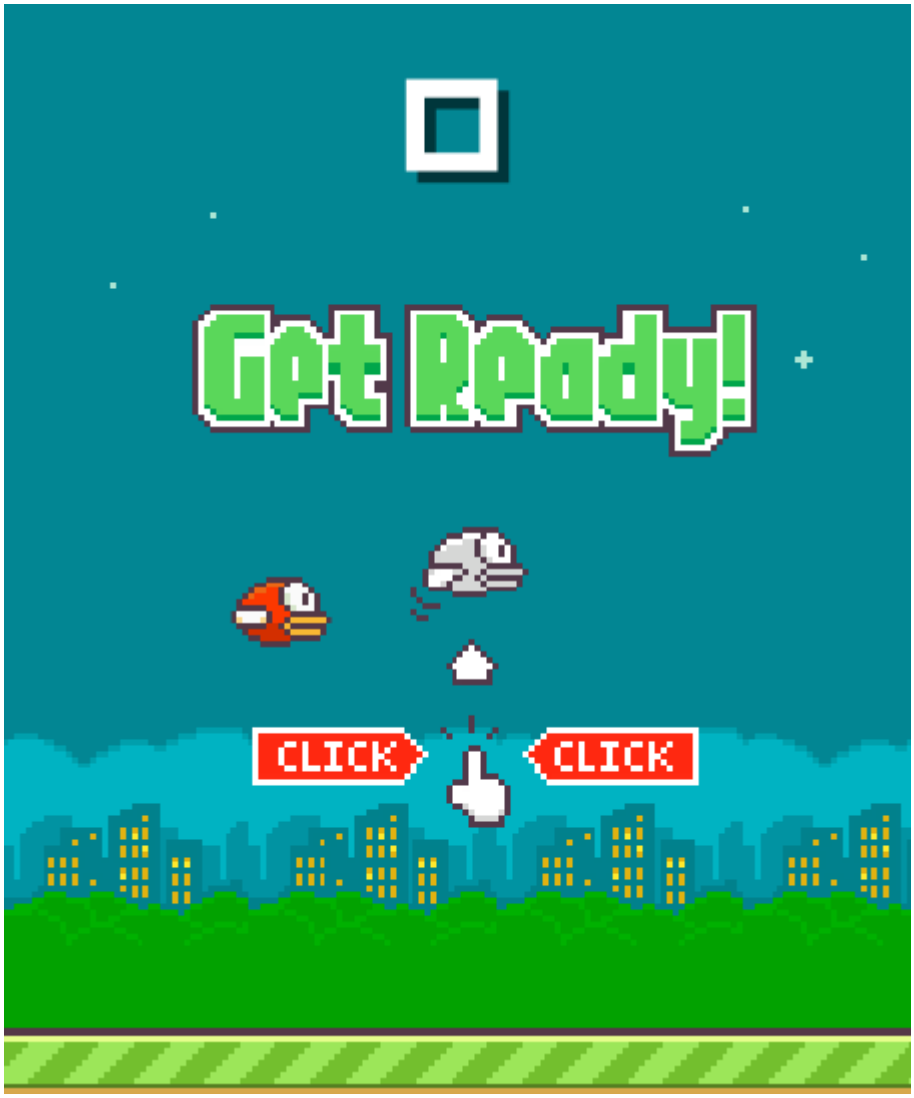

Figure 2.1.2: Flappy bird game.

Strength: The player only need to perform one-button click to control the bird jump. This game also have a simple design, it is simple to let user to understand, play and operate.

Weakness: No option to quit the game in Android platform. The game will runs slow on low RAM availability.

Space Invader is a simple graphics and simple story game. Player can easy understand the gameplay while they first time playing the game. The players only need to control a cannon, move it left and right on the screen and attack those alien.

There only have three simple controls, it won't cause the player feels confuse while playing the game. The alien will move along at the same rate of speed toward the player's cannon. While the player destroy more alien, aliens will increase the rate of speed. When all the aliens are destroy, the new mission are appear at the same time. The player survive longer, the score higher. Therefore, there is an endless game to allow player to get and break their high score.

Figure 2.1.3: Space Invaders game.

Strength: The game have simple control such as left, right, and fire. This is easy for player to understand the gameplay while they start playing this game.

Weakness: The game will get boring after certain of level, because this game no increase the difficulty much.

Table 1: Comparison between existing systems.

	Graphics Design	**Complexity**	**Provided Training**
Running T-Rex	This game with low graphics design. The T-Rex is a bitmap image and look simple.	This gameplay is easy understand by all range of age. Because there are only need to perform one action which is jump to avoid the block.	Yes, this game can keep on provide response training to the player. This is because of the game speed and number of block will increase after a certain high score.
Flappy Bird	This game with medium level graphics design. This game graphics design in full colour, it look cute and attract user.	This gameplay is easy understand by all range of age. Because there are only need to perform one action which is jump to avoid the block.	Yes, this game is quite nice for user to train their response. Because user need to keep control the bird fly through the tunnel without touch them.
Space Invaders	The game with medium level graphics design. There include some animation to attract the user, for example when player hit the alien, the explosion animation will apply on alien.	Can easily to handle this game, because they only have a simple goal which is defeat all the alien and get the high score. Besides, the control also not so difficult.	No, this game only provided one goal to get the high score and defeat all the alien, that's not much training for the user to train their response.

CHAPTER 3: PROPOSED METHOD/APPROACH

3.1 Methodologies

Software Used:

	• **Microsoft Visual Studio 2013** The integrated development environment (IDE) chosen for this project is VS 2013 as it is the IDE support Phaser library.
	• **ASP.NET & C#** ASP.NET is common language uses to create a web application with C# as the code behind.
	• **Microsoft SQL Server** MSSQL Server is selected as database software as it integrated inside VS 2013.
	• **JavaScript** JavaScript is the common language on develop game 1.
	• **Adobe Photoshop** Photoshop is used to edit, draw and design all the images in game design.

