

**AN ACTION ARCADE WEB BASED GAME –  
SLIME ATTACK PLUS (BACKEND INTEGRATION)**

By  
Cheah Kean Huang

A REPORT

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## DECLARATION OF ORIGINALITY

I declare that this report entitled “**AN ACTION ARCADE WEB BASED GAME – SLIME ATTACK PLUS (BACKEND INTEGRATION)**” 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 : \_\_\_\_\_

Name : CHEAH KEAN HUANG

Date : 25<sup>th</sup> August 2017

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Finally, I must say thanks to my parents and my family for their love, especially my mother, Tang Fong Yin, for giving fully support, love, and continuous encouragement throughout the whole course.

Specially dedicated to  
My friends and family.

## ABSTRACT

“Slime Attack Plus” is an action arcade web-based game prototype. There are total of 3 game modes of “Slime Attack Plus”: 2 arcade mode “Slime Invader”, “Stack-O-Slime” and 1 boss raid mode “Slime Attack!”. All game modes are written with Phaser.io library with MSSQL database. The game prototype will be presented with an ASP.NET web application with C# as code behind to easier connection to the database. The database are develop for the authentication of the user login and also the purpose of retrieve and record the high score of game and the user’s character data. The character data is individually to each account. Users are able to upgrade the character by playing respective game modes, by using the specific upgrade point. The project are distributed into 3 modules: 2 different game modules and a backend module. The backend module including the database design, website publishing and the game design. The web application is using the domain <https://www.slimeattack.com>. It is using the hosting services purchased from GoDaddy and the domains are secured with Comodo SSL certificate. All the design in the prototype, including all the website design, interface design, character design, images & videos are created / draw by backend module. The result of this project is successfully published the project to the website and user are able to login and register account with their own individual game progress recorded.

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## LIST OF ABBREVIATIONS

<i>FPS</i>	First Person Shooter
<i>RTS</i>	Real Time Strategy
<i>RPG</i>	Role Playing Game
<i>EXP</i>	Experiences

## **CHAPTER 1**

### **INTRODUCTION**

The focus on this project is to create a web-based action arcade game named “Slime Attack Plus”. This game designed to be under the action arcade game genre, which is only require simple and intuitive controls from player but rapidly increase in difficulty in order to emphasizes challenges for player for fast reaction to maximize score.

“Slime Attack Plus” is a web application. The website allow user to register an account in order to keep track their game progress. The game allows player to growth their character with the score they obtains in each play. Therefore, the game will have a backend database running to store the user account, player high score and character data. The game allows user to upgrade character so it reduce the level difficulty for player to achieve higher score. To make sure there is no copyright issues happens in the game prototype, every single design on the object, character and images are design by backend module for “Slime Attack Plus”.

In this report, we focus on creating a game prototype by using Phaser, an open source game framework for Canvas and WebGL powered browser games. On the backend part, the database is using Microsoft SQL Server setup to match the Phaser Visual Studio 2013 integration. The project background provides a basic understanding about our game prototype including the hardware requirement of our game prototype support, the algorithm we will implement into the game and other approach we using to create our game prototype.

## 1.1 Background

### Video Game

As the advancement of technology, one of the most common ways for people to entertain themselves are playing video game. Video games can be play under many platforms such as TV, computer, mobile phone and gaming console. Each kind of platforms has different type of game experience including the gameplay itself. Under video game itself had defined as multiple categories of genres (*Lindsay Grace 2005*).

Each of the genres has completely different gameplay and environment. These genres including of adventure, action, fighting, first-person shooter (FPS), real-time strategy (RTS), role playing game (RPG), survival, simulation, sports, rhythm, puzzle games and many other genres. Not to mention one game are usually fall under multiple of genres, or even cross genres combine.

### Project Platform

To design a good type of game, we first need to determine which genres of game are best on which type of gaming platform regarding to the condition that create a best user experience for the player. Wrong choices may result bad experience for user. In this project, the game we created will fall under the Web-based platform, which the user are required to play using an internet browser of a PC. This choice has shorten the time of installation for user as they doesn't need to install the game into the PC but it require internet to visit the website for start playing. We believe this will not be a problem as it was 2017 where fast internet can be found in every house and even user's smartphone.

On the genre side, in order to create a challenging environment to attract the user for keep playing, this game prototype is designed to be under action and arcade categories. This mean the game will only require user to perform simple and intuitive controls by using mouse as input and player's only goal is to maximum their score in the game modes respectively. Despite the simple goal and game control, to achieve a high score is not easy as the game difficulty will be increase rapidly. This can

provide player physical challenges including hand-eye coordination and reaction-time while playing the game.

### **Feature**

To increase the feature of the game, this game has a database to record the user character data as well as high score. The character's stats can be build up to helps reduce the game difficulty so the player can obtain higher score. There will be a leaderboard to display high score so it can be user's goal to break their own high score over again. There will also be an extra game consist of a boss fight that will be unlock in certain time to allow player challenge it with their upgraded character. In order to create the originality of the game, every single design on this project is created by backend module. All the character, background and interface are draw and design by own ideas, it is only to be coincidental if there are similarity between them and others.

### **Slime Attack Plus**

The final "Slime Attack Plus" will contains three different web-based game modes as we define the story mode as "Slime Invaders" and "Stack-O-Slime", and the challenge mode as "Slime Attack!". Both story mode games have a different gameplay style and objectives. Both games allow player to obtain score and items for specific character stats upgrade. Every time the character upgraded, the character's statistic will changed such as increasing health, attack or unlock some hidden abilities. Thus, the challenge mode game is to challenge user reaction and limit to break through the highscore with the character. All stats changes and high score will be recorded into a database so player can be load from the character every time the application launch. Each player will have their individual account that can register in "Slime Attack Plus" page. Other detail about background, update or content of this game may find on "Slime Attack Plus" home page.

## **1.2 Problem Statement**

As a hardcore gamer in real life, one of the best strategy to makes the player playing on the game for long time is setting a highscore leaderboard for user to compare with each other. Therefore, if the control are simple, the easier the score able to achieve, the player leaderboard will getting more competitive. And that is how “Slime Attack Plus” choose to be combining with arcade and action genre. The game will need to have its unique gameplay compare to similar existing system. Therefore, on the backend integration part, the project has implemented a database to recording data such as user high score and the character data.

To ensure our game can be easier to access in anywhere, the project has been chosen to be presented in web application, where user can access by simply visit the website link in any desktop browser. This also eliminated the hardware requirement from this project toward the user.

In order to prevent copyright, on the game design, every design has to be original. Also, the design had to be accepted by all range of ages since the game are designed for everyone who age above 5.

## **1.3 Motivation**

The motivation of creating this game prototype is to provide a challenging platform to any aged gamer. As the technology growth rapidly, nowadays the player interest toward game has changed. They prefer more challenging and upgradable gameplay in order for them to stay playing for a game (*Nathan Lovato 2015*).

Therefore, “Slime Attack Plus” contain with different gameplay in order to give player having different game experience and challenge, yet allow user to growth the in game character to make sure the player will not get boring and motivate them to achieve higher score and break the achievement when they playing in the challenge game mode.



To make sure “Slime Attack Plus” game mode to be presented nicely, the project choose to get a domain and host a web application so “Slime Attack Plus” game can be presented on it. A website also easier for user to access and authenticate so the player data can be saved.

All the designed has chosen to be designed as 2D cartoon since it can be accepted by any age range. The cartoon way design may create a funny and comfortable feel for player.

#### **1.4 Objectives**

The aim of backend integration module is to create a original and good impression interface layout design and game design to user. Backend also provided the database connection to the game and enable it to save and load the game data using database. To meet the aim, the following object will need to be achieved:

- To create a standard web application that have own domain name hosting on internet.
- To design a user friendly website layout to display the game created by other module.
- To design an original and beautiful game design including all character, background, all kind of images to interface and animation.
- To create a website database that allows the user to be authentication and save user’s game progress.
- To create a game database that are able to save and load the game data for game module, including the character stats data and high score.

## **1.5 Impact, Significance and Contribution**

The “Slime Attack Plus” designed by using Phaser.io which rendering a game on HTML5. After publicity of “Slime Attack Plus” project, it will encourage more developer to discover the game on HTML5 and focus more back to HTML game. A website game allow user to eliminate hardware requirement and since in 2017 internet connection can basically found anywhere, it can say it’s easy to access a website game. “Slime Attack Plus” can be the first step to start recover the HTML5 era.

## **1.6 Project Scope**

The final prototype of this project is to design a web application that can use to present the game. After developing the web application, it supposed to be get publish to internet by hosting provider. To keep track user progress on the website, the web application will have a connection toward a database that will allow user to authenticate. User can register new account and login into the web application. Each user will have own individual character data and game progress. These data will help user to survive and achieve high score inside the game. The database created will use to store all these important user data. Some game mode in the web application will also only be unlock depends on the user data.

On the design part, every design part including website design, webpage layout, website interface, game character animation and design, game background design and interface will be design by own idea. It should not be copyright and it is to be coincidental if there are similarity between other.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Literature Review

One of the technical article guide (Emil, 2016) provided a detail guide about creating database for action game. The article highlight on what is the uses of the database and the data should be store inside the database. It mentioned before the start of modelling database, as a developer will need to know some background about of the project as:

- **Game type:** Action Game's background, gameplay, control and design.
- **Uses of Database Model:** User profile, character, level and game parameter.
- **Character of game:** Protagonist and Villain.
- **The time of the game last:** number of levels of the game.

After introduce the background information need to be concern about, the article then start to focus on guide about the database modelling. The database model provided by the article shown was divided into four subject areas:

- Game Setup (to store every data that relevant to the game): levels, maps, objects, enemy.
- Character, Opponents and Skills (contains formulas & algorithm to run the game): skills uses by character & enemy.
- Actual Skills (store character data): character current level, stats and skills.
- Players (store user account detail): user name, password, login information.

Each area contains the data table that are connected to each other with relationship. After the areas are finish build up, four areas are combined with relationship to become a complete database model.

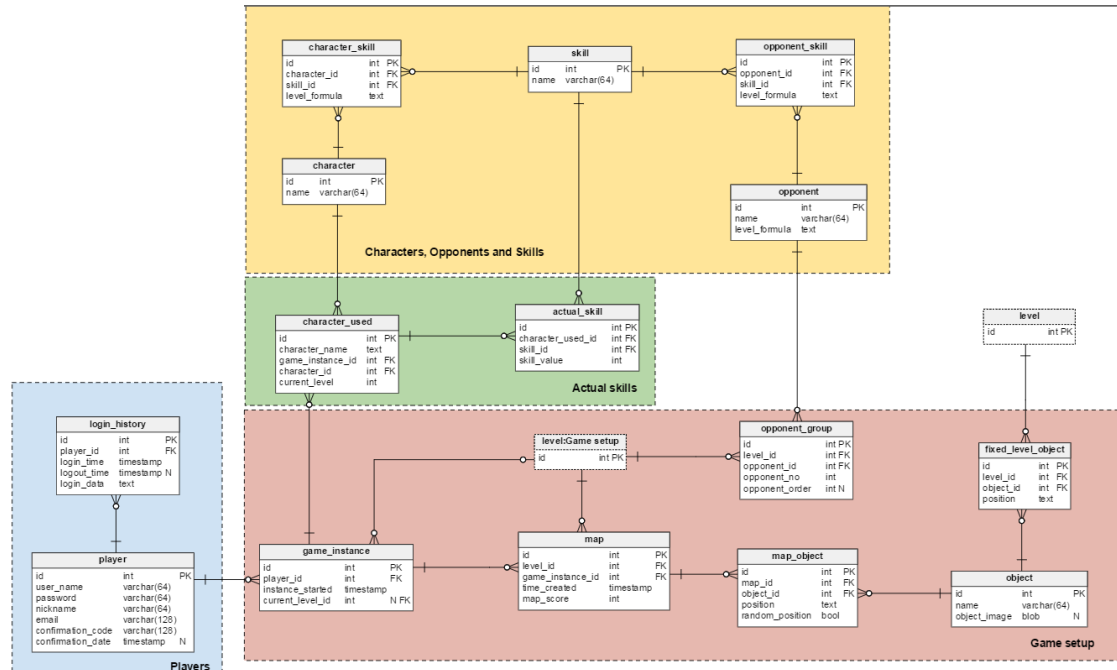


Figure 2.1: Database Model (Vertabelo 2016)

After acquire the knowledge on create database model for action game, the project “Slime Attack Plus” will focusing on what should take into consider for creating own project database model. The factor considered for each area was listed:

- **Game setup:** Game modes, game object, game enemy, game control.
- **Characters, Opponents and Skills:** Character available, enemy in each game mode, boss enemy, all skills.
- **Actual Skills:** Player’s Character stats & data.
- **Players:** User login account, username & password.

In addition, the project will also implement a new area for highscore store for each game mode. The area is named as **Highscore** and will be store the data of: highscore, datetime achieved, player’s username.

## 2.2 Existing System Review

### 1) Flappy Bird (*Flappy Bird 2014*)

Flappy Bird was one the most popular download among all mobile game. It use simple graphic user interface and simple logic gameplay but require a lot of user patience to play the game.

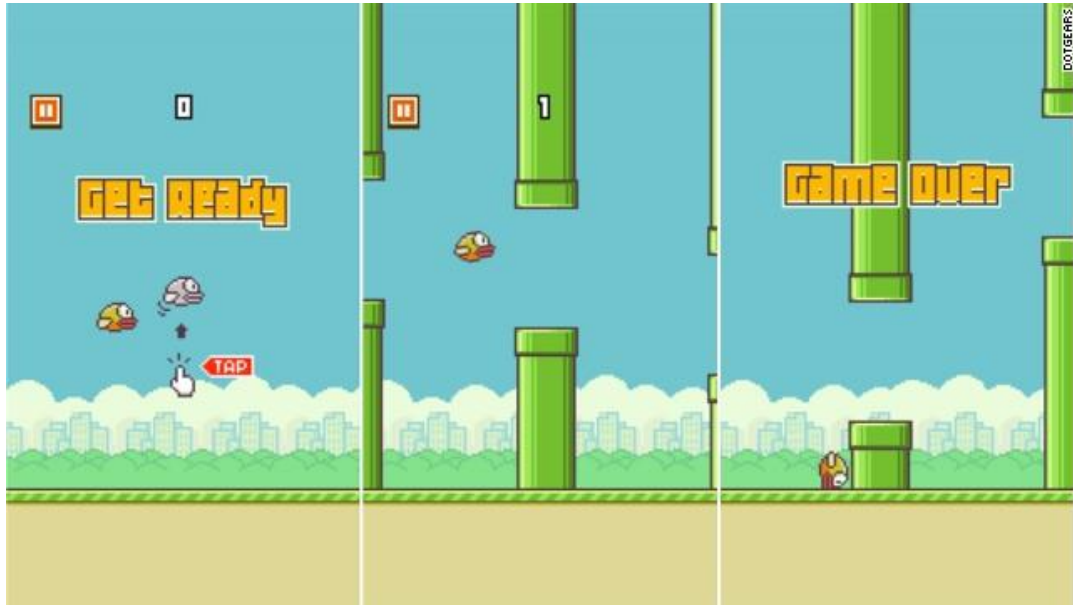


Figure 2.2: Flappy Bird Gameplay 1

The game did not store any user data into the game as they use the device's game account (Google Play Game for Android / Apple Game Center for IOS) to recognize as user login. It will save the user's high score to the internet leaderboard when internet is available on the user device. Other than this, the game itself will only save the highest high score, which is the score that the game will displayed in the end game screen. If the current player break the high score, the high score then replaced by the player's current score.



Figure 2.3: Flappy Bird Gameplay 2

## 2) **Jetpack Joyride** (*Jetpack Joyride* 2011)

Jetpack Joyride is a popular mobile game. The game was using only one control to the character but on the game there is power up items able to pick up by the user. Also, the character can be upgraded with many ways, for example higher armor suit, longer lasting power up, double coin and many more. The game was able to save the character upgrade so this help the game to get a lot of player keep staying for playing since 2011 until now.



Figure 2.4: Jetpack Joyride Home Screen



Figure 2.5: Jetpack Joyride Gameplay



Figure 2.6: Jetpack Joyride post end game screen

End Game screen of Jetpack Joyride display a lot of gameplay detail for the user. Score, coin collected, and even mission that the game given to the user are calculated. There is also one random screenshot of character during the run will display to user.



### 3) Yasuhati (*Yasuhati* 2017)

This game is definitely have the most creative way of gameplay in early 2017. The Yasuhati is a game that have totally no hand control to the character. The only way to move the character is using voice. Yasuhati only input is from the device's microphone. The game will determine the volume of player's sound input, and the character moving distance is directly proportional to the voice input.

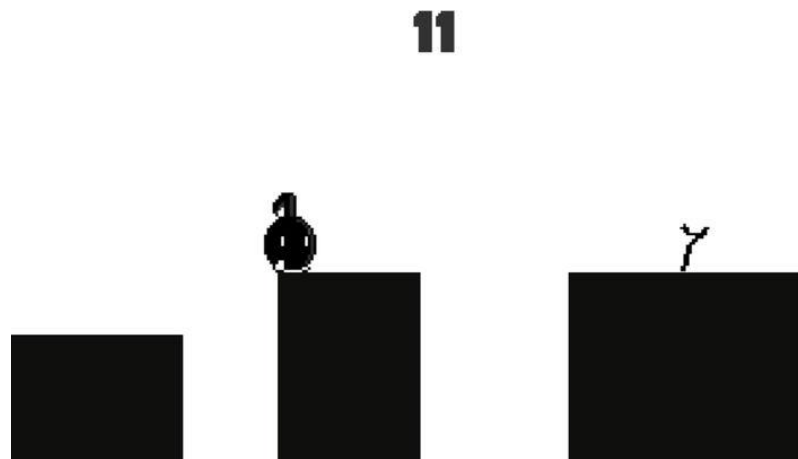


Figure 2.7: Yasuhati Gameplay

Same as Flappy Bird, the game will only save the high score and displayed it on the end game screen. If user surpass the high score, the high score then replaces by the current score.