Table 0.1.1: Software used table

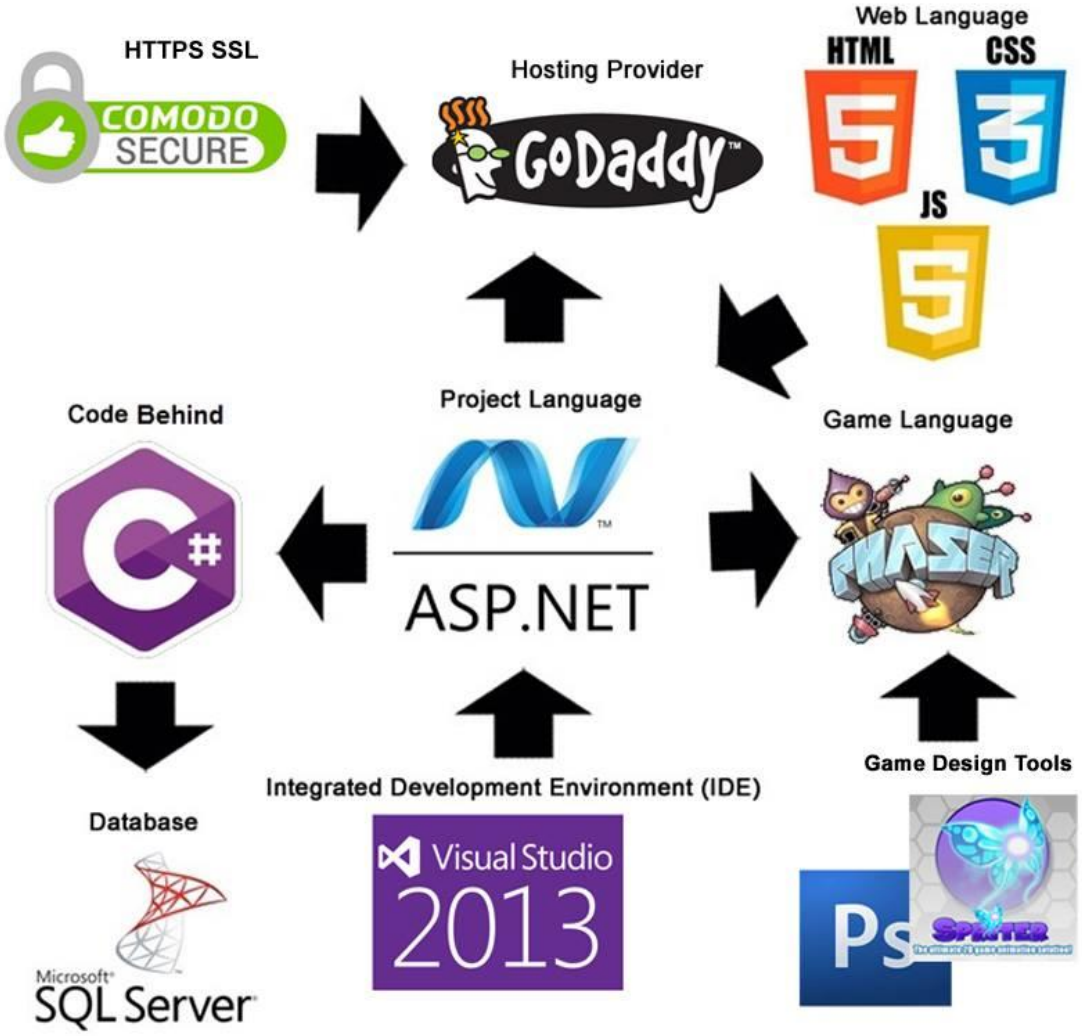

Figure 3.1.2: Diagram of methodologies.

Figure 3.1.3: Methodologies model.

3.2 System Flow Design

Step 1: Start gather and collect the data about arcade game, and web based game.

Step 2: Start drawing the story board in order to design the game's prototype.

Step 3: Start learning tutorial from the phaser.io website in order to get more understanding on our game's prototype limitation.

Step 4: Start develop those basic into project.

Step 5: Keep on testing the game flow, and adding new function into project.

Step 6: Complete game's prototype version.

Before I start to build this project, I start to do research on arcade game and web based game information and data. This step is important for a project develop, if no enough understand on those game characteristic, that is very hard to build a real arcade game and web based game. In this step, I study on arcade game characteristic which found out, arcade game is not focus on story and content, it more focus on the gameplay, therefore, in this study, I plan to design the gameplay that can auto update the game's difficulty.

Next step, I draw the story board for the project. Story board is a good method to let me build the project easily. Through the story board, I can get those requirement that I need and plan how to build the whole game's prototype. And also, story board give me some vision on the graphics design later on, and also the database table design.

After drawing the story board, and get some idea from it. I start to do research on the phaser.io which is the game develop environment. In the first step is collect data about arcade game and web based game, in this step is want to get more understanding on the game system design. For example, I need to know what is the phaser.io limitation and strength before I start to work on the game's prototype. This can allow me prevent the mistake after I start to work on it, and also I can know what are the strength and resource that I can use in my game's prototype.

Next, I start to develop the game's prototype. I need a canvas which can allow me to draw graphics. I set the canvas width and height by 800x600. So, I can import those character, slime, score, life, and tunnel into the canvas. Before I import the image into canvas, I need to collect those image, and edit it. After I import the image into the project, I need to load those image into canvas. Phaser have provided phaser.game constructor which can let me declare a game variable. This game constructor need to pass the canvas' width and height as input, so the game constructor will auto to create a canvas for me. After that, I load all my image in the preload function. Preload function is to help me store the image into memory location. After all the image was finished loaded into canvas, I use add sprite function to add my image into canvas and display it out. So when the web game is start, all the picture will display on the canvas.

Next, I need to set game physics to Phaser.Physics.ARCADE, so I can use the function which have related to physics arcade. For example, if I want the slime can move, I need to enable slime physics arcade, then I just can set the velocity to slime. If I no enable it become physics arcade, the slime image won't move at all. I also set the background will move automatic. But I no need to enable the background become physics arcade, this is because there have another function can handle it which is add title sprite and auto scroll. Auto scroll enable the background move at a speed that I defined. In this game, my character will not move at all, but the background and slime will move toward character. Therefore I set the background and slime moveable. Besides movement is implement to the slime and background, I also develop jump function to my character. In this game's prototype, after player reach certain score, the tunnel will appear to increase game's difficulty. So I need to enable character to physics arcade in order to implement jump function to it. After enable physics arcade, I can set character's gravity become less in order to perform jump action. If want to perform jump action, I also need to set a key to allow player to press and perform the action. Next, slime will create in a group, and each group initial have 5 slimes will add into the canvas. Every slime have a random speed move from right to left and random spawn location in canvas. Player need to click the slime to make it disappear, so I implement clickable function to every slime that I created. When player click on slime, kill function will trigger and score will be recorded. After all the slime was killed by player, a new group of slime will appear in right hand side with random location and random speed again. This game will keep on update to check the slime position, if slime x-position is less than zero, it will respawn in right-hand side again. Lastly, several conditions have to be archive in order to end the game. So, the player need have life to survive, I set 3 life for each game, when all life was gone, then the game will end. The character's life will display on top right hand side, and the score will display on top left hand side.

After game end, the game system will convert high score into character experience and specific coins in order to allow player to upgrade their character's status. After player completed his first game, game system will unlcok the game 2 for the player. Therefore, player can choose to replay the game 1 or back to game menu page in order to process to game 2. When the game is unlocked, player can continue

to play next story line. For the third game, we plan to unlocked it on every Saturday and Sunday as an event. And inside the "Slime Invader" and "Slime-O-Stack", we will added different coins for the player to collect, this coins and diamond can allow player to upgrade their character in the game menu page. For example, coin will used to upgrade the character game 1, and diamond can only upgrade the character game 2. This upgrade function is allow player to fight the final boss in third game, if the player no upgrade their character before going the final game, they are unable to pass the game.

After implement a game's prototype, I try to run testing phase in order to check the error and make changes. There have several testing that I achieve in the game prototype. Besides, I also add in new function which is help player to regen their character's life. After few group of slime get killed by player, game will add a life image into the canvas. The life also will spawn at right hand side with random position and speed. Players can click the life to trigger regen function, but if players miss click the life image after few second, it will disappear from the game, until player kill more slime.

3.3 Implementation Issues and Challenges

The implementation Issues and challenges in this project for me is debug the code. When I try to do debugging coding, I need to have a lot of imagination on my program flow. Debugging a JavaScript is not an easy task, I need to keep put alert to make sure the code run correctly, It different to other language such as C#, C++, Java, because of it don't have the breakpoint for me to view the program flow. Another challenge will be study the Phaser library. Before implement the game, I need to get a deep understanding on the Phaser library in order to build a game with less weakness. Study function library is not an easy task too, it require a lot of time to do research and testing. Some of the functions have less resource and information on internet, so this will cause me more time to study on those functions.

CHAPTER 4: SYSTEM DESIGN

4.1 System flowchart

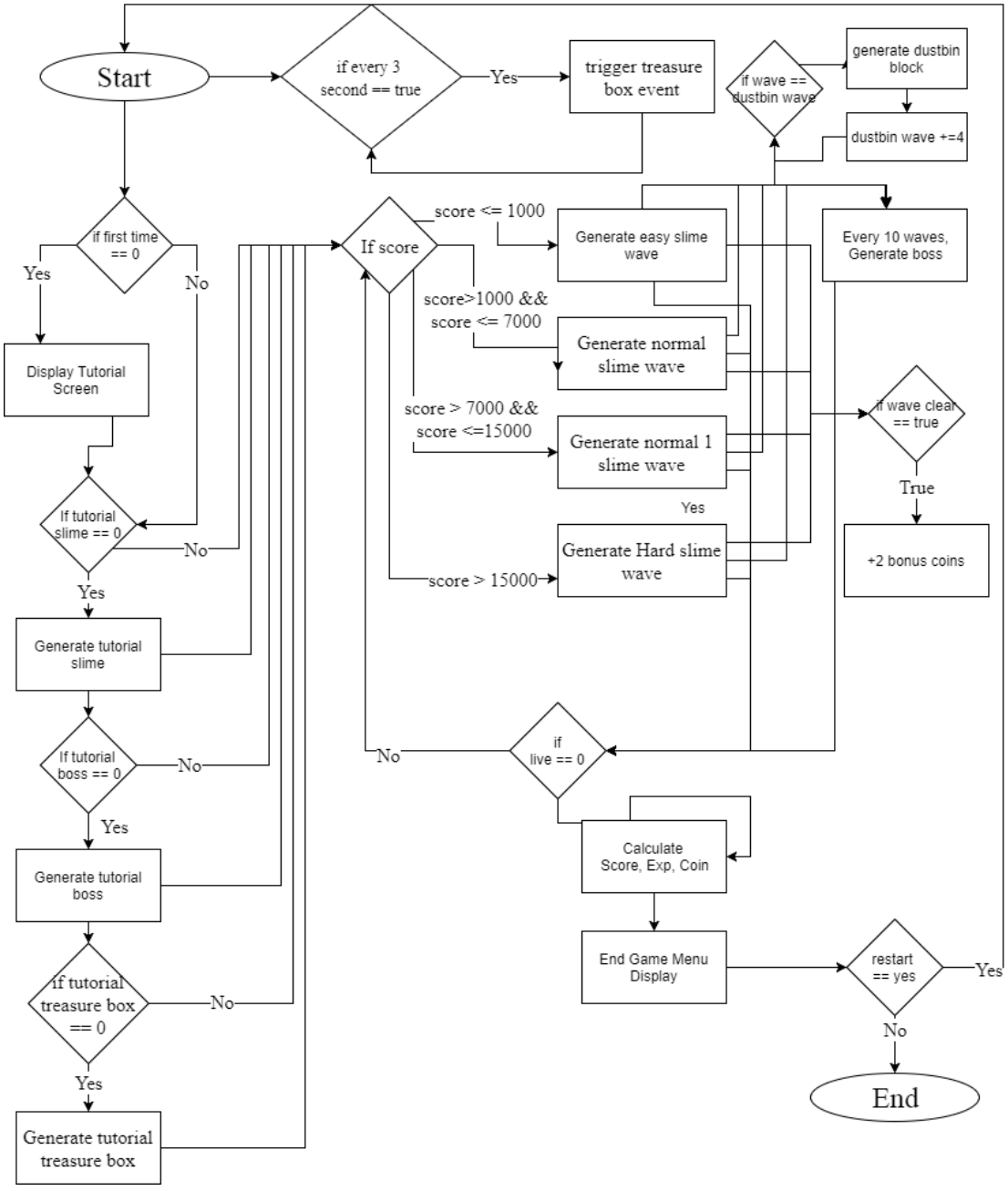

Figure 4.1.1: System flowchart

After start the game, game system will check the player first time flag, if first time flag equal to true, then will display tutorial screen for player. If first time flag not equal to true, then will straight go to next checking which is game play guideline. If all the game play guideline flag equal to true, then will display each of the game play

guideline for the player. Besides display guideline to player, game system also will trigger treasure box event to randomly generate treasure box with low chances to player in every 3 second. Next the game system will process to checking score in order to generate different level of slime monster to defeat player. After 10 waves of slime monster appear, game system will generate one boss stage to fight with player. Moreover, game system also will base on slime waves to generate one dustbin block to interrupt player. If player kill every slime monster on screen, game system will bonus the player with 2 coins. If player's life equal to zero, game system will trigger calculation and display end game menu to the player. Player can choose replay the game or back to game menu page.

4.2 Story Board

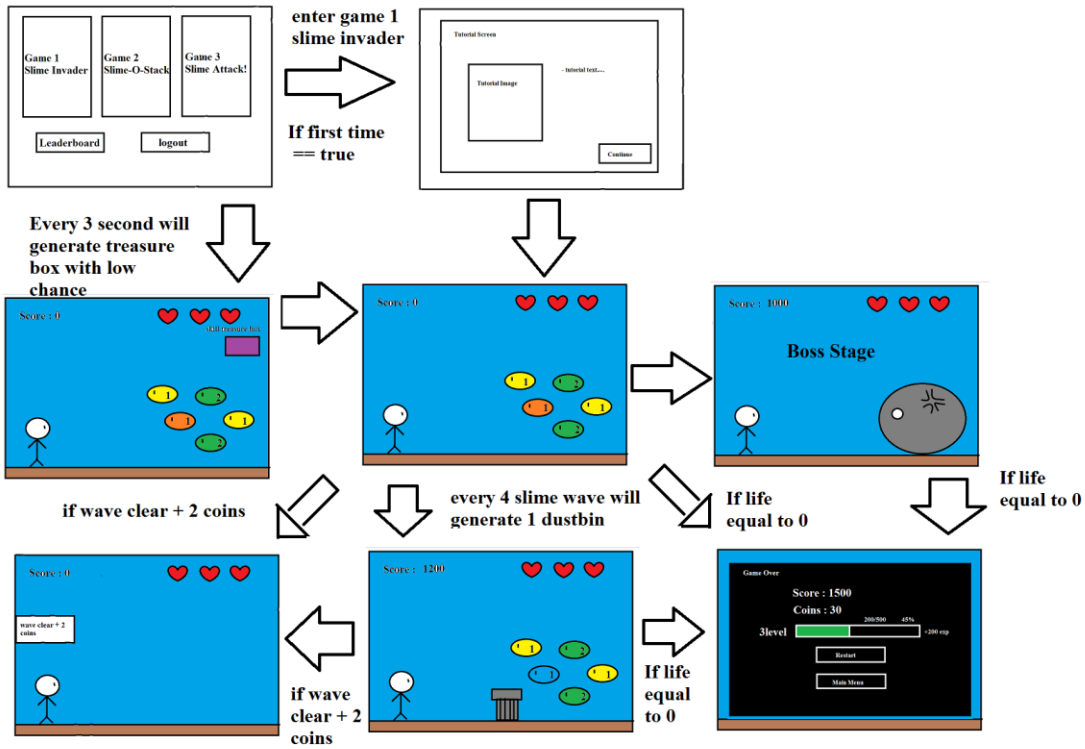

Figure 4.2 : Story board

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Software Used

Visual studio 2013 will be the development tools for our project. This tools can support the project build in web application. This is important to our project due to we are going to use Asp.net and JavaScript to implement our game prototype. We also will import some Phaser library such as Phaser.d.ts. Besides, it also needed Phaser JavaScript as support, therefore we also import the Phaser.js and Phaser.min.js into the project.

Installation step:

Step 1:
Download the visual studio 2013 in URL
https://www.visualstudio.com/vs/community/.

Figure 5.1.1: Visual studio download link screen shot

Step 2:

Click on Download button and an installer file will start downloading.

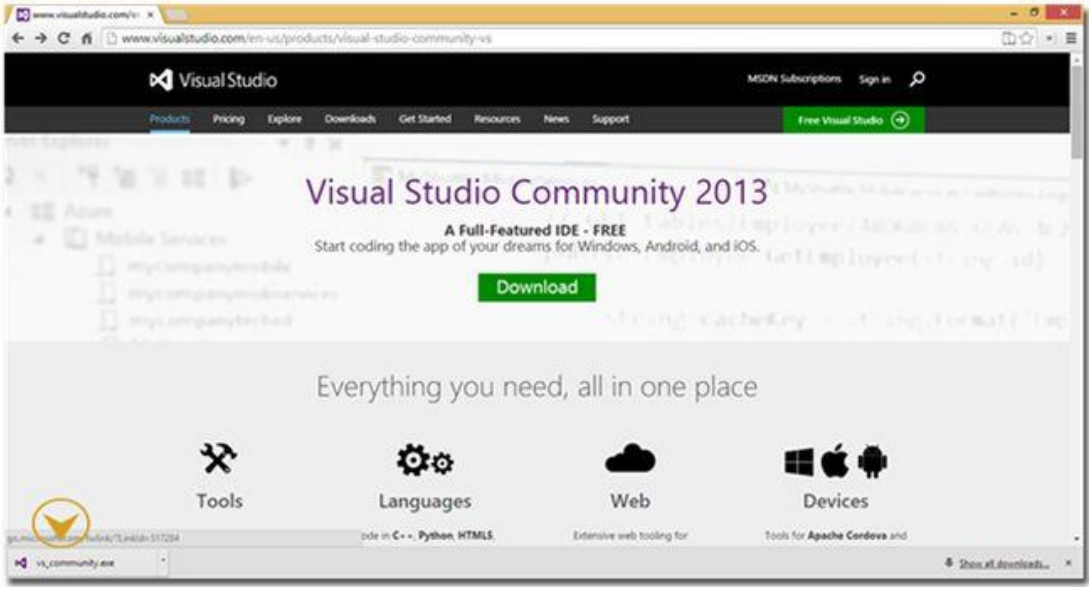

Figure 5.1.2: Visual studio download button screen shot

Step 3:

After the file is completely downloaded on system, click on the file and run the setup.