Figure 2.8: End Game screen of Yasuhati

### 2.3 Strength and Weakness of existing systems

	Description	Strength	Weakness
<b>Flappy Bird</b>	High score saved and displayed on end game screen. Online leaderboard available	-Clean and neat way to display high score	-Only usage of database is save high score
<b>Jetpack Joyride</b>	Perfect game with high score saves, mission generate, achievement, item purchasing and character upgrade	-Character are able to upgrade to more survival ability -Plenty of game features keep game alive and it's users stick to the game for long time	-Too much game feature created big file size. Not suitable for web-based game that user will needed to re-download every time
<b>Yasuhati</b>	High score saved and displayed on end game screen. No online leaderboard.	-Interesting way to play the game while contesting high score with friend	-No online access, no much feature to attract user for sticking the game

Table 2.1: Strength and Weakness of existing systems

## 2.4 Comparison between existing systems with this project

System	Feature			
	Save High Score	High Score Leaderboard	Upgrade Character	Achievement
Flappy Bird	✓	✓	-	-
Jetpack Joyride	✓	✓	✓	✓
Yasuhati	✓	-	-	-
Slime Attack Plus	✓	✓	✓	-

Table 2.2: Comparison between existing systems with this project

## CHAPTER 3

### METHODOLOGY

#### 3.1 Design Specification

##### Methodology and General Work Procedures

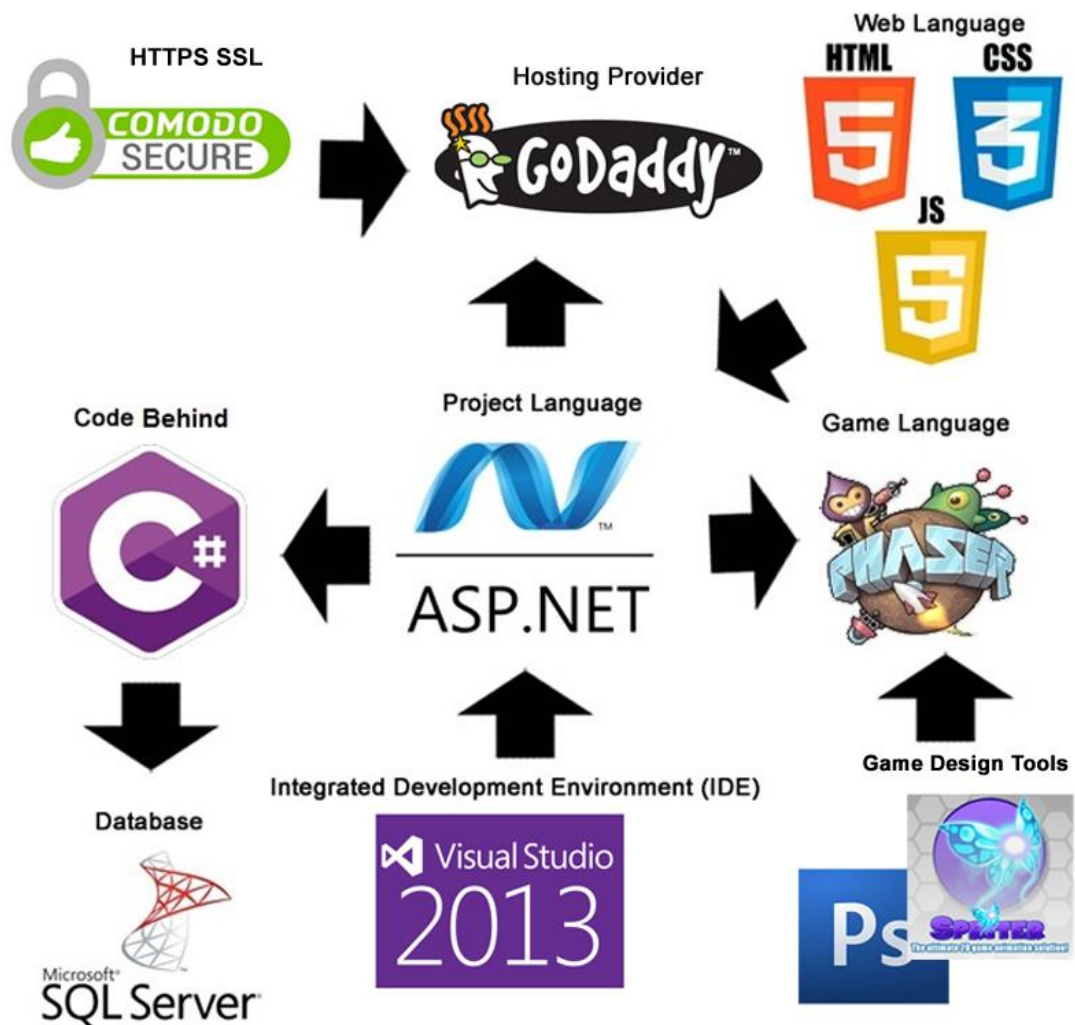


Figure 3.1: Methodology architecture

### **Project Methodology**

“Slime Attack Plus” is a web-based game project. The whole project is written as a web application. The programming languages use for the application is ASP.NET with C# as code behind because of the ASP.NET language is very suitable for web application and C# as a high level programming that could easier our task but also C# enable the connection to Microsoft SQL Server easily in Microsoft Visual Studio.

### **Frontend Methodology**

On the ASP.NET webpage, HTML5, CSS3 and JavaScript are used to modify and organize the webpage to achieve a beautiful and neat layout design. With mixing all these programming languages, the web application was able to get multiple different ways to create function on the webpage. Besides this, both game modes are written with the implementation of Phaser’s JavaScript libraries. Phaser is a HTML5 open source game framework that allows developer to create Canvas and WebGL powered browser games. Therefore, the game page has chosen to implement inside JavaScript. The project games are basically run with Phaser in it, and it can be starts inside the ASP.NET web application.

### **Backend Methodology**

In the code behind, C# allows the web application to get connection to MSSQL database. With C#, all the data retrieve and record for the game are easier. After development of the web application, it needed to be publish to the internet. The hosting service provider GoDaddy had been chosen to be the hosting server. The main reason is because GoDaddy is offer in MYR (Malaysia Riggitt). GoDaddy offer a domain name pricing at RM3.99 and a hosting plan cost RM31.99 which is the most affordable plan can be found compare to other hosting services provider. Other than cheap, GoDaddy also provide MSSQL database on their server and it allows this project to be easily deploy the project database online. The down side of GoDaddy server is they didn't provide SSL certificate for their hosting service. Luckily we was able to get a free SSL certificate by Comodo to secure our website to HTTPS.

### 3.2 Prototyping Model

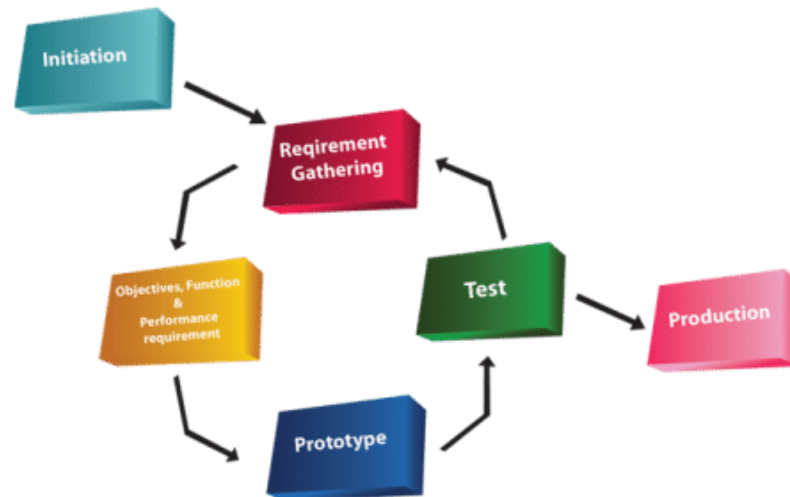


Figure 3.2: Prototyping Model

As the prototyping model shown above, the general work phase is separated into four phases as Requirements Analysis, System Design, Implementation and Testing.

#### 3.2.1 Requirement Analysis

In first phase, we discussed about how the prototype should be build, what requirement on the game should have and what platform the prototype should be done. We considered about web-based game doesn't require installation, where user can access anytime without any system requirement. Next, game genre like Action Game provide challenging gameplay to user, and Arcade Game provide competition between user. The prototype then concluded to build as a web-based action arcade game prototype.

We then analyze about existing action game and arcade game systems. During this we decided which function should adapt from existing systems and which function we should improve from what existing systems lack of. The project concluded with adding a character growth and a high score.

### 3.2.2 System Design

During system design phase, we designed the functionality, logical flow and operation to our game prototype. The project is designed to build as a web application that used backend code behind to connect database, and a frontend implement with Phaser for the game mode. Backend is mainly focus on creating new data and displaying the recorded data to the website, while frontend is on how the data will be updated. The relationship between backend and frontend is to enable data to be read, update and record correctly.

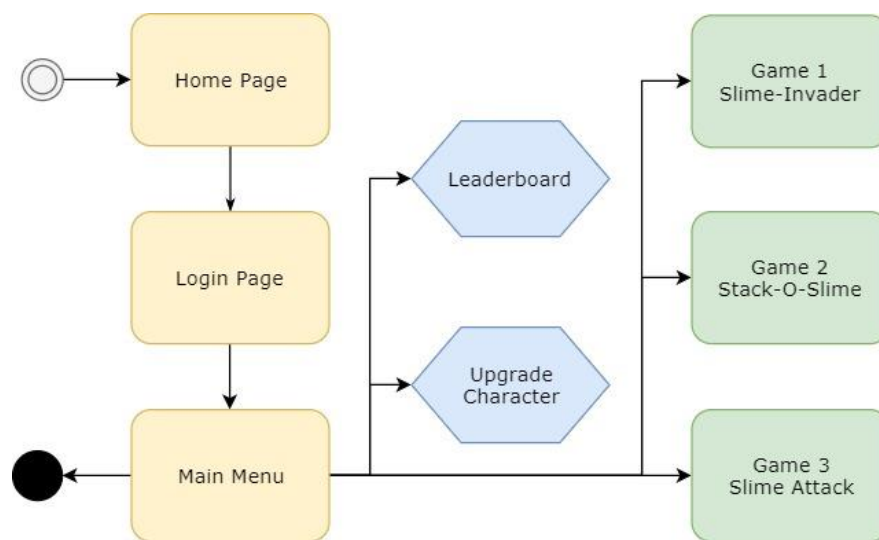


Figure 3.3: System Flowchart

The web application will designed to have a total of 6 pages. The flow is as shown as above. There will be a Home Page to display all information such as game details, background and contact us. Next, there will be a login page for user to authenticate. Register and Login will be done in there. After that the user will able to enter the Main Menu. In Main Menu will have 3 game pages to forward. There will also be two buttons that will open up as Upgrade Character and Leaderboard.

All the pages will load database in code behind. There will be 5 total database table will be used in website consist of User, Character, Game 1 Data, Game 2 Data and a storage table. 5 of these tables will be used to load some data required to display on specific webpage.

### 3.2.3 Implementation

- **Software used:**

	<ul style="list-style-type: none"> <li>• <b>Microsoft Visual Studio 2013</b></li> </ul> <p>The integrated development environment (IDE) chosen for this project is VS 2013 as it is the IDE support Phaser library.</p>
	<ul style="list-style-type: none"> <li>• <b>ASP.NET &amp; C#</b></li> </ul> <p>ASP.NET is common language uses to create a web application with C# as the code behind.</p>
	<ul style="list-style-type: none"> <li>• <b>Microsoft SQL Server</b></li> </ul> <p>MSSQL Server is selected as database software as it integrated inside VS 2013.</p>
	<ul style="list-style-type: none"> <li>• <b>HTML5, CSS, Javascript</b></li> </ul> <p>3 common language used for design website.</p>
	<ul style="list-style-type: none"> <li>• <b>Adobe Photoshop &amp; Spriter</b></li> </ul> <p>Photoshop is used to edit, draw and design all the images in game design.</p> <p>Spriter allows image to perform animation and render into spritesheet.</p>
	<ul style="list-style-type: none"> <li>• <b>Sony Vegas Pro</b></li> </ul> <p>Sony Vegas Pro is a professional video edit software.</p>

Table 3.1: Software used for this project



- **Implementation Issues and Challenges:**

There are always few issues and challenges happened during implementation phase such as publishing issues, debug issues and integration issues but all the challenges help me gain the knowledge on how to handle and deal with it. For example I gained knowledge about hosting and publishing services provider, how to combine HTML5, CSS3 and JavaScript together to become a function and how a game design took part in a game development.

### **3.2.4 Testing**

In order to evaluate the prototype functionality and features in each of the module, testing between each of the project member is conducted to enhance and improve the prototype. Through this testing, the backend module is able to find some bugs and errors occur when running the program and accessing data. This helps to create a good opportunity to improve and fix the program which can reduce the chance of failure.

## CHAPTER 4

### SYSTEM DESIGN

#### 4.1 System Flowchart

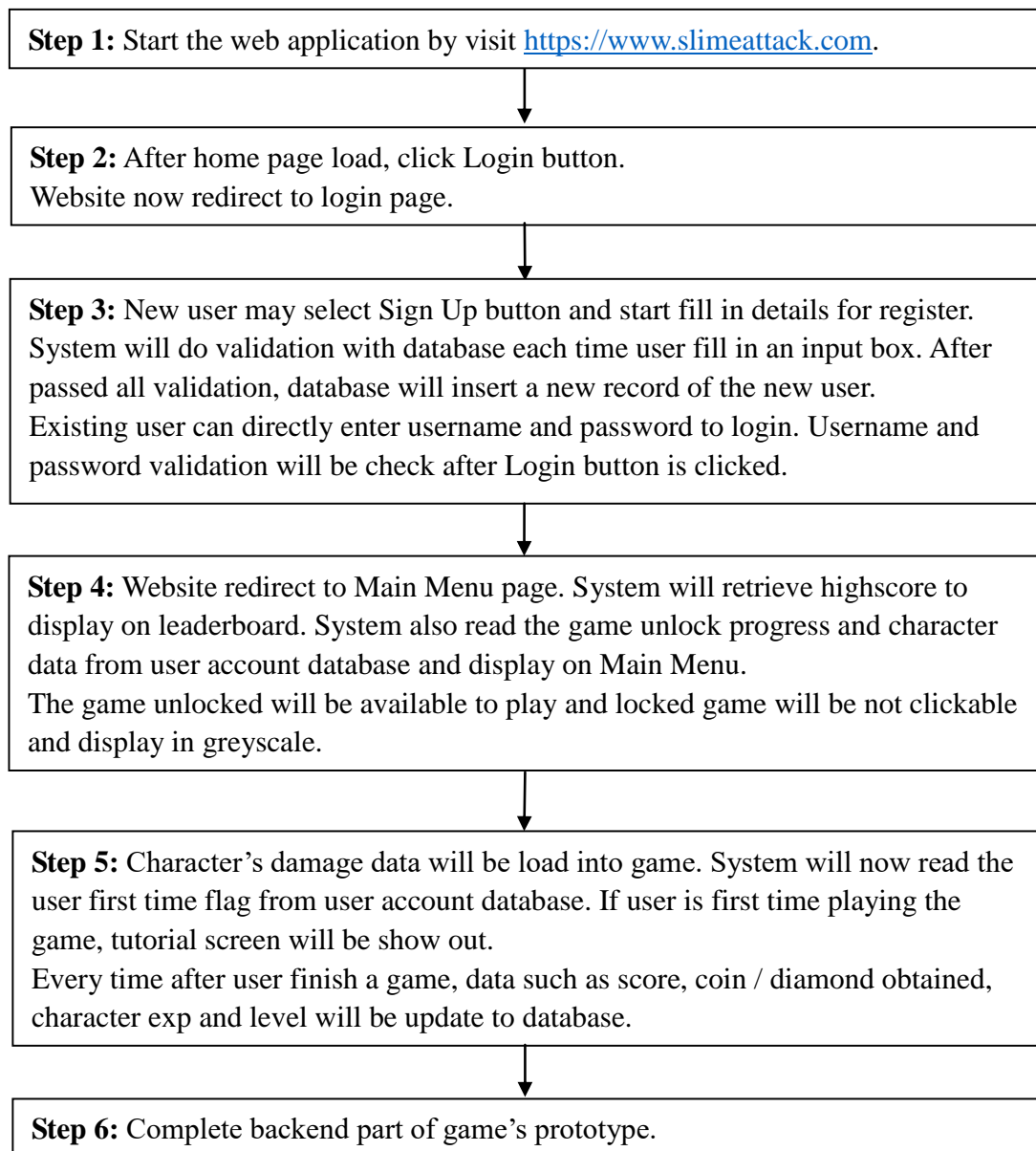


Figure 4.1: System Flow Design

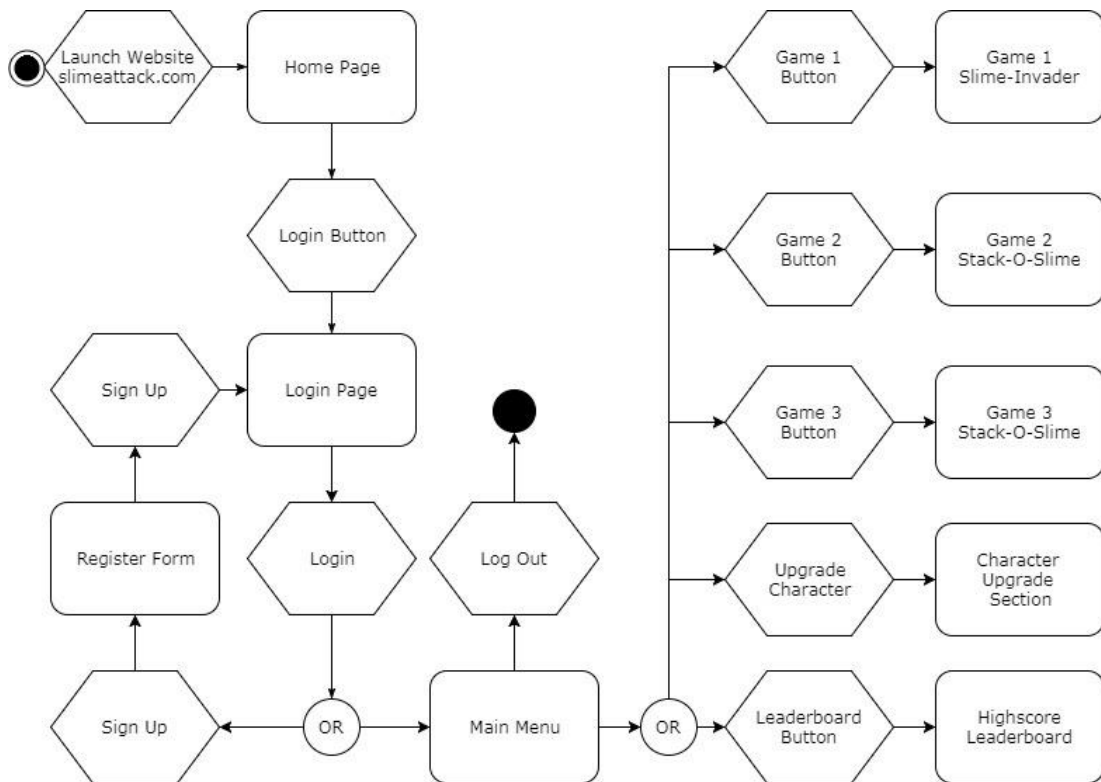


Figure 4.2: Full System Flowchart

In system design, the main functionality, logical flow and operation of the game prototype is designed as the flowchart show as Figure 4.1. The web application actually has clearly designed button made to be easily navigation for user. Most of the link are able to found on top of the header navigate section. It is to allow user to fast navigate to other page. It will easily for user to understand the whole system flowchart without any trouble. Besides main system flow, the system also designed to have multiple sub-flow as the full system flow show on Figure 4.2. The website designed to have multiple sub-flow that will allow user to access other thing other than game in main menu like upgrade character or open up leaderboard.

On the other side, backend is mainly focus on creating new data and displaying the recorded data to the website, while frontend is on how the data will be updated. The relationship between backend and frontend is to enable data to be read, update and record correctly. Therefore, for each action performed by user in the web application, the database will immediately recorded down and be update the data stored right away.

## 4.2 Use Case Diagram & Storyboard

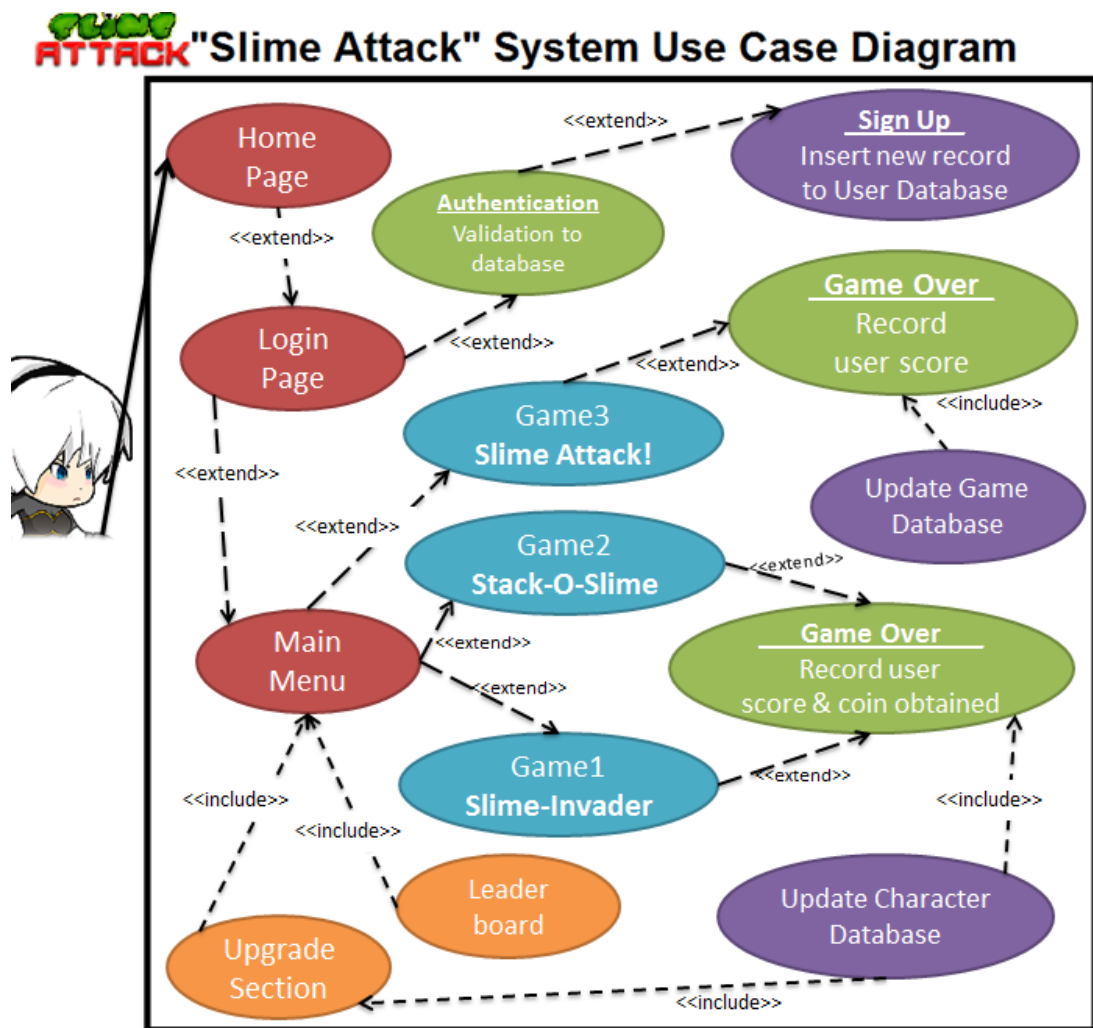


Figure 4.3: Use Case Diagram

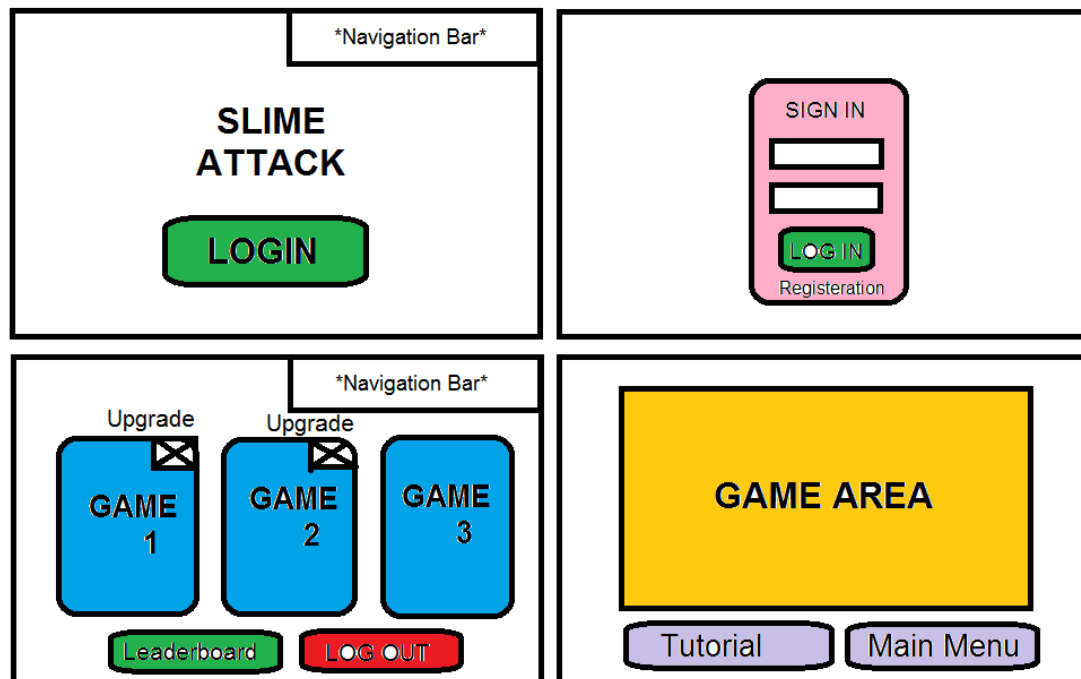


Figure 4.4: Storyboard

### Home Page & Login Page

The use case diagram shows what user can do in the web application prototype and how system will invoke the function to the database. When user first open the website, a home page will show up. User can view all the detail about game like news, background and the creator behind the game in homepage. The home page will have a button that redirect user to login page. The login page allow user to create new account or login as existing account. For new user, the sign up button will bring the register form show up. New user then can fill in detail at the form. For each data fill in the input field, the database will start checking the validation. A function will be trigger to check does the input are valid or if the data existed. If every input pass the validation, new user record will be inserted to User database. This include all the detail user input, new game record and character record will be insert in each table respectively. For existing user can directly enter their registered username and password in login form. After the login button clicked, the database will start validate does this user account are correct. If everything is fine, the system will now direct user into Main Menu page.

### **Main Menu Page & Game Page**

The Main Menu have 5 section: Game 1, Game 2, Game 3, Upgrade Character Data and Leaderboard. For first time user, the Game 2 & Game 3 selection will be disable until user finish the Game 1. After Game 1 is completed, the database will update the flag to unlock Game 2. For the Game 3, it will stay locked since it was designed for special event where it will only be unlocked for a limited time by the developer.

Either one game will trigger the game screen for user to play. Each game page will load respective character data into the game. For the first two game story modes, after the game over, the system will start recording the score and the coin / diamond user obtained. All game modes including Game 3 the challenge mode, after the game over, system will calculate the score obtain and compare to the high score saved in database. If the player's high score is higher than the existing high score, the database will update the high score to the database.

On the other side, the character data & high score leaderboard will be loaded from database right after user enter the Main Menu. The upgrade button is embedded on the game title, once user clicked it, a display will show the specific character data details such as name, level, coin / diamond, attack, defend and health. User then can use respective coin / diamond obtained in game to perform character upgrade. The database will store the updated character data and refresh to user once they perform the upgrade. Next, the leaderboard will also display in same method but after user clicked on the Leaderboard button. The leaderboard will display the top 10 high score stored in database for both story mode games.

### 4.3 Database Relational Model

There will be a total of 7 tables created in “Slime Attack Plus” database. Each of them has different uses in order to make the project data well organized. All tables are made and relationship has done between each table to form a complete database relational model.

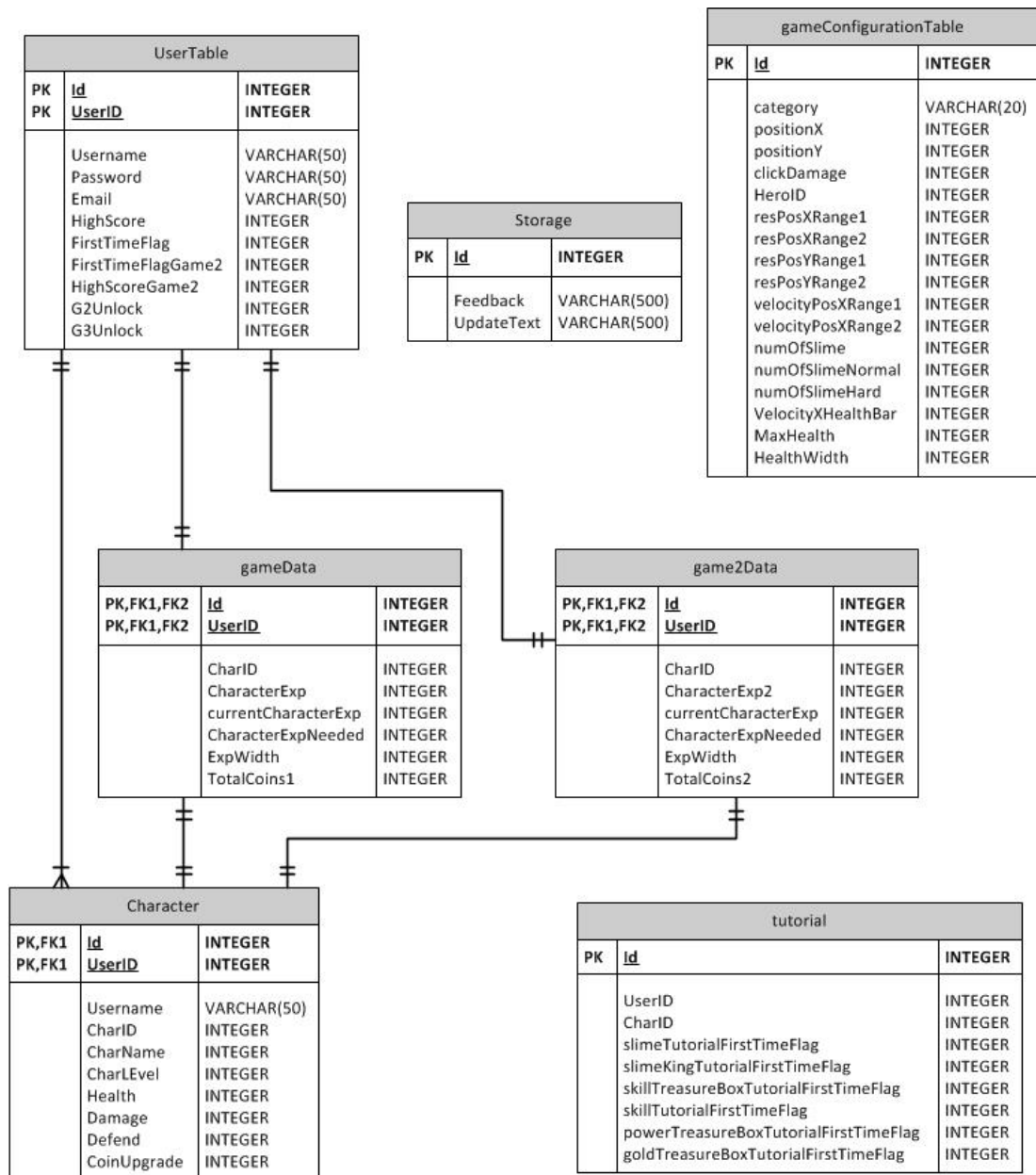


Figure 4.5: Complete Database Relational Model

## Main Table

### User Table

UserTable		
PK	<u>Id</u>	INTEGER
PK	<u>UserID</u>	INTEGER
	Username	VARCHAR(50)
	Password	VARCHAR(50)
	Email	VARCHAR(50)
	HighScore	INTEGER
	FirstTimeFlag	INTEGER
	FirstTimeFlagGame2	INTEGER
	HighScoreGame2	INTEGER
	G2Unlock	INTEGER
	G3Unlock	INTEGER

Figure 4.6: User Table

User table will be record User ID, Username, Password & Email which is entered by user self. After that database will auto insert a 0 to High Score for new user account to be updated. There will be 5 flag store inside user account for Game progress detection. All the flag was set to false 0 and will update to true 1 once the user complete the progression.

### Character Table

Character		
PK,FK1	<u>Id</u>	INTEGER
PK,FK1	<u>UserID</u>	INTEGER
	Username	VARCHAR(50)
	CharID	INTEGER
	CharName	INTEGER
	CharLEvel	INTEGER
	Health	INTEGER
	Damage	INTEGER
	Defend	INTEGER
	CoinUpgrade	INTEGER

Figure 4.7: Character Table

In Character Table, it will record User ID from user table into it after user register an account. Currently each user will have 2 Characters available in their account – Aries



& Leo. All the character stats will be created at a default value. When user acquire the amount of upgrade coin, they can perform upgrade on specific character. The table will then update the stats and also the Coin Upgrade recording the coin needed to perform next upgrade. The Damage will be used in each game respectively and Health & Defend will only be used in Game 3 Boss Fight scene.

### Game Data Table

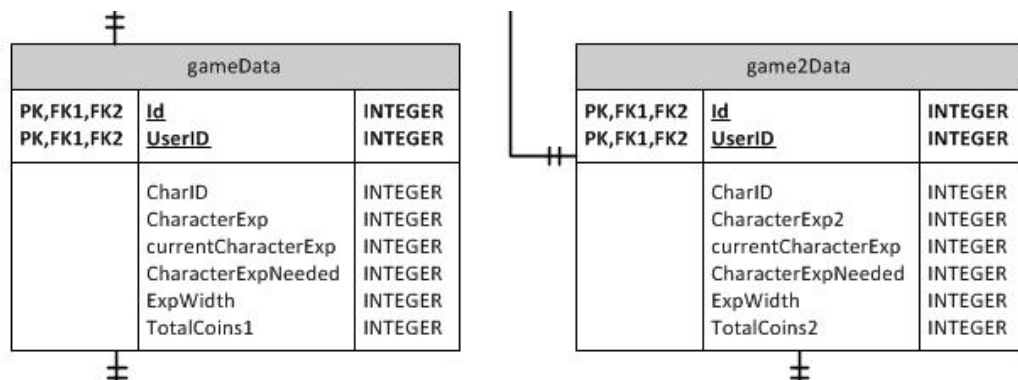


Figure 4.8: Game Data Table

There will be 2 game data table that will record the Character Experience and the Coin they obtained in each game respectively. This table data will use to be load as end game screen in both games.