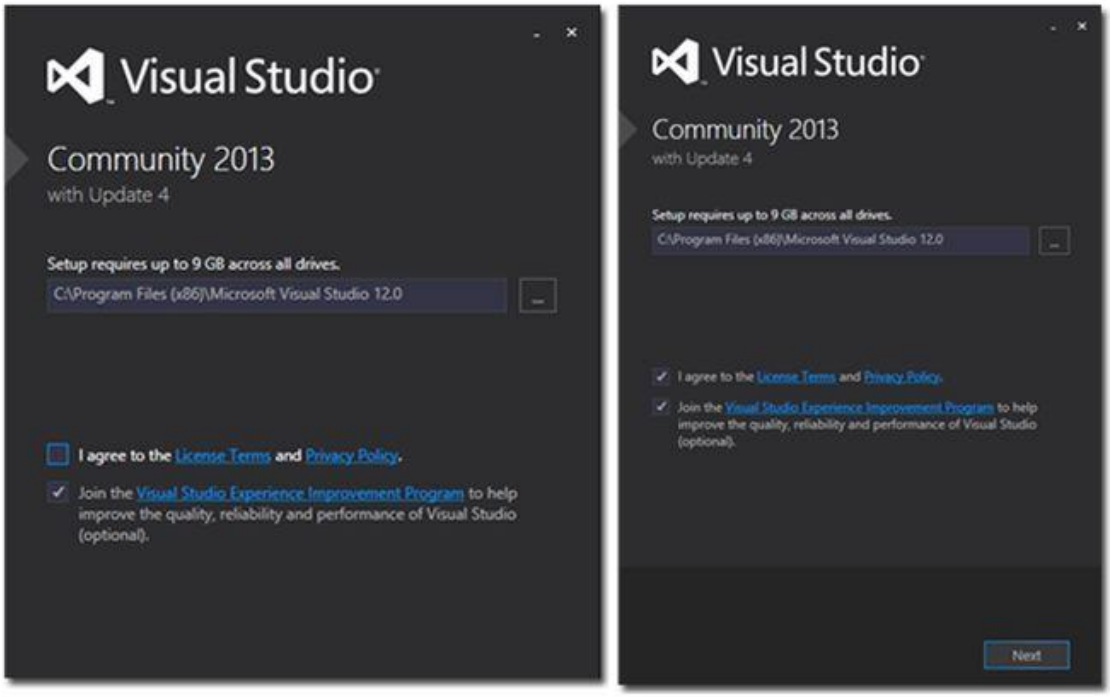

Figure 5.1.3: Install screen shot

Step 4:

Choose from the following options to install the specific or complete features.

Figure 5.1.4: Visual studio install feature screen shot

Step 5:

The installation process needs to download the useful files and resources from internet. And this will take some time to let it finish download all the file and useful resources.

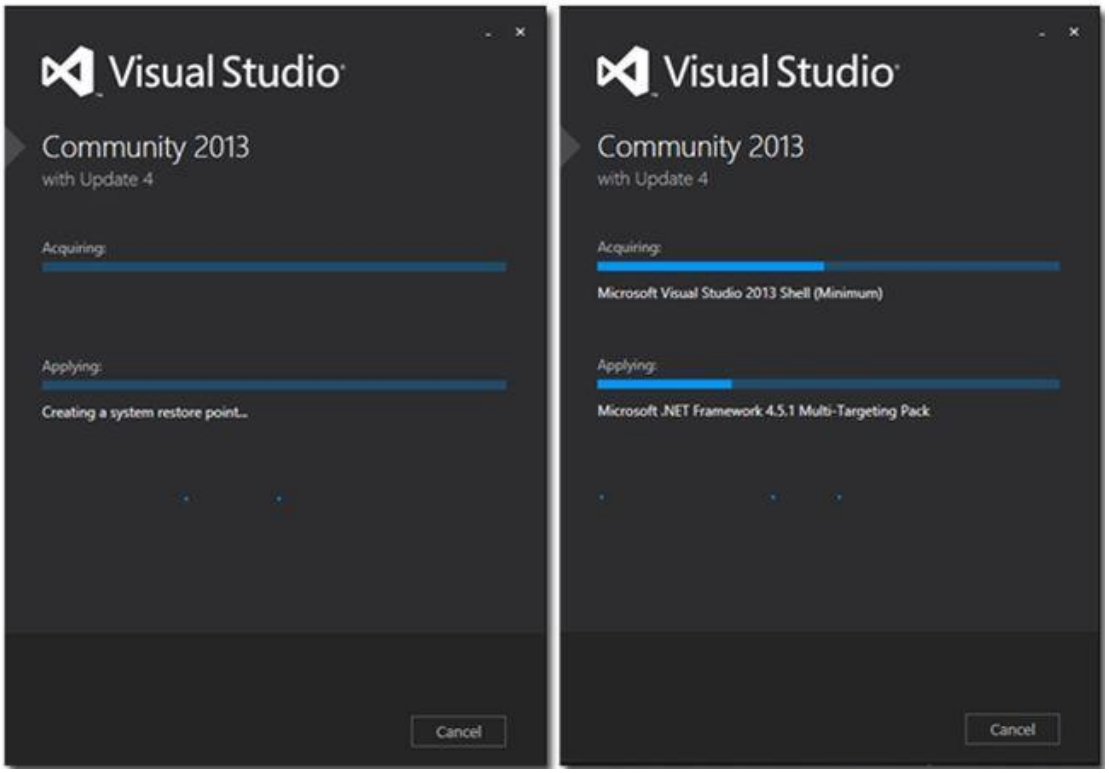

Figure 5.1.5: Visual studio install progress screen shot

Step 6:

After the setup is finished installing Visual Studio Community 2013 on computer,then Click on “Launch” button to launch Visual Studio.

Figure 5.1.6: Visual studio install complete screen shot

Phaser is a development environment which using Typescript, JavaScript language to build a phaser web based game. It is a fast, free and fun open source framework for HTML5 canvas element and WebGL. Phaser also provided a huge library function to allow developer to build a good and creative web based game.

Figure 5.1.7: Development Environment – Phaser

Another methodology takes an important role to complete this game prototype which is adobe Photoshop. Adobe Photoshop is a tool that can allow developer to design their figure in order to put in the project. We use adobe Photoshop to create the sprites and animation sprite sheets. This will help us improve our game's prototype with a good graphics design.

Figure 5.1.8: Logo of adobe photoshop

Last methodologies also take an important role which is MSSQL 2014 database. We use the MSSQL database to store our game data. It provided us an easy retrieve data method and easy manages data method to handle the game data and user data. Also we use the C# code behind to make a linking on MSSQL and our project. Therefore, MSSQL database is quite important to us.

Figure 5.1.9: Logo of MSSQL Database

5.2 Hardware used

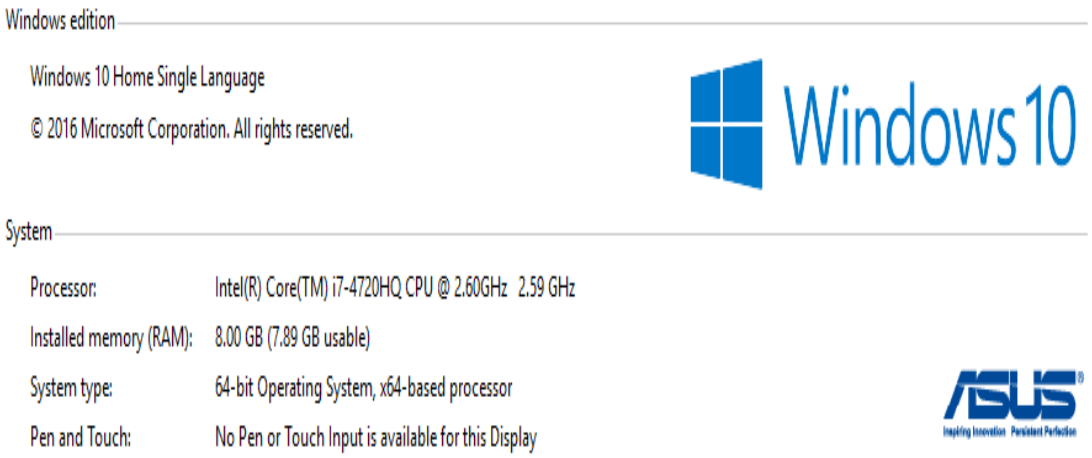

Figure 5.2.1: Hardware system involve.

5.3 Algorithms involved

This is the pseudocode for game 1 “Slime Invader”.

Function Create is phaser provided us to develop our game easily. When the game run, it will initial create everything in function create. This function only run once per game, this mean after running one time, the function create will stop.

Function Create

Define game physics to Phaser.Physics.Arcade
Add background image to the game
Allow background keep move from left to right automatic
Add another opacity background to the game
Allow game can capture mouse input

IF FirstTimePlayFlag == 0
  Display story board
  Display tutorial screen
  Add tips text
  Add start game button
Else

Add tips text

Add start game button

END

Add function to space bar key

Add gravity to the game

Create character group

Enable character group physics

Set character group physics to Phaser.Physics.Arcade

Add character to character group

Add run and jump animation sprite sheet to character

Create slime group

Enable slime group physics

Set slime group physics to Phaser.Physics.Arcade

Create tunnel group

Enable tunnel group physics

Set tunnel group physics to Phaser.Physics.Arcade

Create live group

Enable live group physics

Set live group physics to Phaser.Physics.Arcade

Create slime king group

Enable slime king group physics

Set slime king group physics to Phaser.Physics.Arcade

Create skill button group

Create skill treasure group

Create gold treasure group

Function Update is provided by phaser library also. This allows us to put in some other function into it and it wills automatic loop for us every millisecond. Therefore this is one of the core functions to the slime invader.

Function Update

```
Check every slime position in slime group

IF gameLevels != gameBossLevels AND gameEndFlag == false
    IF slimeWave != 0
        IF slimeKilledAmt == 5
            Set waveClearFlag become true
        ELSE
        IF slimeKilledAmt == 10
            Set waveClearFlag become true
        END

        gameLevels += 1

        IF waveClearFlag == true
            Add 2 bonus coins to player
        END

        Trigger Function Game rule
    END
END

Check every live position in live group
Check character whether have collide with slime
Check character whether have collide with slime king
Check character whether have collide with dustbin block


IF Space Key == Down
    Character perform jump function
END
```

Function Game rule is one of the cores of the slime invader. Without this game rule function, slime cannot regenerate and no more boss stage will create. Also the speed of the slime, dustbin blocks and slime boss won't increase.

Function Game rule

```
IF score < 1000 AND gameLevel != gameBossLevel
    Generate easy mode slime
END

IF score >= 1000 AND score <7000 AND gameLevel != gameBossLevel
    Generate normal mode slime

    IF slimeWave == slimeIncreaseWave
        Increase slime move speed
        Increase background move speed
        slimeIncreaseWave +=3
    END

    IF slimeWave == tunnelIncreaseWave
        Increase tunnel Move Speed
        tunnelIncreaseWave += 5
    END

    IF slimeWave == slimeKingSpeedIncreaseWave
        Increase slime king move speed
        slimeKingSpeedIncreaseWave += 10
    END

    IF tunnelTimes == tunnelSetTimes
        Create dustbin block
        tunnelSetTimes += 60
    END
END

IF score >= 7000 AND score <15000 AND gameLevel != gameBossLevel
    Generate above normal mode slime
```

```
    IF slimeWave == slimeIncreaseWave
        Increase slime move speed
        Increase background move speed
        slimeIncreaseWave +=3
    END

    IF slimeWave == tunnelIncreaseWave
        Increase tunnel Move Speed
        tunnelIncreaseWave += 5
    END

    IF slimeWave == slimeKingSpeedIncreaseWave
        Increase slime king move speed
        slimeKingSpeedIncreaseWave += 10
    END

    IF tunnelTimes == tunnelSetTimes
       Create dustbin block
       tunnelSetTimes += 60
    END

END

IF score >= 15000
    Generate hard mode slime

    IF slimeWave == slimeIncreaseWave
        Increase slime move speed
        Increase background move speed
        slimeIncreaseWave +=3
    END

    IF slimeWave == tunnelIncreaseWave
        Increase tunnel Move Speed
        tunnelIncreaseWave += 5
    END
```

```
    IF slimeWave == slimeKingSpeedIncreaseWave
        Increase slime king move speed
        slimeKingSpeedIncreaseWave += 10
    END

    IF tunnelTimes == tunnelSetTimes
        Create dustbin block
        tunnelSetTimes += 60
    END

END



IF gameLevels == gameBossLevels AND gameEndFlag == false
    IF gameBossLevels == 30 OR gameBossLevels == 50 OR gameBossLevels == 70
        Increase by 10 slime king health value
    ELSE
    IF gameBossLevels == 80 OR gameBossLevels == 110 OR gameBossLevels == 130
        Increase by 30 slime king health value
    ELSE
    IF gameBossLevels == 180 OR gameBossLevels == 210 OR gameBossLevels == 230
        Increase by 50 slime king health value
    END

    Repeat display the flash screen before enter boss stage
    IF slimeKingTutorialFirstTimeFlag == 0 AND slimeKingFirstTimeFlag == 0
      Provided guideline to player how to defect boss
      Delay 5 second to generate boss
    ELSE
      Delay 5 second to generate boss
    END
END
```

5.4 Graphical User Interface (GUI)

First, player started the “Slime Invaders”(Game 1), the game system will check the player whether he/she is first time playing the game 1, if the player is first time playing this game prototype, the game system will display the tutorial screen for the player. Example screen shot as below figure 5.4.1. After the tutorial screen, the game system will provided some game play guideline for the player who are first time playing this game. For example, game system will display one “click me ” icon point to the slime as below figure 5.4.2

Figure 5.4.1: Tutorial screen

Figure 5.4.2: Game play guideline

After player click the first slime and it dead, game system will based on player's score to decide generate which level of slime. For example, if player score below 1000, game system will generate first level of slime for the player to challenge. If player reach over 1000 scores, the game system will generate 2nd level of slime(Figure 5.4.3) for the player, and number of slime monster will increase to 10. As i mention before, each of the slime monster have their hit point. At the 2nd level of slime monster, the hit point also will increase. This game rule will apply to 3rd level and above. This is wanted to make sure the game balance while player playing the game prototype.