**Minor Table**

gameConfigurationTable		
PK	<u>Id</u>	INTEGER
	category	VARCHAR(20)
	positionX	INTEGER
	positionY	INTEGER
	clickDamage	INTEGER
	HeroID	INTEGER
	resPosXRange1	INTEGER
	resPosXRange2	INTEGER
	resPosYRange1	INTEGER
	resPosYRange2	INTEGER
	velocityPosXRange1	INTEGER
	velocityPosXRange2	INTEGER
	numOfSlime	INTEGER
	numOfSlimeNormal	INTEGER
	numOfSlimeHard	INTEGER
	VelocityXHealthBar	INTEGER
	MaxHealth	INTEGER
	HealthWidth	INTEGER

tutorial		
PK	<u>Id</u>	INTEGER
	UserID	INTEGER
	CharID	INTEGER
	slimeTutorialFirstTimeFlag	INTEGER
	slimeKingTutorialFirstTimeFlag	INTEGER
	skillTreasureBoxTutorialFirstTimeFlag	INTEGER
	skillTutorialFirstTimeFlag	INTEGER
	powerTreasureBoxTutorialFirstTimeFlag	INTEGER
	goldTreasureBoxTutorialFirstTimeFlag	INTEGER

Storage		
PK	<u>Id</u>	INTEGER
	Feedback	VARCHAR(500)
	UpdateText	VARCHAR(500)

Figure 4.9: Table with Minor Function

There will be some extra table that will only have minor uses in the game prototype. A Storage table that use for store the data that will be used in home page that contain a Feedback column that will insert a new record everytime user submit a feedback to us and a UpdateText column that use to store update news that convenience for developer to post news about game update.

There will be a Tutorial table that used to record the user's in game tutorial flag. The flag will be update after user done their tutorial. Another Game Configuration table that once use to store data for game to perform dynamic generated data. But there will be some limitation happens in game when using the table so the table now is only partially / minor used.

## CHAPTER 5

### IMPLEMENTATION AND TESTING

#### 5.1 Software Used

**Integrated Development Environment (IDE):** Microsoft Visual Studio 2013



Figure 5.1: Microsoft Visual Studio 2013

The IDE of this prototype selected is Microsoft Visual Studio 2013. Visual Studio is a most common and popular IDE for web programming. It supports creating ASP.NET that with code behind and also allows easier creation toward MSSQL database. The main reason we selected VS2013 is due to the Phaser.io library first supported IDE is VS2013. For not thinking further, we select 2013 version as our game prototype IDE to prevent there is any incompatible in newer version.

**Project Language: ASP.NET & C#**



Figure 5.2: ASP.NET with C#

ASP.NET is a web application programming language with code behind support which is with C#. ASP.NET can create not only webpage but a whole web application. For example, ASP.NET able to creates a simple looking button on webpage but with powerful function in it because the button able to trigger the function written in code behind by C#. With C# allow create a connection string to a database created inside the project. Database connected can directly retrieve data to ASP.NET or C#.

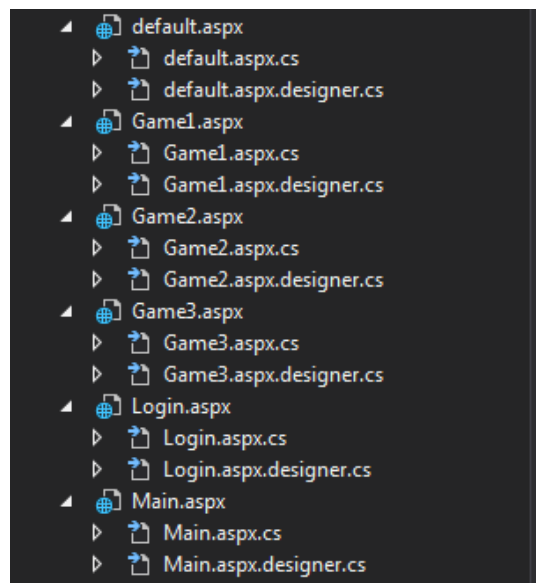


Figure 5.3: ASPX file with C# as code behind

## Database: Microsoft SQL Server (MSSQL)



Figure 5.4: MSSQL Server Management Studio

MSSQL creation is very easy inside Visual Studio. It also able to connected to ASP.NET by just a connection string. The database created can directly do simple function inside the Server Explorer in Visual Studio. With installed SQL Server Management Tools, it become very easy to manage the database inside the software in both online database or localdb.

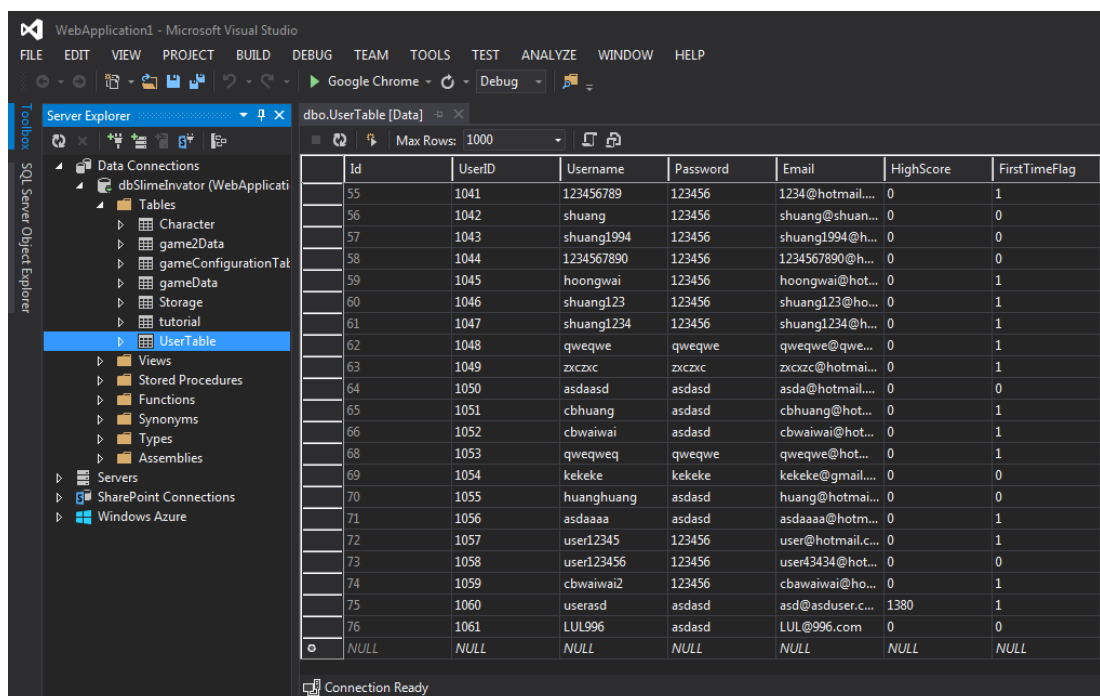


Figure 5.5: MSSQL Database in VS2013

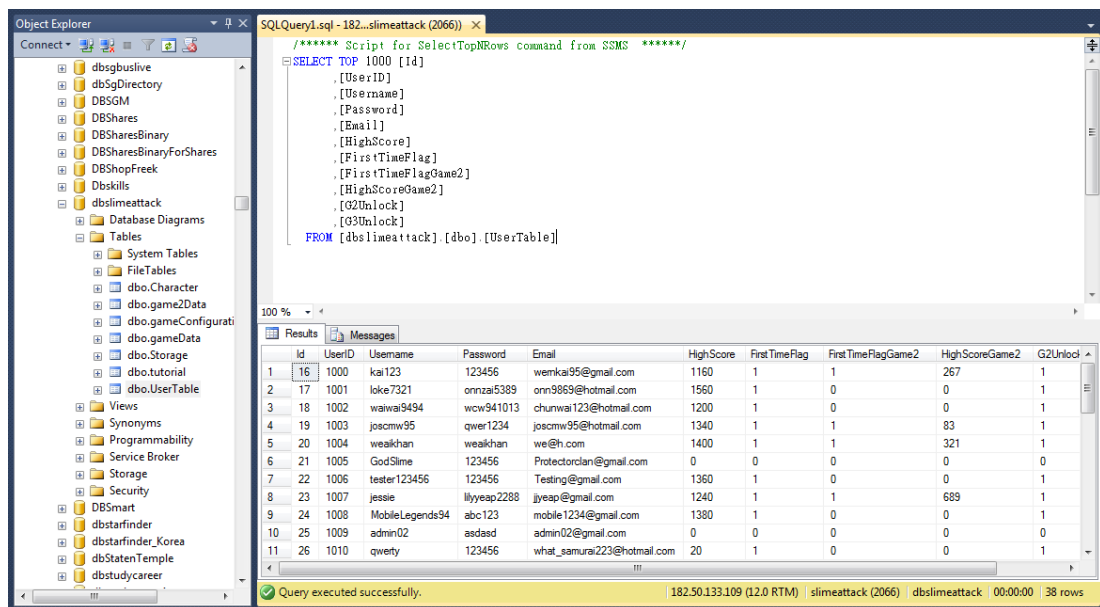


Figure 5.6: Connect MSSQL Database Online in SQL Server Management Studio

## Web Language: HTML5, CSS3, JavaScript



Figure 5.7: HTML5, CSS3 & JavaScript

With HTML5 & CSS3 released, modify a layout and design of a webpage has become better than ever. The coding are able to be mix together with including each tag only, and it allow a webpage combine both design and function together. With implementing all these web language along with ASP.NET, the game prototype web application had become very versatility in both function and design. It can also fire the function in C# or read data from database. All of them make the web application become a wonderful project.

**Game Language:** Phaser.io (JavaScript)



Figure 5.8: Phaser.io

Phaser.io is an open source HTML5 game framework for Canvas and WebGL powered browser games. It contains a large library and allows developer to implement the library to create a game of wanted. The library are written in JavaScript language. The game prototype has implemented the written game script file into the ASP.NET web page and it allows the game able to connect a database in code behind for store and read data.

### **Game Design Tools: Adobe Photoshop & Spriter**



Figure 5.9: Photoshop & Spriter

Adobe Photoshop is the most popular software to edit image. With some knowledge about the Photoshop since young age, I was able to adapt it into the use of drawing the game item quickly. To create originality, all the game content such as character, background, wallpaper, and logo are created by my own using Photoshop. The drawing process took a very long time and required high patience.

After completion of designed character, the character are now able to put into Spriter, an animation software. Spriter able to animate a character by attaching a “bone” structure on multiple images of a character such as hand, leg, body and head. After attached the bone, it can now be animate within each keyframe created in timeline. Once all the animation keyframe completed, Spriter are able to render all the frame into a spritesheet that Phaser game required to perform animation.