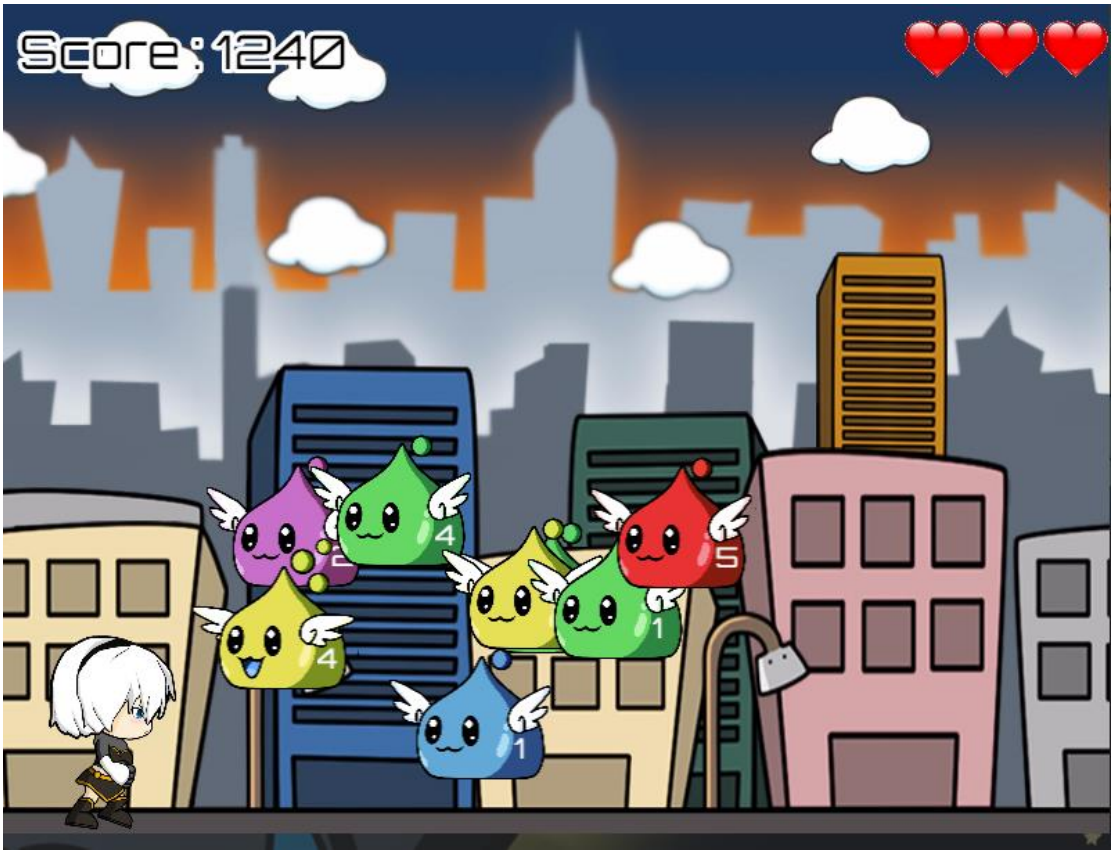

Figure 5.4.3: 2nd level of slime wave

For every 10 waves of slime monster, the game system will generate 1 boss stage (Figure 5.4.4) for the player to fight with it. The boss very special due to it can instant kill the character if the boss touches player's character. Therefore, player needs to kill the boss before it kills the player's character. This is one of the challenge part in this game, because the boss also have its own hit point, and it will based on the stage increase its own hit point. This mean, if the player no upgrade their character's damage, it will become more difficult to go further in game 1.

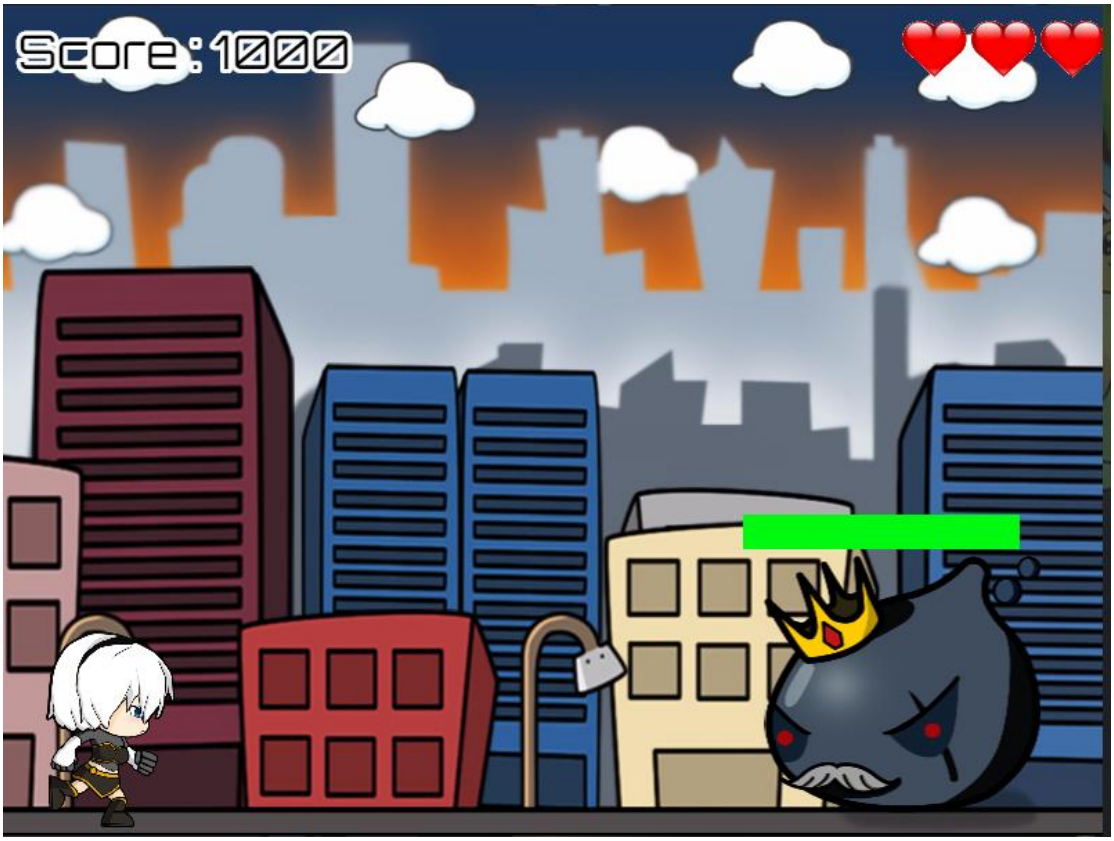

Figure 5.4.4: Slime boss stage

Beside the boss stage and slime monster wave, there have one more situation to interrupt the player to get higher score which is dustbin block. Dustbin block will based on the slime wave to generate, every 4 slime waves will generate 1 dustbin block (Figure 5.4.5) for the player to jump it. Dustbin block have the same characteristic with the slime boss which is can instant kill the player, if player no avoid from it. Dustbin block created because want to increase the game's difficulty and bring effective training method to the player. Player not only focuses on those slime, they also need pay attention on the dustbin block and jump over it. Once the player go further in game 1, the slime waves and dustbin block will let player feels busy because player need to pay attention on both side.

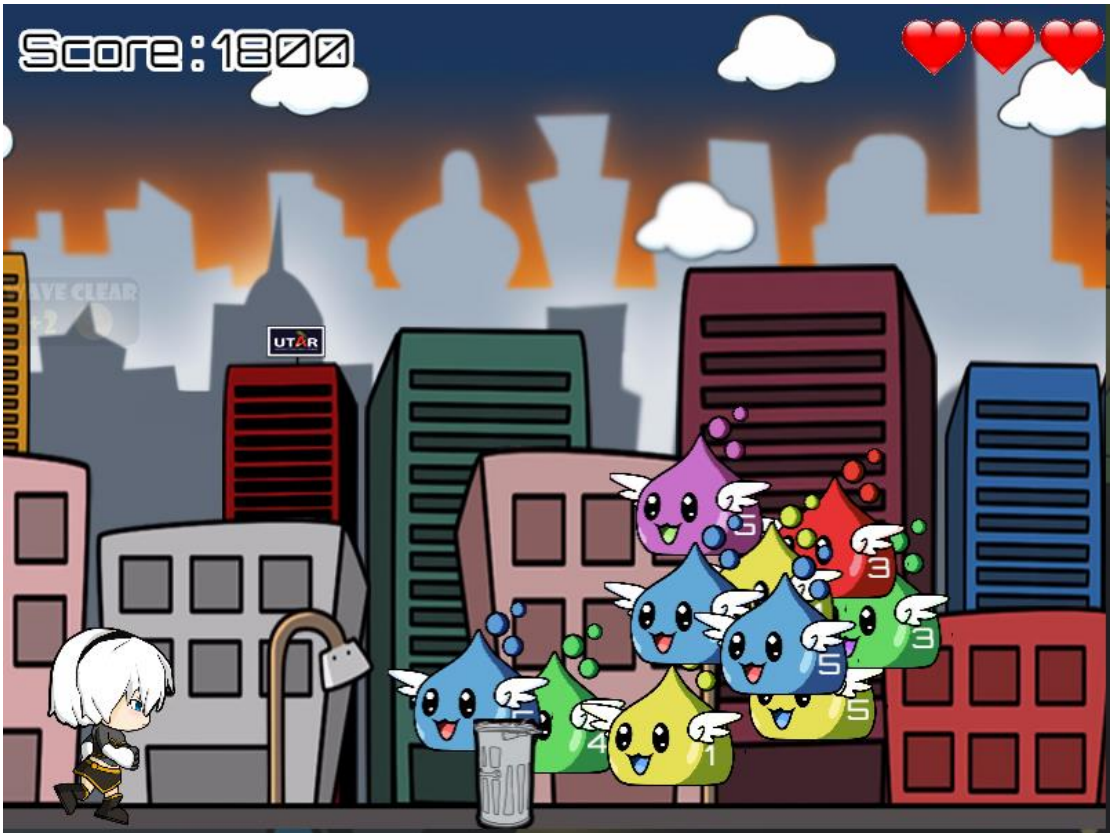

Figure 5.4.5: Dustbin Block

In the game 1, there have 2 hidden ability, one is “magic skill”(Figure 5.4.6) another one is “power up battery”. This 2 hidden ability will generate by the treasure box event. The treasure box event will generate the hidden ability with 5% chances. The treasure box will appear on top right of the screen. “Magic skill” button will appear on top left of the screen if the player get the “magic skill” treasure box. When player use the “magic skill”, every slime monster on the screen will be kill. This “magic skill” was created to help player to clear some heavy slime waves. Furthermore, there have 1 more hidden ability which is “power up battery”. “Power up battery” will unlock when player’s character reach level 10. “Power up battery” will double the character’s damage in game 1 for 30 seconds. This is want to help player to kill the slime boss and higher hit point slime. Moreover, treasure box event also will generate gold treasure box(Figure 5.4.7) with low chances. When the player get the gold treasure box, game system will gift the player 50 bonus coins for player easily to upgrade their character. If player success to kill all the slime on screen, game system also will gift 2 bonus (Figure 5.4.8) coins to player. This function is want to

ensure that player can easily get the coins to upgrade their character and can go further in game 1.