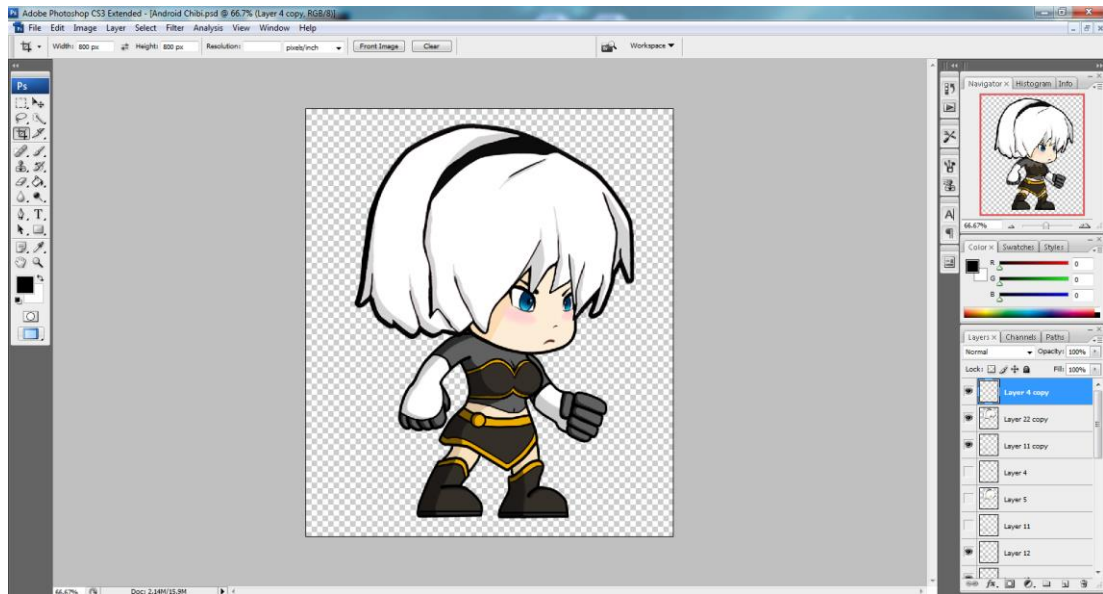


Figure 5.10: Character Design in Photoshop

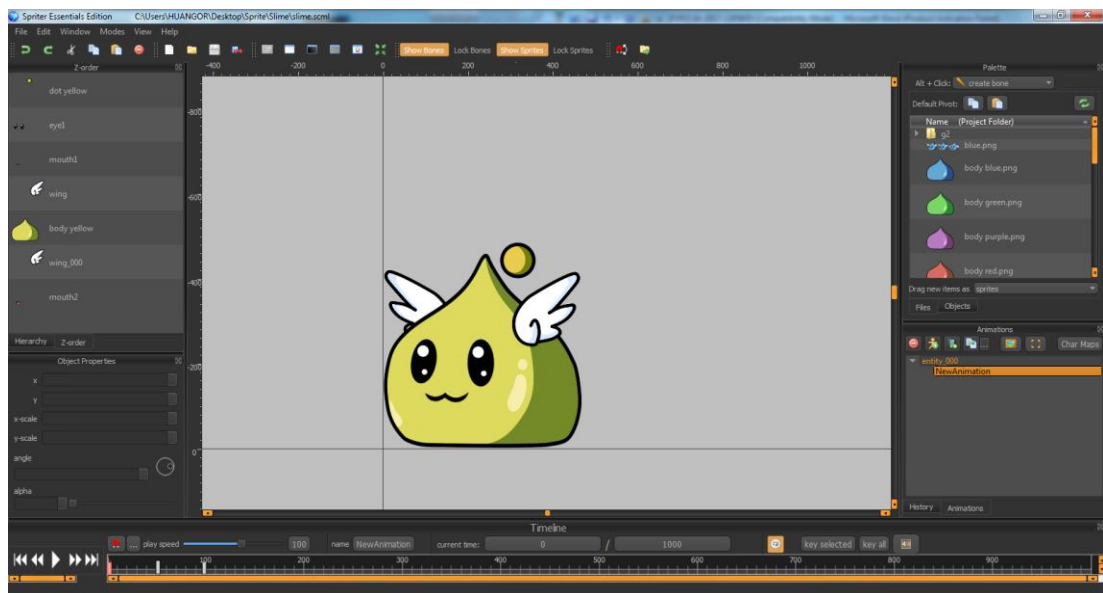


Figure 5.11: Animation in Spriter

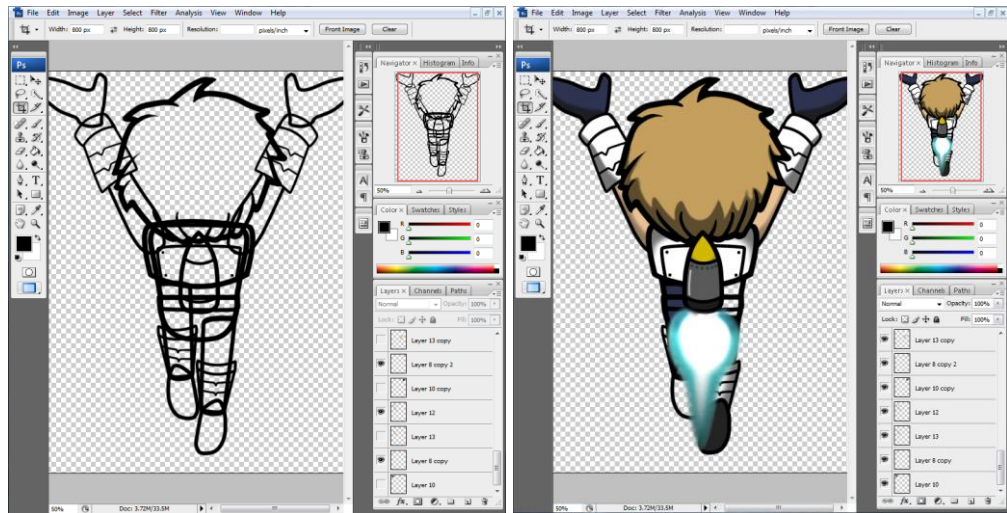


Figure 5.12: Before & After Character Drawing

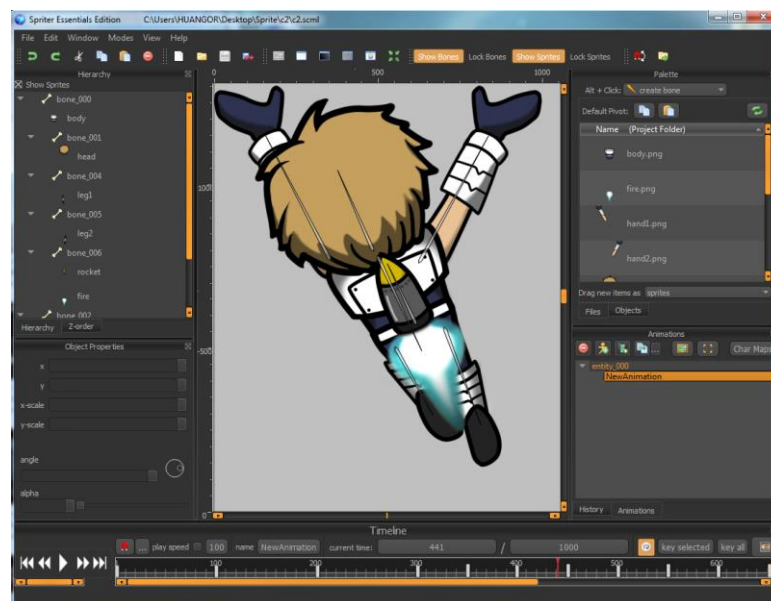


Figure 5.13: Build Animation with Bone

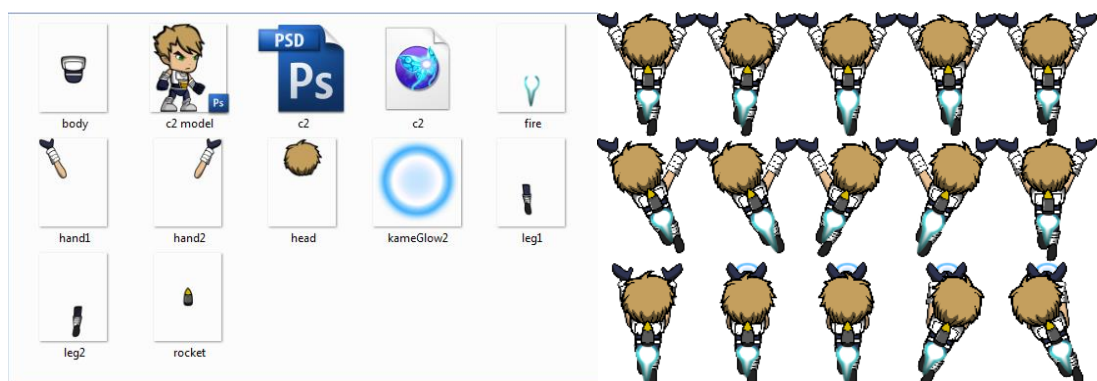


Figure 5.14: Image Files & Spritesheet Rendered

## Web Hosting Services Provider: GoDaddy



Figure 5.15: GoDaddy

GoDaddy is one of the website hosting services provider that can be easily found online. One of the main reason we choose GoDaddy is they offer their package in MYR (Malaysian Rigit). GoDaddy did offer domain name and hosting services. Another reason we choose GoDaddy is because in their plan they provide 1 MSSQL Database to be implement into their server. This reduce our work for deploy our database to elsewhere. In hosting part, GoDaddy is using Plesk 12 control panel.

	Best Value	Most Power and Security
<b>Economy</b> Best price for a basic site.  As low as <b>RM16.00/mo</b> On sale - <b>Save 50%</b> RM31.99/mo when you renew <sup>4</sup>	<b>Deluxe</b> More space and flexibility for multiple sites.  As low as <b>RM20.28/mo</b> On sale - <b>Save 49%</b> RM40.56/mo when you renew <sup>4</sup>	<b>Ultimate</b> Handles the most complex sites and heaviest traffic.  As low as <b>RM34.00/mo</b> On sale - <b>Save 50%</b> RM67.99/mo when you renew <sup>4</sup>
<b>Add to Cart</b>	<b>Add to Cart</b>	<b>Add to Cart</b>
1 website 100 GB storage Unmetered bandwidth ⓘ Free Microsoft Office 365 Business Email – 1st year ⓘ 10 MySQL databases (1GB each) 1 MSSQL database (200MB) 50 FTP users Free domain* with annual plan ⓘ Site backup & restore (paid option)	Unlimited websites Unmetered storage ⓘ Unmetered bandwidth ⓘ Free Microsoft Office 365 Business Email – 1st year ⓘ 25 MySQL databases (1GB each) 2 MSSQL databases (200MB each) 50 FTP users Free domain* with annual plan ⓘ Site backup & restore (paid option)	Unlimited websites Unmetered storage ⓘ Unmetered bandwidth ⓘ Free Microsoft Office 365 Business Email – 1st year ⓘ Unlimited MySQL databases (1GB each) Unlimited MSSQL databases (200MB each) Unlimited FTP users Free domain* with annual plan ⓘ Site backup & restore (paid option) Premium DNS ⓘ 1-year SSL certificate <sup>††</sup> to secure customer data and increase search rankings. (restrictions apply) ⓘ

Figure 5.16: Current plan offered by GoDaddy

## An Action Arcade Web-Based Game – Slime Attack Plus (Backend Integration)

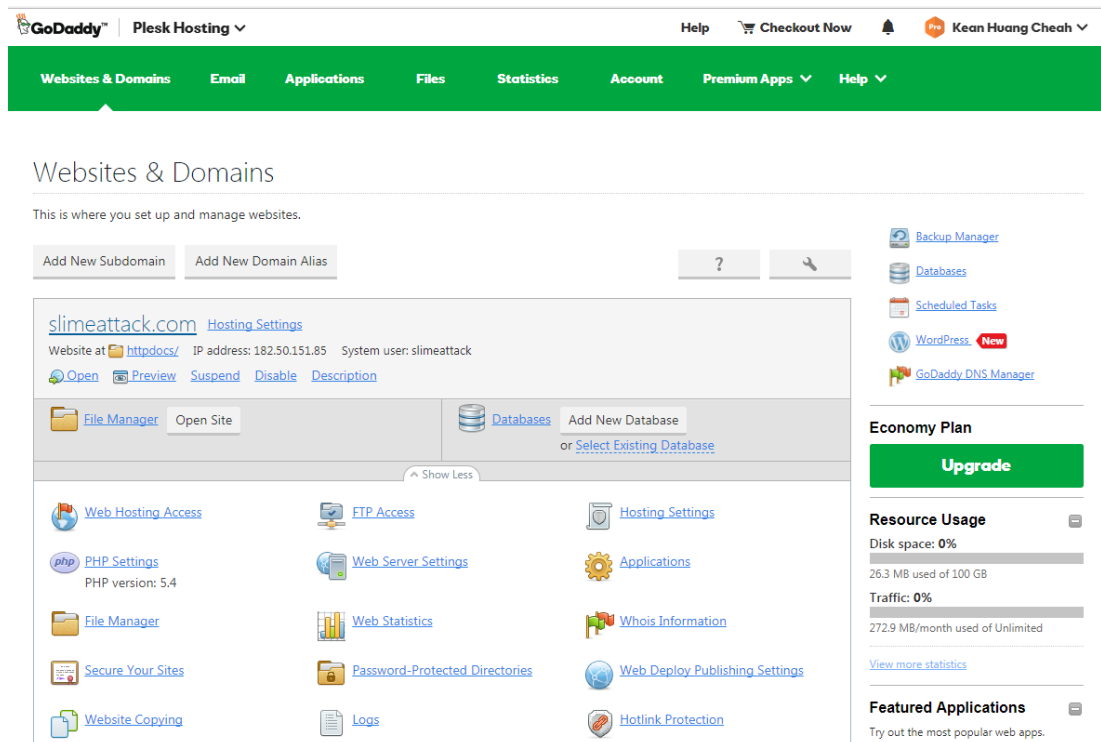


Figure 5.17: GoDaddy Hosting's Plesk Control Panel

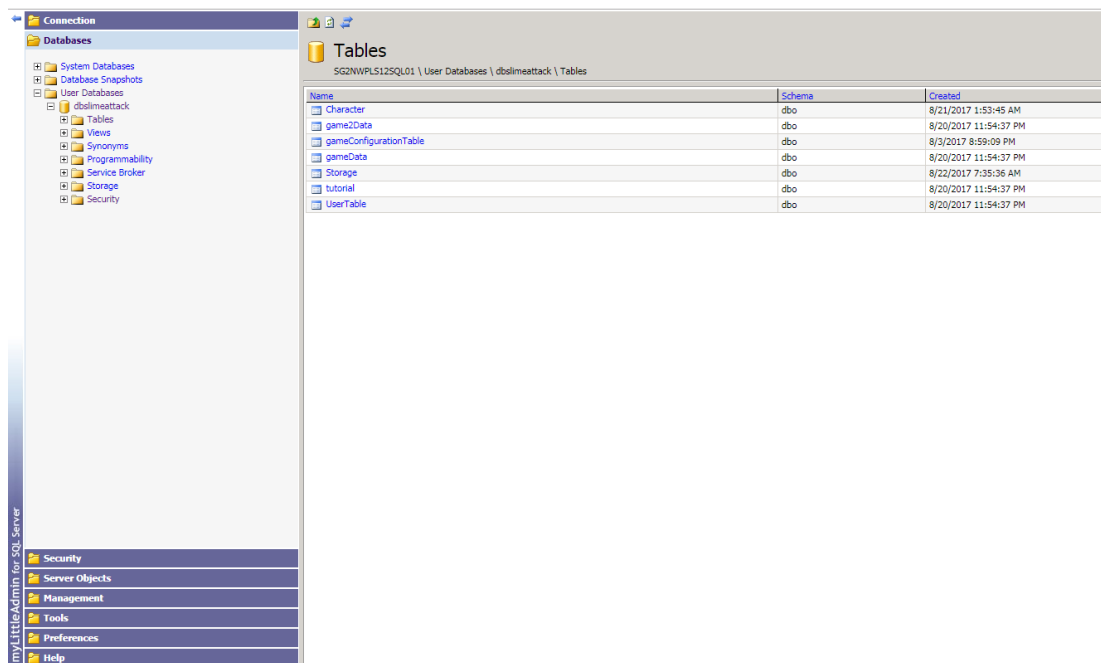


Figure 5.18: Online MSSQL Offered by GoDaddy

## **5.2 Issues / Challenges in the implementation**

One of the biggest problems in implementation is selecting the hosting provider. There are tons of hosting services provider in the world and all of their services provided are significantly different. We been tried few of it until we select our final hosting provider which is GoDaddy.

### **Hosting Services Provider Selection Issue**

The first we tried is using Microsoft Azure since our class had thought and it is directly located inside Visual Studio. Azure did provide a lot of powerful services inside their server but the free services aren't able to satisfy us. If we choose a paid plan, the price range would go from about RM100 up to RM2000. Even the cheapest is too much for us.

Next we tried H2 Hosting because it having promotion and cost about RM30. The services provided by H2 is by far the best, fastest, most stable and most suitable services for us but it required us to have own domain name or we had to purchase it with high price. Without knowing some knowledge of web hosting, we searched online looking for cheap domain name and we found GoDaddy provide a very cheap domain name at RM3.99. There were the mistake makes as after purchasing the domain name, we found out we aren't able to relocate the domain name to H2 server due to a fact that cyberlaw has restricted a newly purchased domain must wait 60 days until it can relocated to other hosting service provider. This causes us a lot trouble and in the end we had to give up H2 Hosting and start looking for GoDaddy.

Luckily GoDaddy did have a cheap hosting plan that got our minimum requirement but its feature is far worst than H2. Although GoDaddy use the same hosting paneas H2 which is Plesk Control Panel but the version is far slowest and also lack of feature compare to H2. The luckiest thing is GoDaddy provided what our project minimum needs and we are able to publish the web application without much trouble. One of the down side of GoDaddy is they did not provide SSL certificate to secure their domain and hosting services. It took me sometime until I was able to found

Comodo SSL which giving me a free SSL certificate to licensed our website in GoDaddy.

### **After published changes**

After we successfully deploy the web application to hosting server, the integration of module has become harder and ever. Whenever any module got problem, the module has to report to all other module he needed to apply a changes into the web hosting server. Then every other module must backup their published file before the module update the changes on the web server. The integration too longer and cause more trouble as sometime redundant or missing of code and function will be found inside the web server.

Another publishing trouble is some coding inside the web application in local machine and in hosting server has slightly different in a way that doesn't affect the program but affect the web server. These different aren't noticeable but it will cause some serious bug on the application. So it is quite troublesome to find all those little trouble out and until now we cannot 100% sure everything has solved.

### 5.3 Graphical User Interface (GUI)

The GUI of the game prototype web application is as shown below. Once the application launch, the home page will be opened:

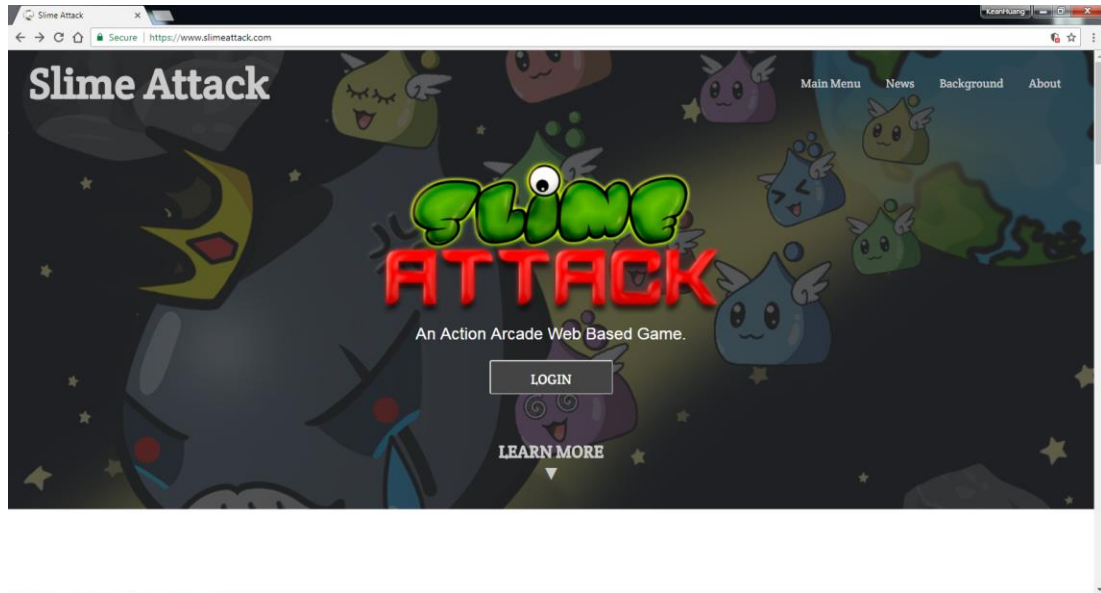


Figure 5.19: Home Page

The Home Page will have a navigation bar. The link will auto scroll down to respectively section.

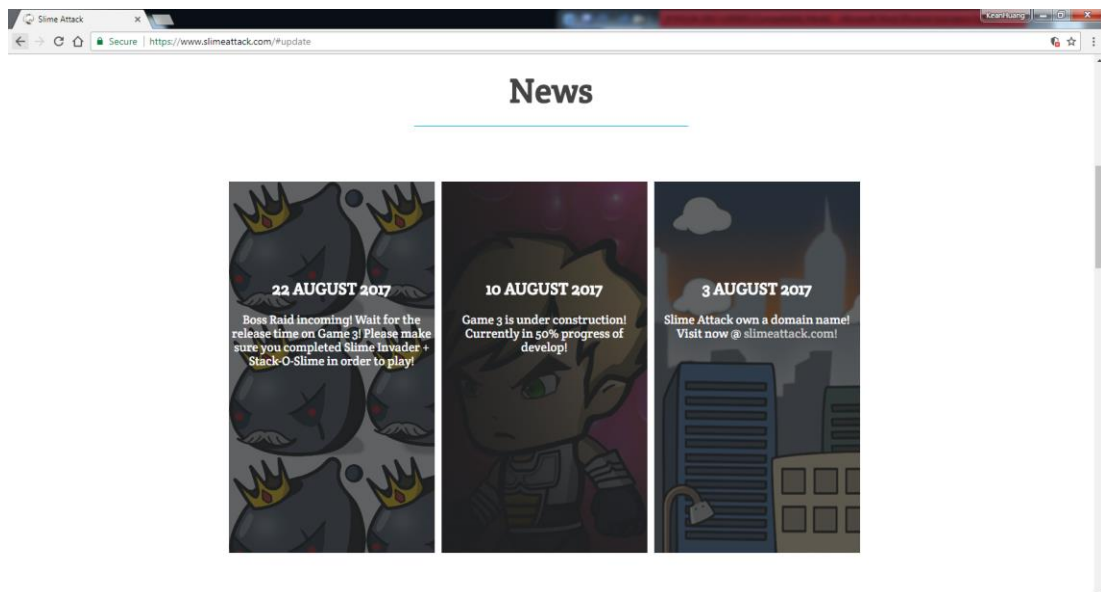


Figure 5.20: News Section



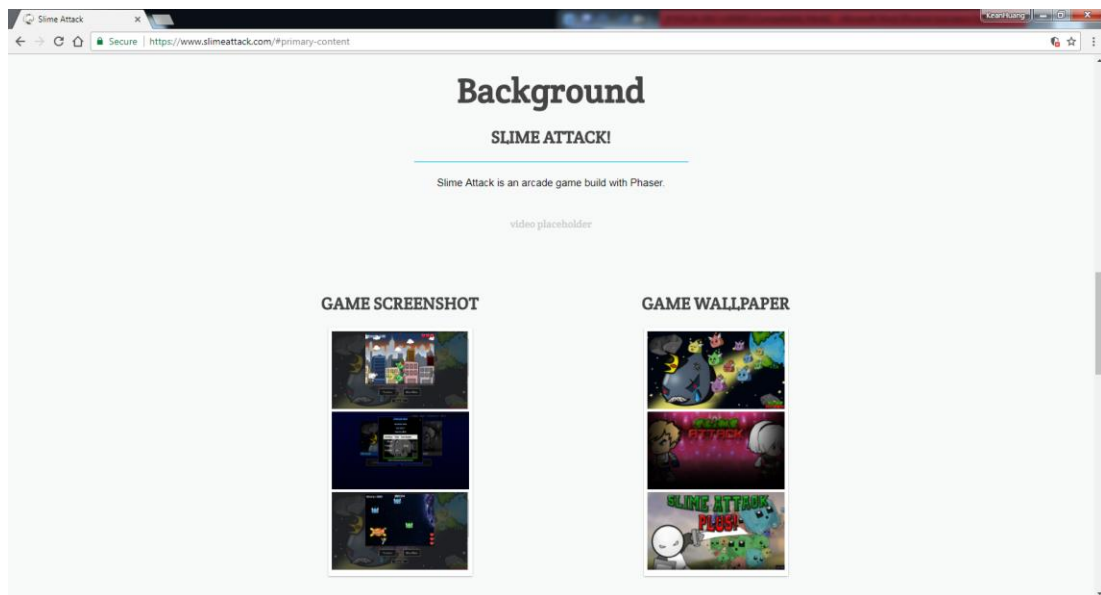


Figure 5.21: Background Section

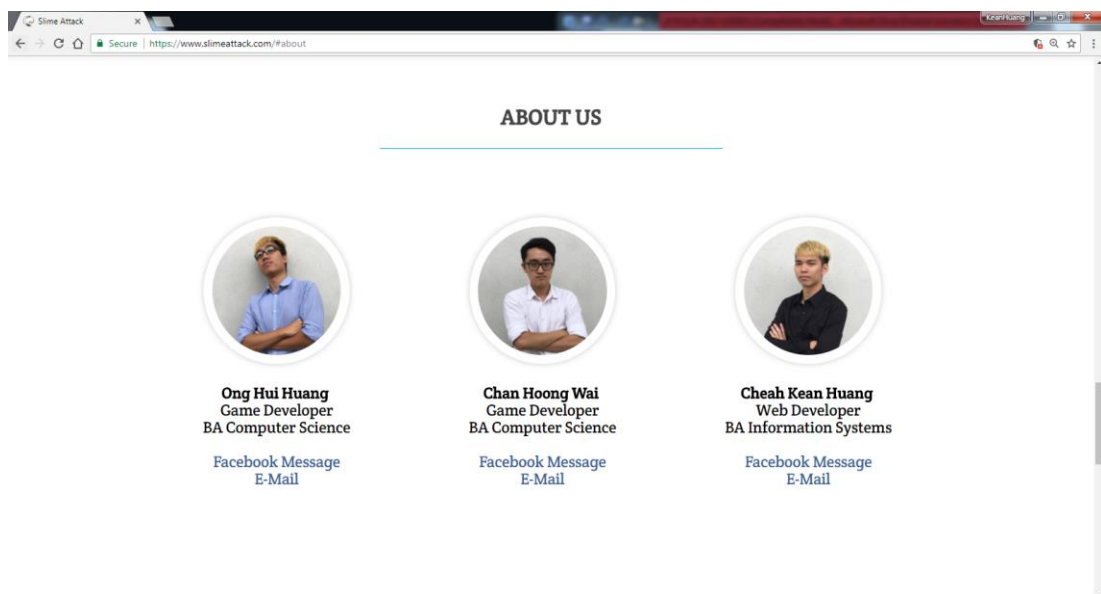
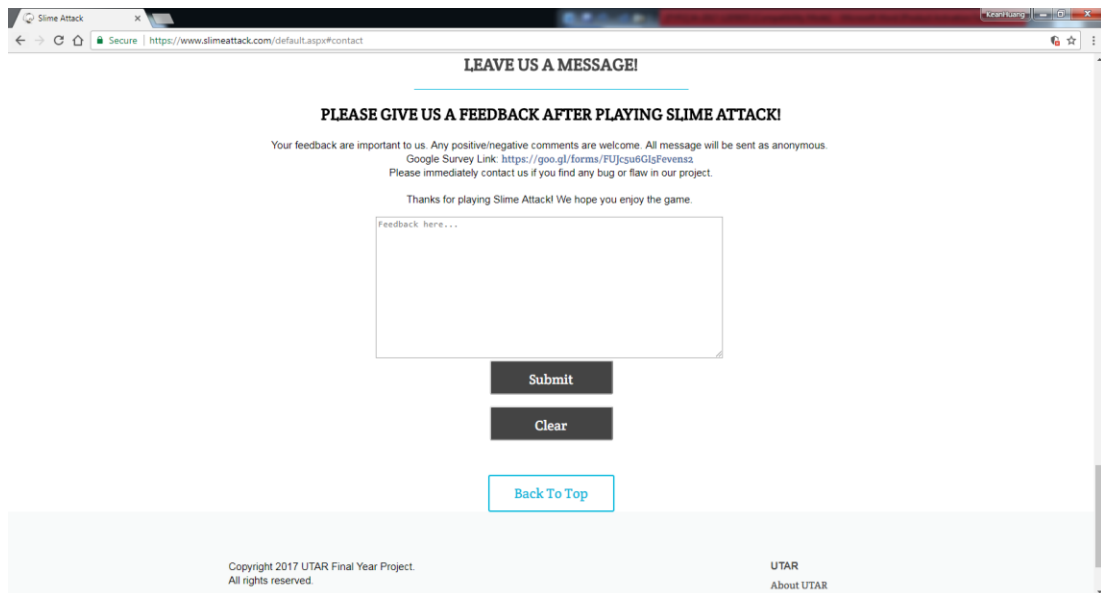


Figure 5.22: About Us Section



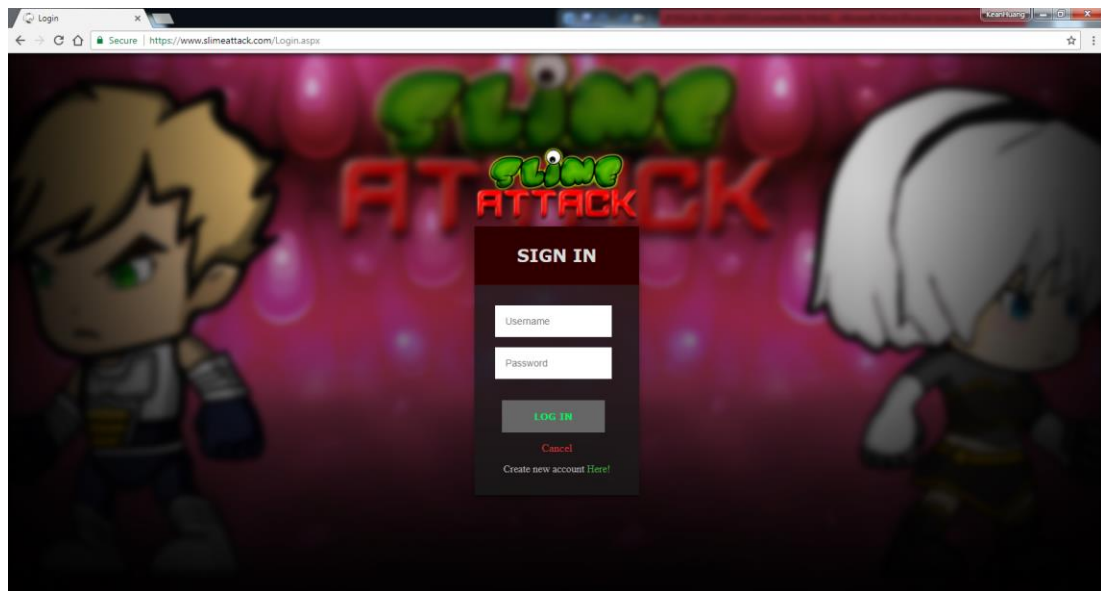
## An Action Arcade Web-Based Game – Slime Attack Plus (Backend Integration)



The screenshot shows a web browser window with the URL <https://www.slimeattack.com/default.aspx#contact>. The page has a white background with a dark header. The main content area is titled "LEAVE US A MESSAGE!" in bold. Below this, it says "PLEASE GIVE US A FEEDBACK AFTER PLAYING SLIME ATTACK!". A paragraph of text explains that feedback is important and that all messages are anonymous. It includes a Google Survey Link: <https://goo.gl/forms/FUJcsu6GlsFevess2> and asks users to contact them if they find a bug or flaw. A text box labeled "Feedback here..." is provided for users to enter their feedback. Below the text box are two buttons: "Submit" and "Clear". At the bottom of the form is a "Back To Top" button. The footer contains copyright information: "Copyright 2017 UTAR Final Year Project. All rights reserved." and a link to "About UTAR".

Figure 5.23: Feedback Section

After user click the Login button. The page will be redirect to Login Page.



The screenshot shows a web browser window with the URL <https://www.slimeattack.com/Login.aspx>. The page features a dark background with a large, stylized "SLIME ATTACK" logo in the center. On the left and right sides of the logo are two cartoon characters: a blonde boy on the left and a white-haired girl on the right. In the center, there is a dark gray login form with the title "SIGN IN". The form contains two input fields: "Username" and "Password". Below these fields is a green "LOG IN" button. At the bottom of the form, there are two links: "Cancel" and "Create new account Here!".

Figure 5.24: Login Page

Existing user can login at here. New user can click the create new account link at bottom of the form. The login form will be transition into a register form.

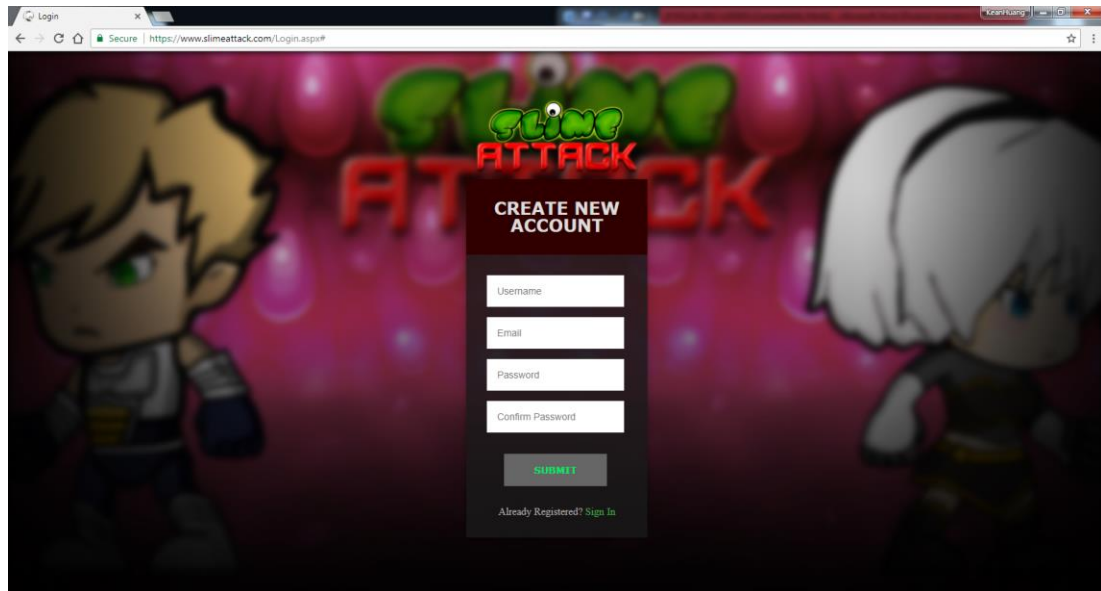


Figure 5.25: Registration Form

After user login, the page will now redirect to Main Menu page. For first time login user, Main Menu will only display Game 1 (Slime Invader) in color. Which mean two of the other game is not available. A tooltips will show when user hover on the greyscale game title, saying it's not available.

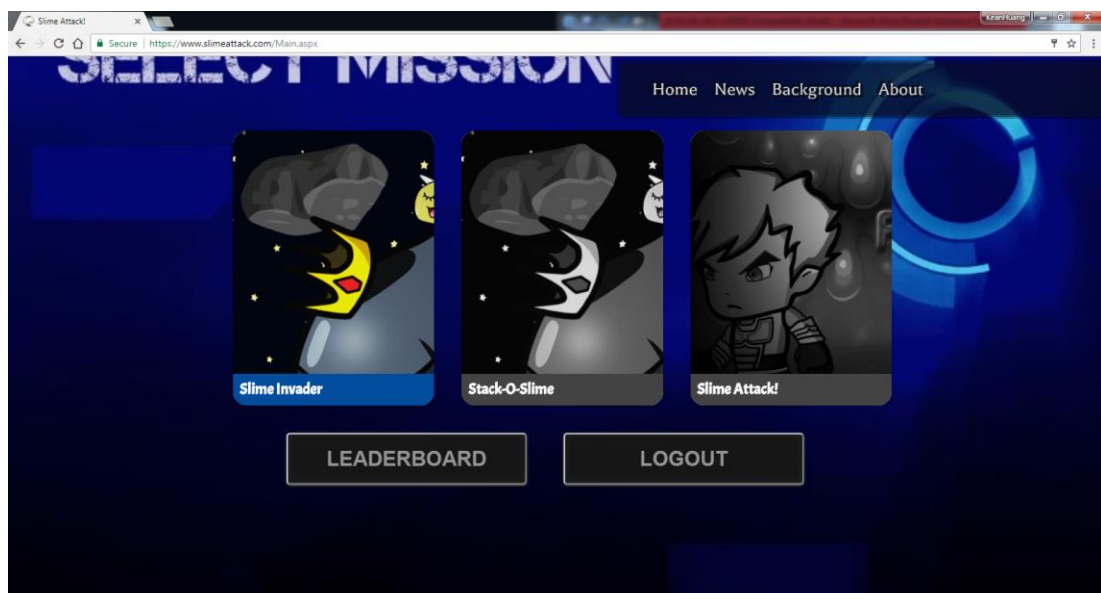


Figure 5.26: Main Menu for First Time Player

The only choice for user is to start the Game 1. The Game 1 page will be opened up and tutorial will be shown for first time user.

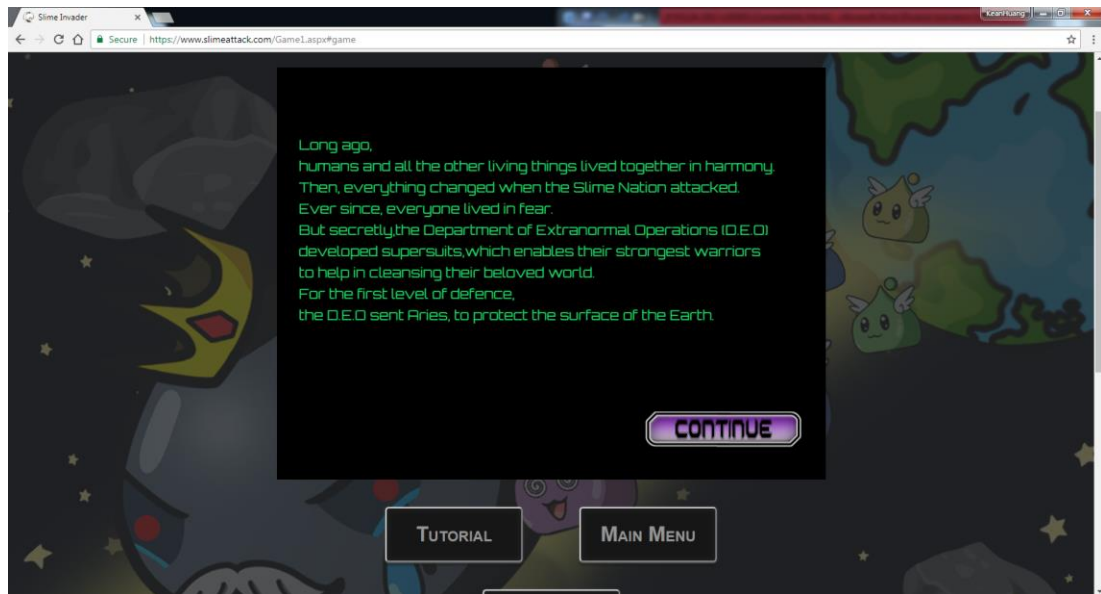


Figure 5.27: Game 1 (Slime-Invader) Page

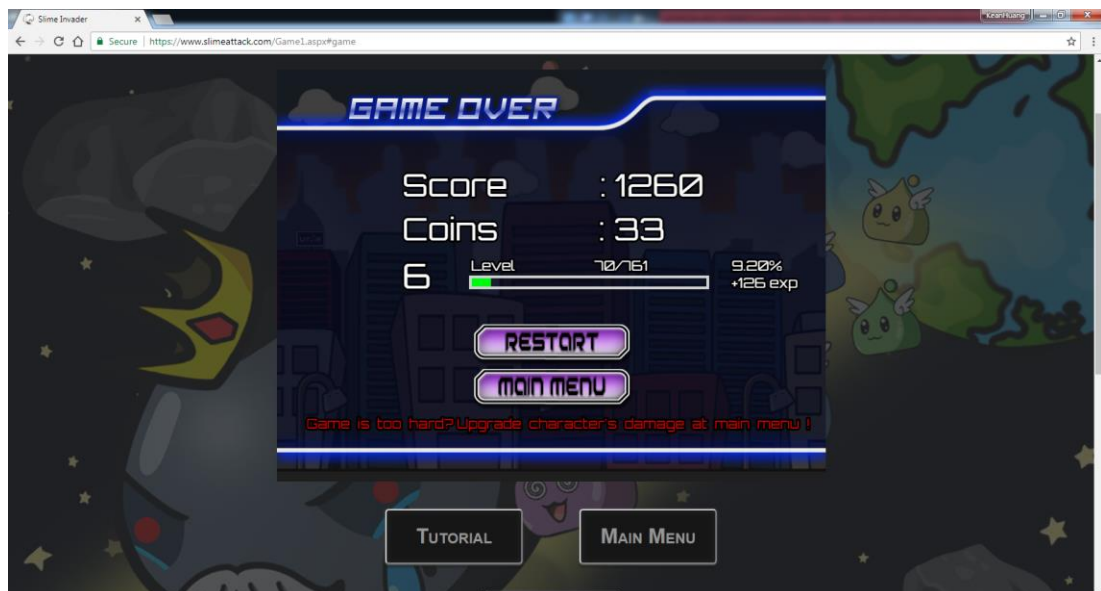


Figure 5.28: Slime-Invader Game Over

After the game end, the database will record down the user score and coin obtained. User can spend their coin on upgrading the character in Main Menu page.