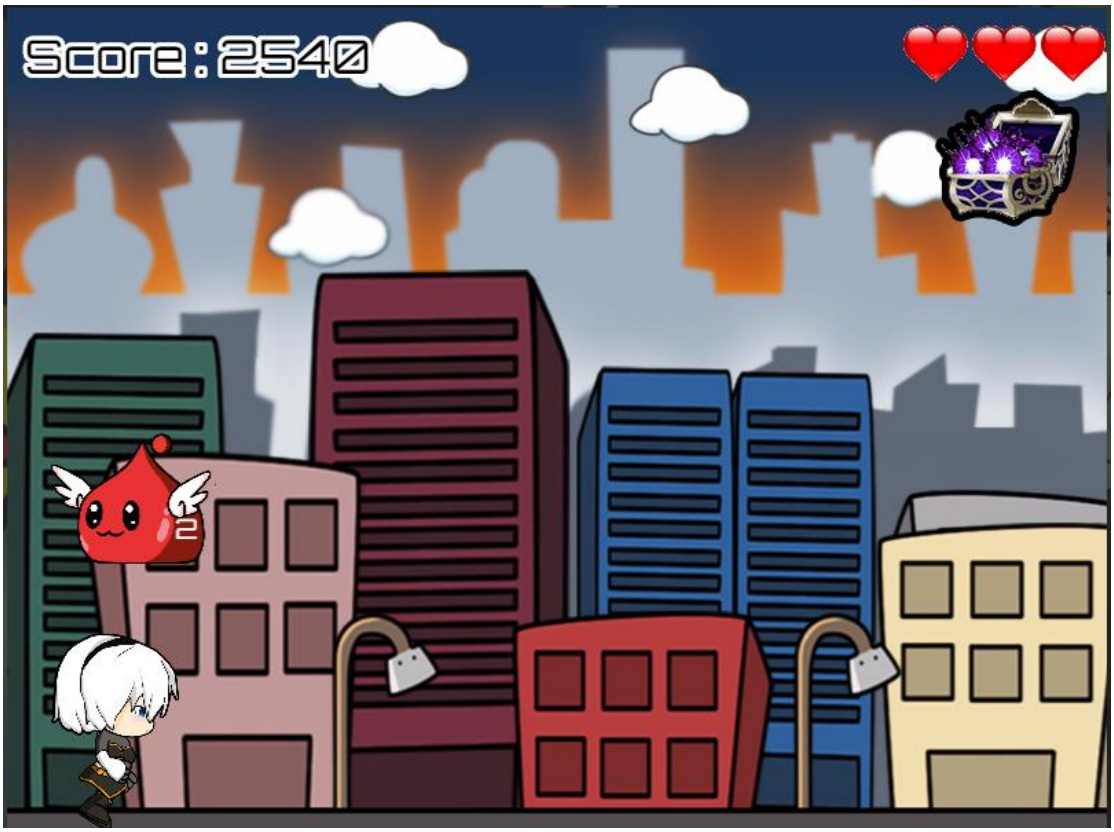

Figure 5.4.6: Skill treasure box

Figure 5.4.7: Gold treasure box

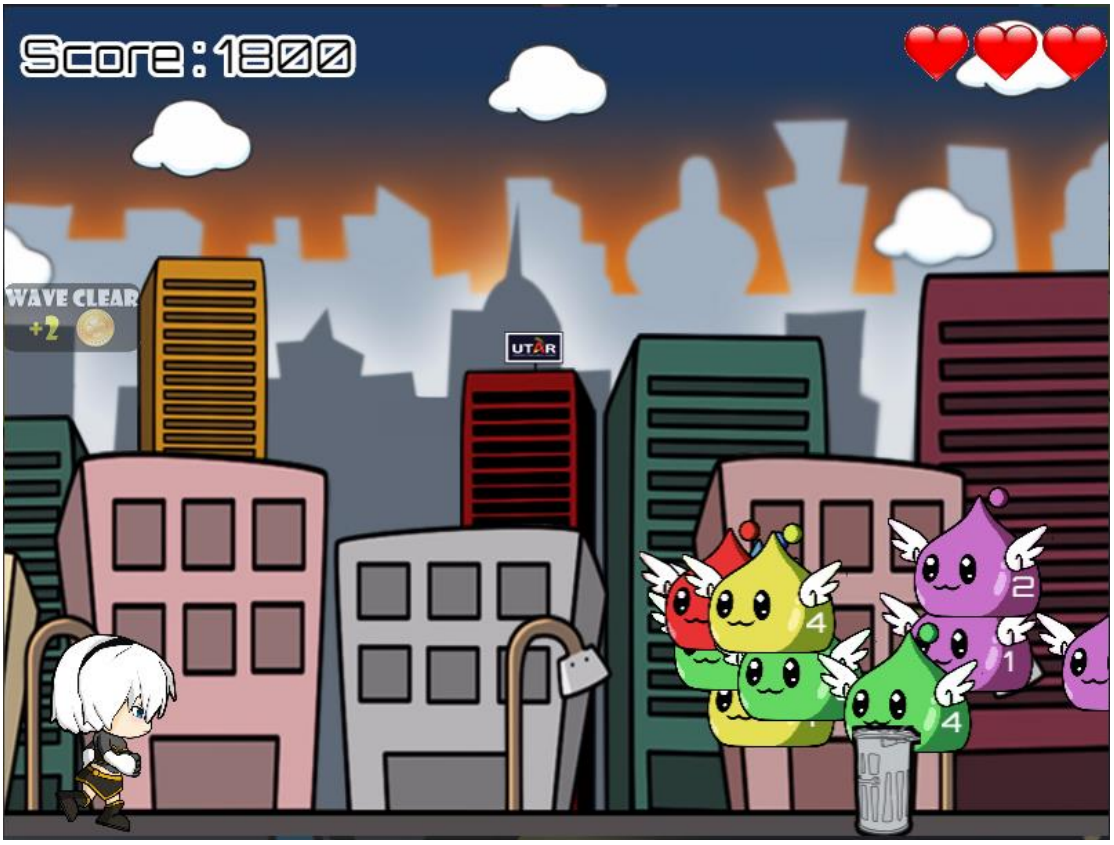

Figure 5.4.8: Wave clear + 2 bonus coins

Lastly, game system will check the player's life is it more than one or less than one. If the player's life more than one, then game system will continue to check score and generate slime monster, dustbin box, slime boss and so on. But if the player life less than one, game system will process to calculation part in order to calculate player's character experience (EXP), coins, and score. After all the calculation, game system will show an end game menu(Figure 5.4.9) to display those result for player to view. Moreover, inside the end game menu, there also have 2 button to allow player to click which is restart button and go back to game menu page button. Player can choose to replay the game 1 or go back to game menu page to upgrade their character or process to game 2.

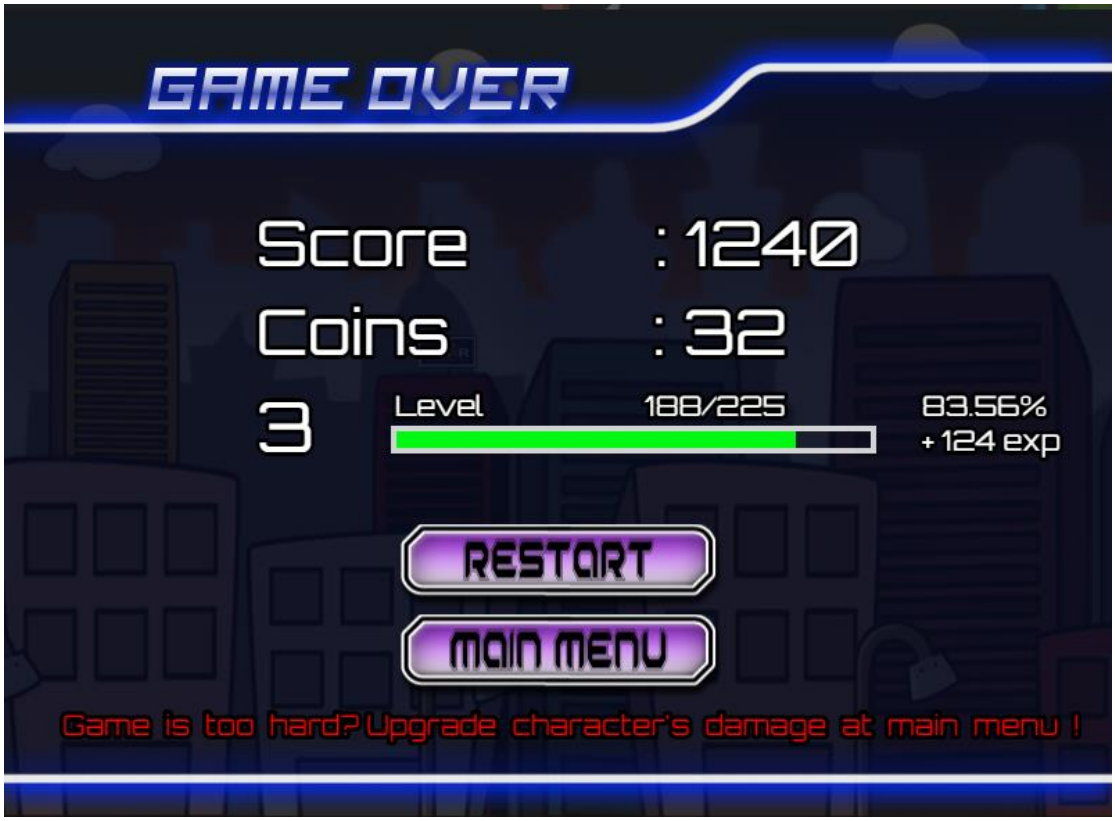

Figure 5.4.9: End game menu

5.5 Testing

5.5.1 Black box testing

No	Test case	step	Expected result	Actual result
1	Character will jump 2 times? If player press twice space bar	Press twice space bar	No, character only will jump 1 time	Working as expected
2	If all slime on the screen killed by player will trigger wave clear event?	Kill all the slime on screen in one waves	Yes, and +2 coins for player	Working as expected
3	Is the magic skill after press it will disappear from screen?	Press the magic skill button	Yes, it will disappear and function well	Working as expected
4	Dustbin block will easy collide with character	Jump over dustbin block	No, can easy jump it	No Working as expected, dustbin block will easy collide with character
5	After slime king hit point less than 0, it is will disappear instantly?	Kill the slime king	Yes, it will disappear instantly from screen	Working as expected

Table 5.5.1: Black box testing

5.5.2 Survey data

We success receive survey form from 52 people, there have 26 people are male and another 26 people are female. Most of them are 18 to 25 years old. From the survey form, most of the people can understand the game play easily. Furthermore, most of the people return the feedback with no error found. But less of the people comment on game 1 about the dustbin block problem. They comment on dustbin block will easy collide to the character. This problem so far still have no solution, due to collide function provided by phaser is detect the coordinate of the sprite. For example if anyone of the sprite coordinate collided with another sprite coordinate, it will trigger the function. This problem I has write in test case and test it, and it cannot reach my expected result. Beside this problem, they also request us make the screen become full screen mode, and put more sound effect to the game.

CHAPTER 6: CONCLUSION

This project provided a game platform for user to training their response. User can train their response effective and efficiency through the game's prototype. This is because the game's prototype automatic increase the game's difficulty when player reach certain high score. This game's prototype also will bring new gaming experience to the player, because of the character growth system. We do the combination of arcade game and role-playing game to build up this system. System will use the player's high score to calculate the character's experience and coins for player to upgrade their character's power. When the character level up, it can unlock some hidden ability and power in the game.

The weakness of this game's prototype is game flow control. When user reach certain high score the system will automatic increase the game's difficulty, this may cause the game become not smooth. I need to calculate all possible outcomes after game's difficulty was increased. Besides, the dustbin block also very difficult to jump over it, due to the character sprite size too big. The problem occurs due to if one of the corner of sprite collide with another sprite's corner, it will trigger the function.

From this project, I found out there is difficult to create a game from zero to the end. For example, I need to learn how to edit photo, how to code those sprite and build connection in game. I also need to find suitable music for the game to increase the "Fun" factor. When I receive the survey from player, I feel happy because most of them gave a good feedback to game that I develop. I also pay attention on those improvement that player send to me. Because those comment can let me create a better game in future work. I appreciate this so much. Lastly, I want to thank my group member Chan Hoong Wai and Cheah Kean Huang. Thank to them fighting with me to complete the whole project. Also thanks our project supervisor, Ms Saw Seow Hui for giving this opportunity to us. Thank you!

For the future work, I will develop this project into mobile application version. Due to this game prototype is arcade game, this is very suitable in mobile application

version. Player can fight their high score with each other on anytime and anyplace. Moreover, i will design new story line for the player to complete it, because this project combined story and arcade together, there still have a lot space to do improvement and evolution. For the game 3 will open every Saturday and Sunday, in the future, game 3 will become a raid boss game play. Player can invite their friend fight the boss together. That mean, game 3 no longer using game 1 character and game 2 character, player can choose any character and invite friend character to fight the boss together.

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APPENDICES