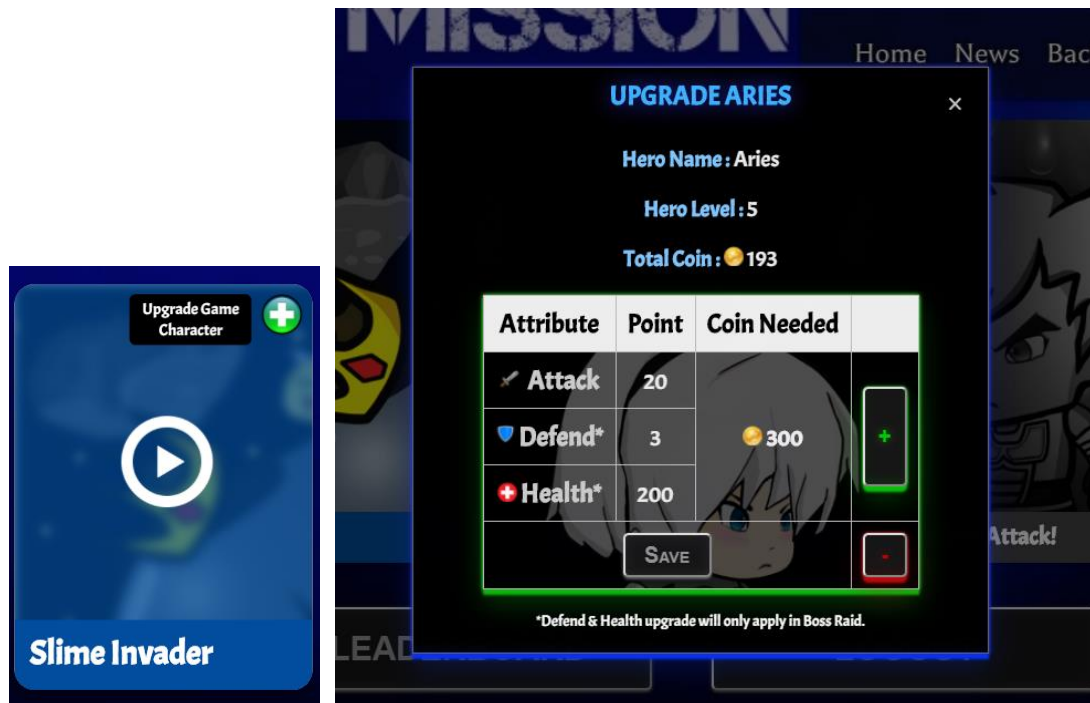


Figure 5.29: Upgrade Section can be found at top of Game Title



Figure 5.30: Main Menu after Unlock Game

The Main Menu will be show with Game 2 (Stack-O-Slime) unlocked after user completed Game 1. User now can start playing Game 2.

## An Action Arcade Web-Based Game – Slime Attack Plus (Backend Integration)

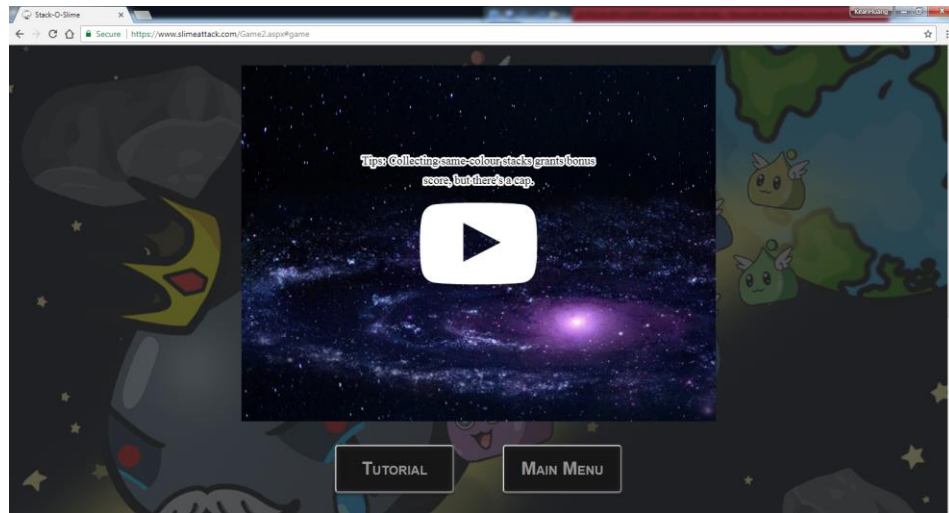


Figure 5.31: Game 2 (Stack-O-Slime) Page

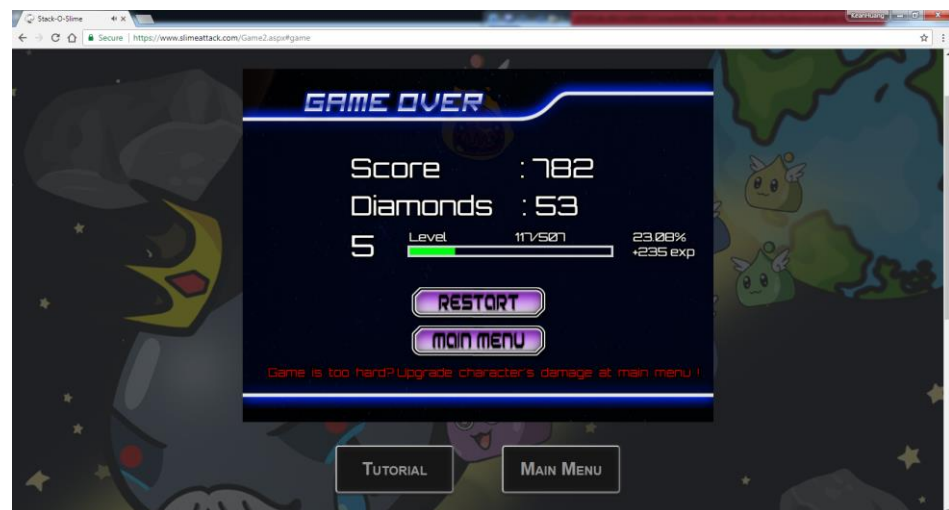


Figure 5.32: Stack-O-Slime End Game Screen

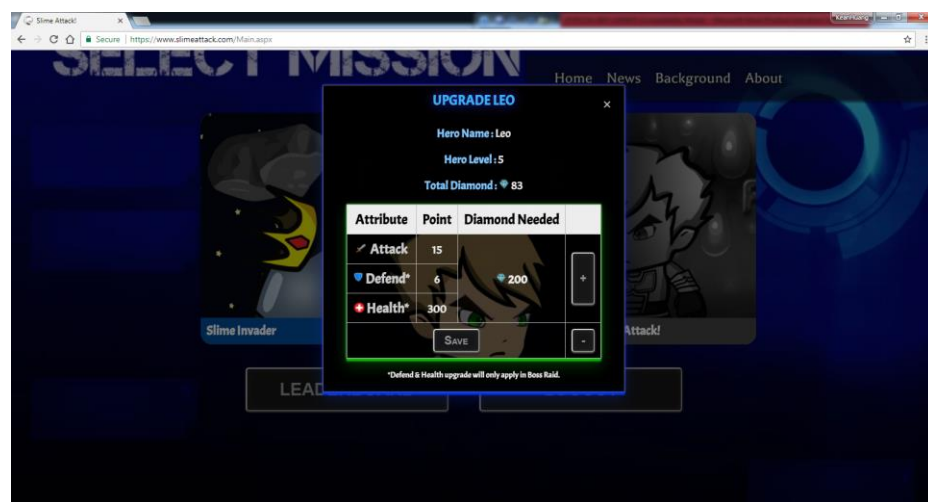


Figure 5.33: Game 2 Character Upgrade



On the below of Main Menu, there is two button available: Leaderboard and Logout. Leaderboard will display the top 10 high score of both Game 1 & Game 2. Logout button will clear user session and redirect them back to Home Page.



Slime-Invasion High Score!		Stack-O-Slime High Score!	
Player	High Score	Player	High Score
William	5260	William	2492
KeyboardWarrior	3960	huangorino	2318
huangorino	3960	viagerz	1053
IrisNotAlice	3860	KeyboardWarrior	751
feederlai	2460	hong123	740
BabiCrystal	2040	jessie	689
admin01	1980	wealkhan	321
sean88	1660	BabiCrystal	304
ongweilun1	1640	ongweilun1	283
loke7321	1560	kali23	267

Figure 5.34: Leaderboard Screen

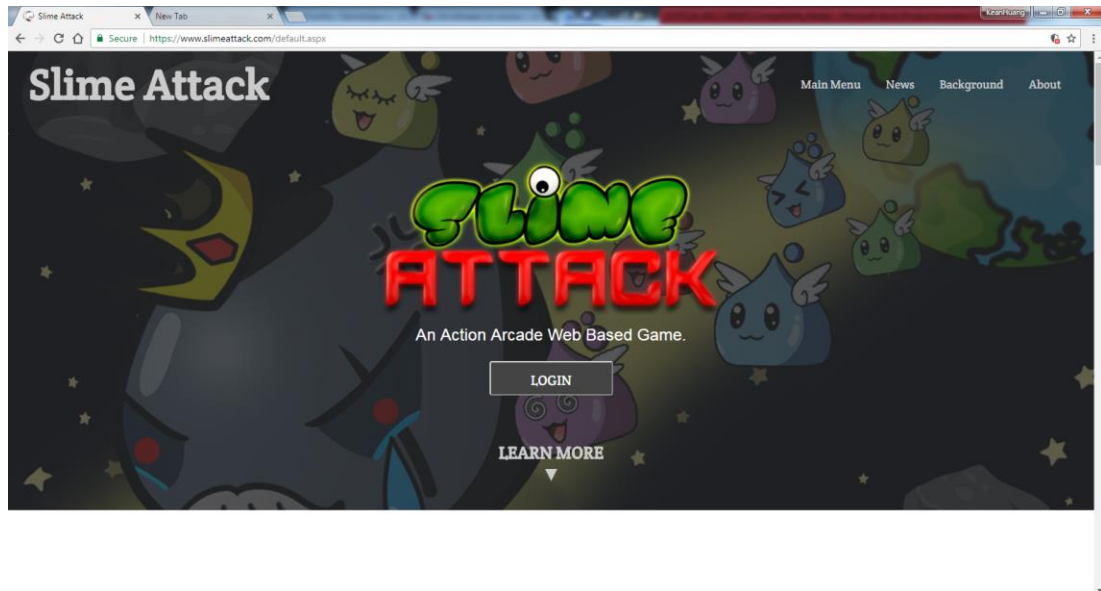


Figure 5.35: Logout

## 5.4 Testing

In order to evaluate the prototype functionality and features, black box testing and survey is conducted to enhance and improve the functionality. Through black box testing, the game prototype is able to find some bugs and error occurs when running the program. This is a good opportunity to improve and fix the program which can reduce the chance of failure.

### 5.4.1 Black Box Testing for Backend Module

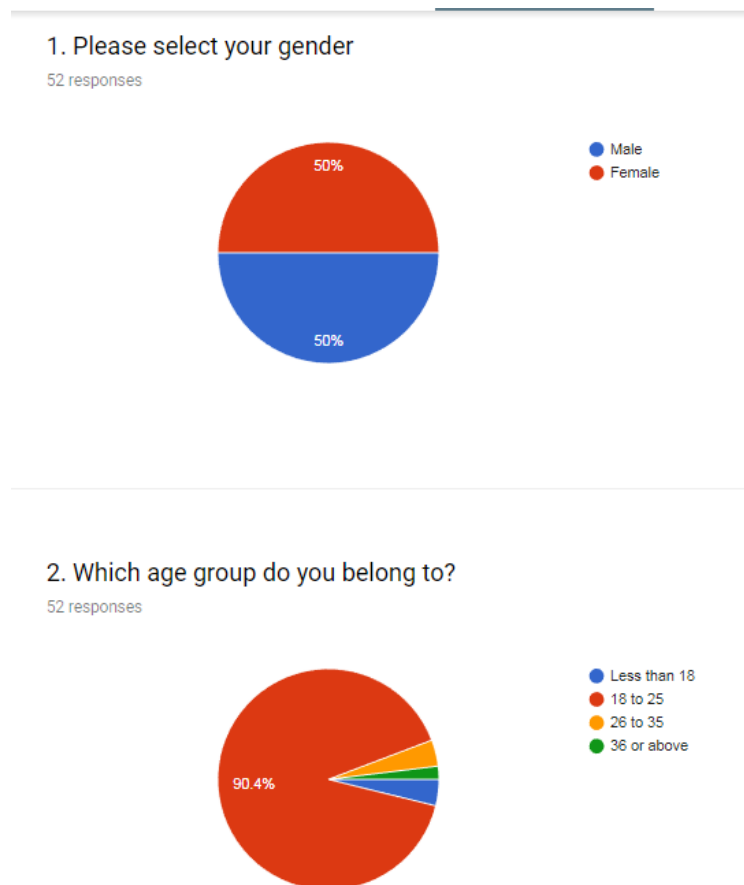
Test Case	Function Name	Inputs	Expected Output	Actual Output	Action Needed
Enter non alphabet input in register form	btnSubmit_Click()	!@#ASD#	Error Tooltips Show	Error Tooltips Display	Pass
Minimize browser to smaller resolution	-	Browser Minimize Button	Webpage interface resized to suitable resolution	Only some item resize to fit the resolution	Need to add css function to detect resolution changes
Click Save button without make changes to character stat	btnSave()	Save Button	Nothing saved. The stats will remain	Screen still refresh but nothing saved	Pass
Enter webpage url without https	-	slimeattack.com	Webpage will redirect https	Only www show up, which made page not function	Add rewrite function to webconfig
Enter Game 2 webpage directly on url without it unlock yet	-	Game2.aspx	Unable to load	Webpage bypass locked and enter Game 2 page	Add flag detection into Game 2 page
Enter Game 1 webpage directly on url without login yet	-	Game1.aspx	System will redirect to login page	System directed to login page	Pass

Play same game at same time with same account	-	-	Both data will be recorded	High score is recorded but not character xp	No action needed
Spam 30 click on Upgrade Character's Save button	-	"Add" button then 30 times "Save" button	Only upgrade once	Screen not refresh until click stop. Upgrade only once	Pass

Table 5.1 Web Application Blackbox Testing

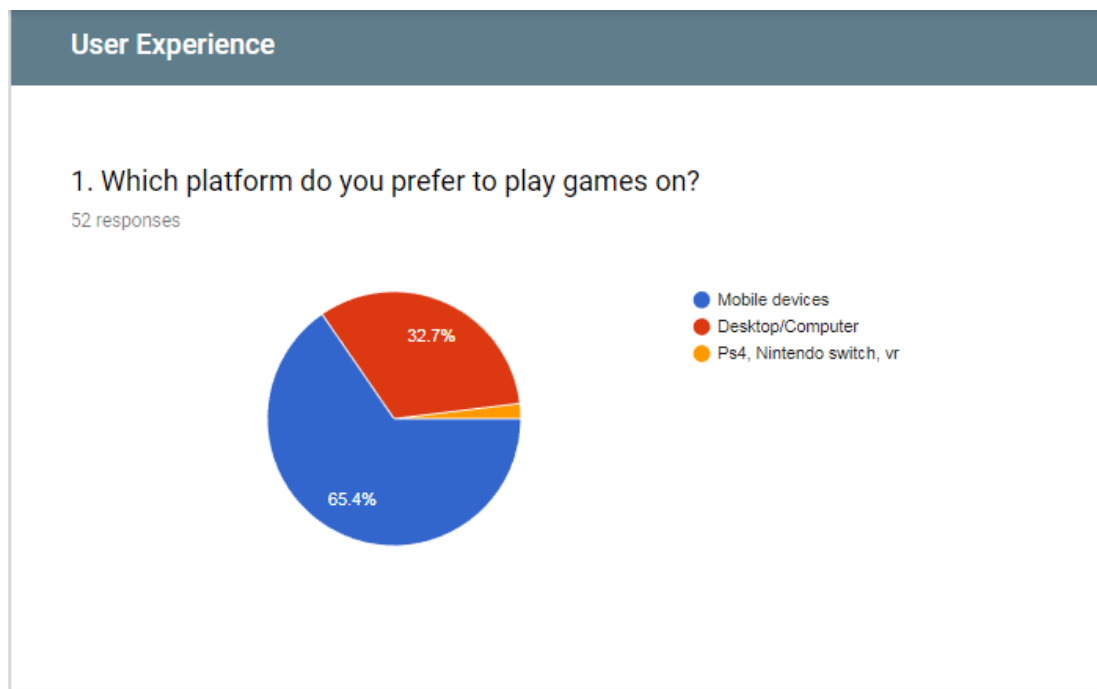
### 5.4.2 Survey Analysis

A survey is carried out on 23 August 2017 to get opinion from public about the prototype design, functionality and performance. About 50 persons from public had visited our website to try the game prototype and ask to fill in the survey form. Both 50% on gender side conducted our survey and 90% of them are from age 18 to 25.

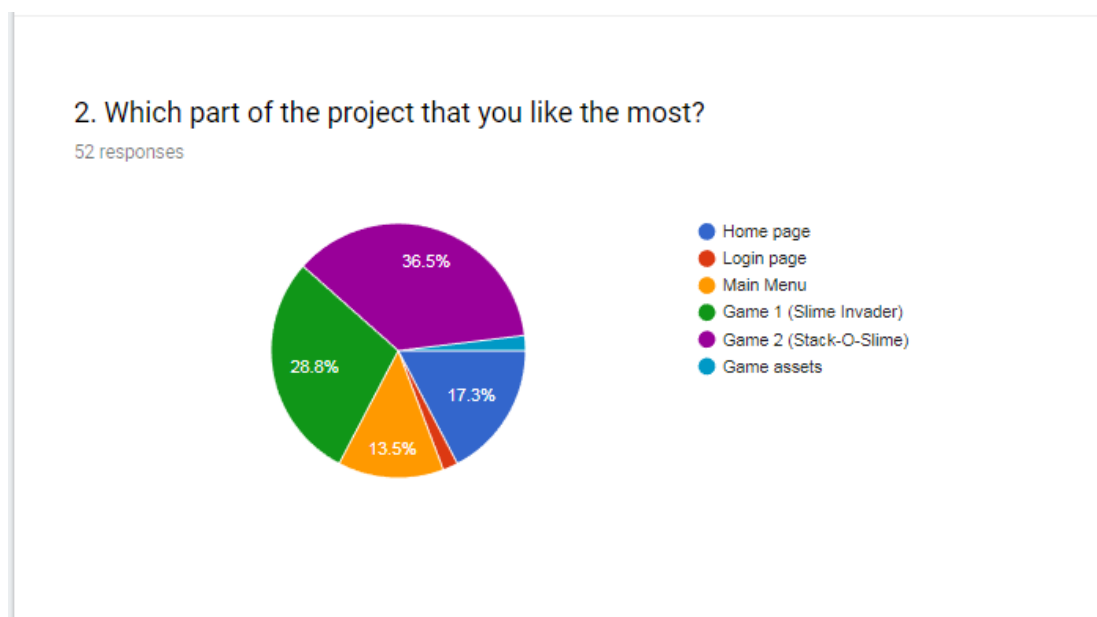




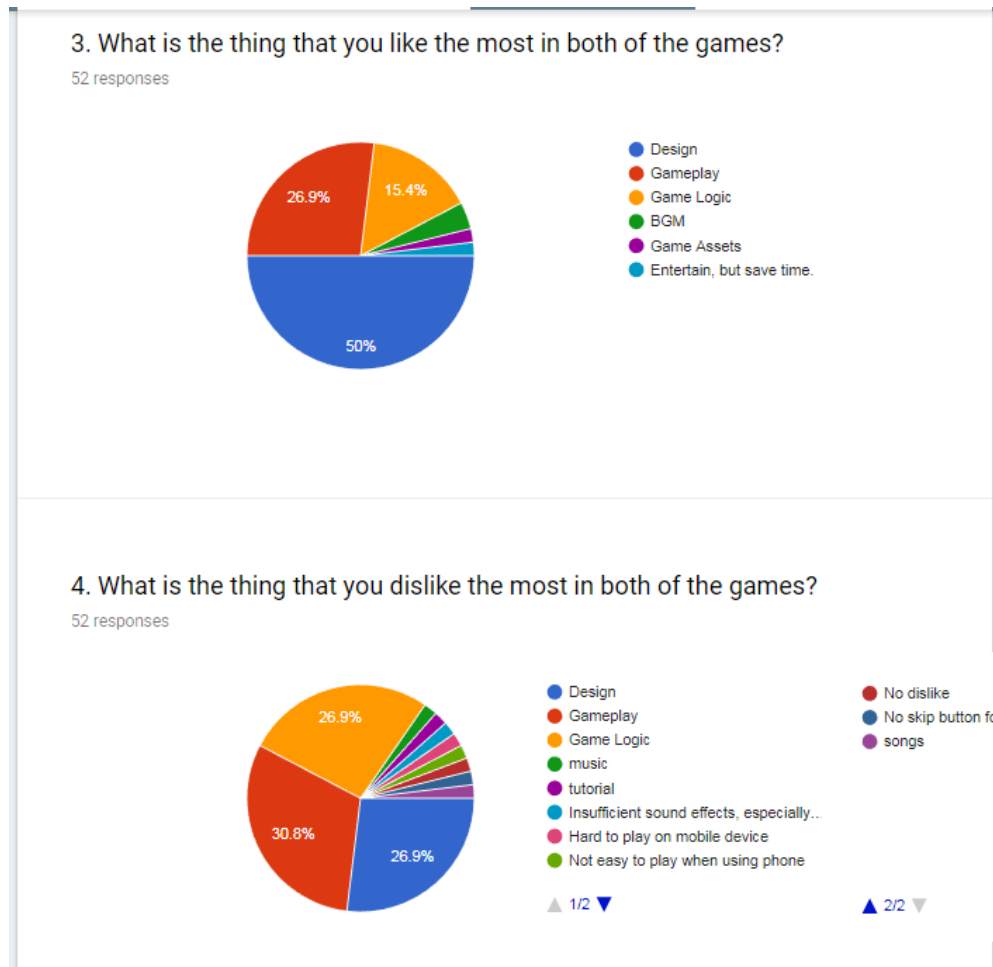
The first section we asked is about user experience toward our game prototype. More than half of the people prefer gaming on mobile apps.



Next, we bring them to our project. We ask about which part of the project they like the most. And seems like all the participant like our Game 2 (Stack-O-Slime).



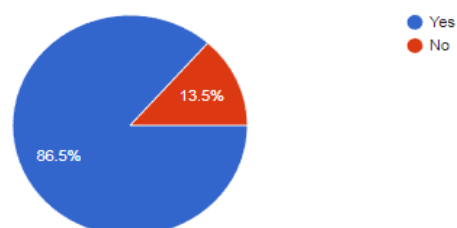
Next we ask about what user both like and dislike in both of the game. The design of the game was favourite by most of the participant but the gameplay of the game got most disliked.



We did ask about how user feel about navigation of the website. Overall we get a very positive result.

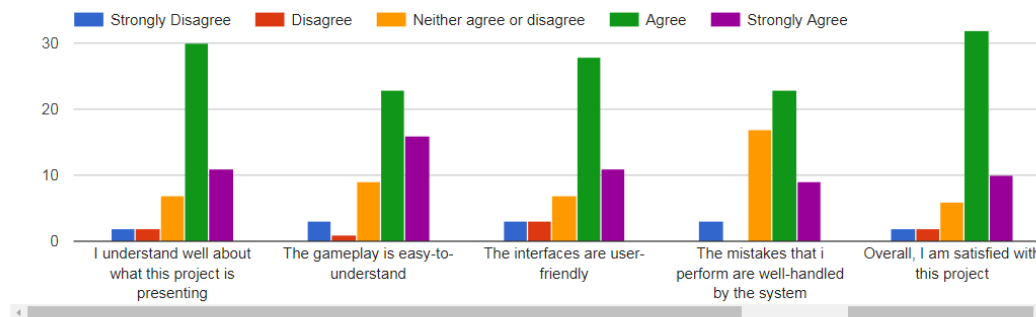
5. Is it easy to navigate inside the website?

52 responses



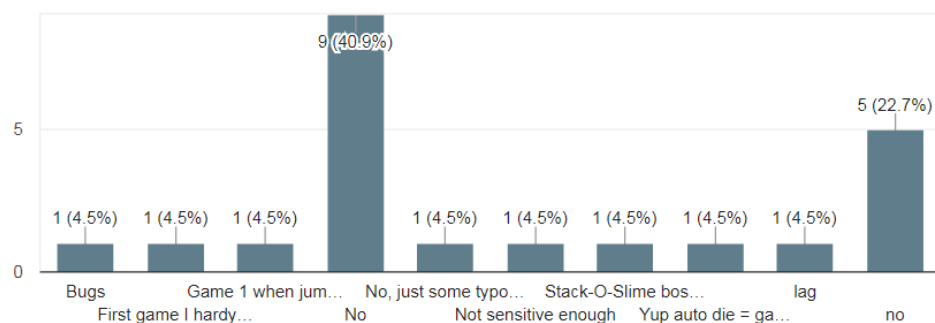
Next, we allow user to select how they understand about our project. Most of the result was positive.

#### Users' Understanding



As a developer, we can't find every bug that happens in our game. So testers are the most efficient way to get bugs on a program. Hence, only a minority of testers get bugs in the game prototype.

Have you encountered any glitch/bugs/errors during your gameplay? If yes, please specify.



We heard from user. We seek for what user needs. We allows them to voice to us.

Please do suggest us some improvements that we could develop in order to deliver a better experience to the users.

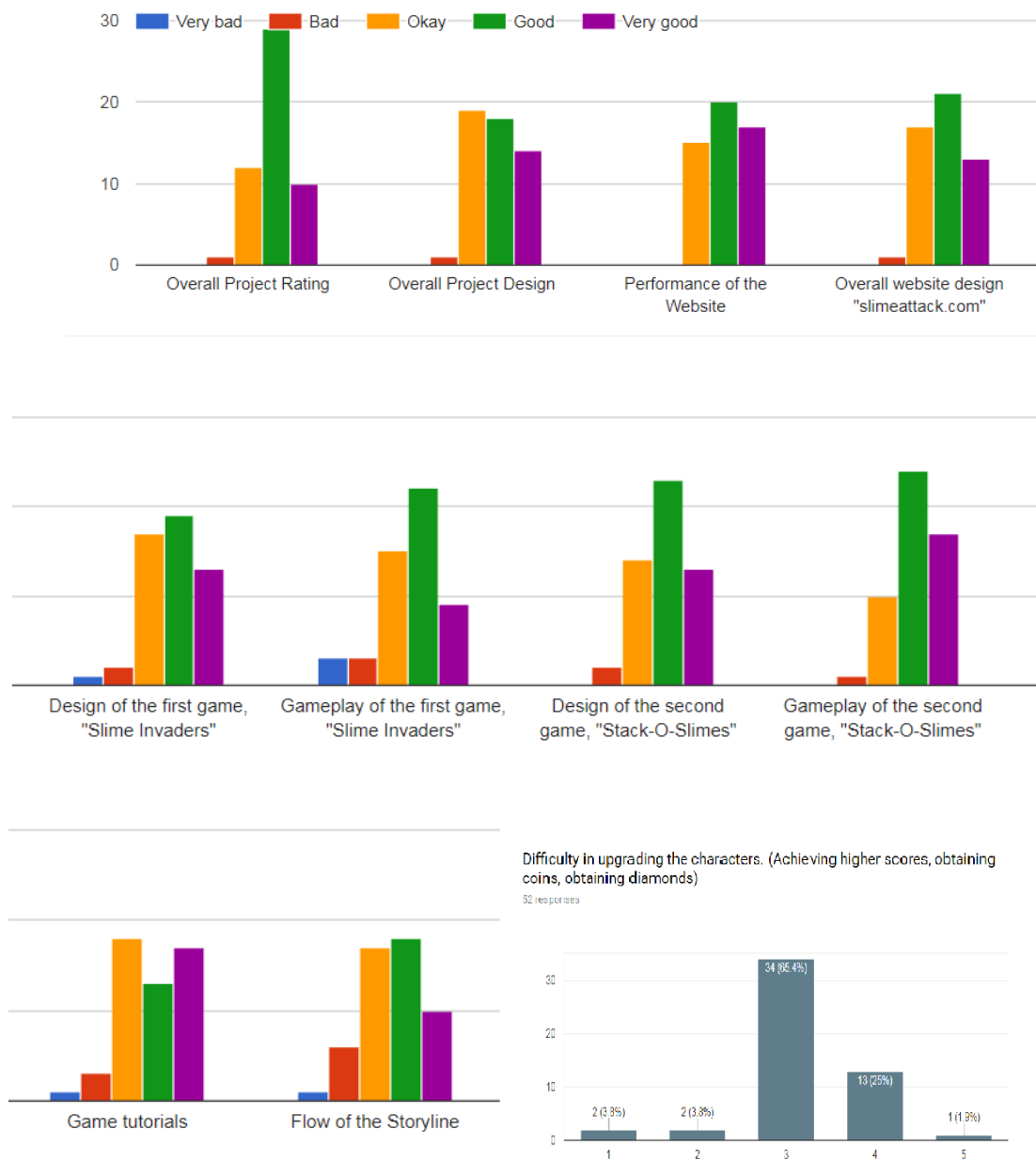
32 responses

hard to find upgrade character button, please provide tutorial or navigate user where the upgrade button. overall is okay.
Gameplay is simple and lacks depth. Character progression also feels weak. Website not optimized for mobile. Important UI elements are not highlighted enough. Tutorial is too long, can try to opt to drop hints bit by bit when the players need it. Boss was too simple, would suggest to add additional mechanics.
Forget password function
more key button to control
keep up the good work
Improve graphic
Good Luck FYP
Better graphics
fullscreen
No
More precise and increase sensitivity of the gameplay
the tutorial may refers to metal slug
N/A
More sound effects
Add backing music as a theme so that it wont be too silent
Improvement in design
GUI are not consistent. first game has many grammar errors. games are fine. graphic is good. for second game, should allow higher stack instead of just 2. first game can be more interesting.
get some interesting background music
Gameplay screen too small
3rd stage cant unlock
Better sensitivity
Better designs
If there is more effect, maybe more sound effect, can be better
Login with Facebook or other social account
Make facebook login. Ez for us
There can be better when enter into home page with background music
Reward system for top player
The character can be cuter
Make skip button for skip story
no
Give top player rewards like coin or diamond for upgrade, maybe cosmetics
put kpop songs please

After we know the user experiences, we're looking forward to user opinion on our project. We asked survey participant to rate on our project. We were getting some positive result.

## Users' Opinions

Please rate our project from a scale of 1 to 5:



## CHAPTER 6

### CONCLUSION

#### **Project “Slime Attack Plus”**

As conclusion, this project is to develop a web-based game prototype, “Slime Attack Plus” which under action arcade genre as we believe action and arcade genre game could attract user and provide them challenge on reaction and challenge to other by highscore. Although there is many arcade game who has similarity with “Slime Attack Plus”, we believe the highscore section allow “Slime Attack Plus” to be stand out among other because there is few game mode to score in “Slime Attack Plus”. “Slime Attack Plus” contains a total of 3 game modes, “Slime Invader” and “Stack-O-Slime” as Story Mode, “Slime Attack!” as Challenge Mode. All game modes are having different type of gameplay and game experience. The character is able to growth and upgrade by playing in story mode to obtain upgrade material. Upgraded character able to survive longer and achieve higher score. In order to save the character data, game progress and user high score, database will be created as backend module. The database is created at code behind of the web application using MSSQL Server. This allowed all game modes to save and load the character, highscore and allow user to upgrade the character to overcome the game boredom.

#### **Final Product**

The final product of this game prototype was able to achieve as what purposed. The gameplay is developed to arcade and action genre and we successfully make the user to fight to be the top of the leaderboard. As we spectating the highscore leaderboard, the leader was keep on changing within few hours despite the game are new and the player base are less. This means users are attracted to the game logic and the game design had become their favourite thing shows in survey. Our website can also be access anyway in a web browser. This has achieved what we wanted to let user

access the game anyway without installation. All the backend objectives has achieved successfully.

### **Part of a Backend**

As a backend part, my contribution to this project is to create a database that able to perform what the game module needs without any error such as record and retrieve data. Since the database is served as a backend of the web application, the whole web application also done by myself. All the webpage design, layout ideas and interface are arranged and designed by me. I need to create an environment to be able to present the game done by game module smoothly and attractive. All the authentication phase, user account and game progress had to be recorded down carefully by perform many testing. Other than the web application, I also take part as the game designer part in the game development because I had some good knowledge about design and using designing tools such as Photoshop or Sony Vegas. All the game mode are written by other module, but all content inside all the game are created by my own. These contents included Game Character, Game Background, Game Object, Game Animation and Game Interface.

### **Problem Encountered**

The biggest problem encountered was mentioned is publish and hosting. This allows me learned more about the field of web application including what can or cannot. I also learn about how a game designer took part in game development that need to be fix a drawing couple of times like redraw, reanimate and even redesign to make the character look great inside the game. And once the development code took some changes, I had to start multitasking on doing their design and handle my backend at the same time. It was both fun and frustrated at the same time but I'm glad that I can make it.

### **Developer Experience**

Thanks to this project, I was able to feel how a developer feel on develop a game. As a hardcore gamer in real life, I always complaint why do some game having some bugs. Right now I do feel how hard is taking care a game as developer. They are hard to catch a bug developed by themselves. Also, having a view as a game admin is fun

as watching people playing your game, fighting for your game highscore and report to you how they feel about what you had developed. I was able to learn so many things in the same time on all the aspect of the project. These are the knowledge that classes will never able to teach you and I appreciate this very much. Lastly, very thanks to my two group member, Chan Hoong Wai & Ong Hui Huang for fighting this project together. Also thanks our project supervisor, Ms Saw Seow Hui for giving this opportunity to us.

### **Future Work**

As the survey conducted shows that people nowadays are tent to be more likely to play games on mobile phone as the reason probably is it is convenience and portable. We was unfortunately due to insufficient time, we was unable to do what we hope that we can convert this game prototype into a mobile game platform by using Adobe PhoneGap, a software that could turn web application into mobile application framework. But we are already plan to do this in future so expect that we can see one day people playing “Slime Attack Plus” in mobile apps!



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## **APPENDICES**