

**E PLAYING GAME**

PERPUSTAKAAN UMP



0000044505

**MUHAMMAD MUHAIMIN BIN JUHARI**

**A report submitted in partial fulfillment of the requirements for the award of the degree of  
Bachelor of Computer Science (Software Engineering)**

**Faculty of Computer Systems & Software Engineering**

**University Malaysia Pahang**

**NOVEMBER 2009**

PERPUSTAKAAN UNIVERSITI MALAYSIA PAHANG	
No. Perolehan <b>044505</b>	No. Panggilan <b>QA</b>
Tarikh <b>12 MAR 2010</b>	<b>76.76</b>
	<b>C672</b>
	<b>M84</b>
	<b>00000</b>

## ABSTRACT

Role Playing Game (RPG) is a popular game genre that usually focused on the in game character development embedded in a fantasy story. Generally the game backbone storyline is circling around the main character and his party, embark on adventurous journey slaying monsters and eventually saving the world. The problem with RPG is the repetition encounter with enemies, making battle phase become easily predictable and soon player will get bored with it. The objective of this project is to develop a working battle phase to demonstrate on how battle of RPG will look like, with integrated artificial intelligence. The rule based AI will heighten the difficulties of game play, and the fun factor, resulting in longer time for player to feel bored. The battle phase developed using Visual C# 2005 with XNA Game Studio 3.0 framework. The result is a RPG with a battle phase and rule based AI in a 2D environment. The integration of AI make the game plays more interesting and fun. Conclusively, the process of battling in RPG was successfully demonstrated and RPG battle phase is more challenging with rule based artificial intelligence.

## ABSTRAK

Role Playing Game (RPG) adalah sebuah genre permainan komputer yang amat popular di kalangan pengguna PC dan penggemar permainan elektronik. RPG biasanya berkisar mengenai pembangunan watak utama yang di jalin gabung dengan plot penceritaan yang amat menarik. Pemain akan mengawal watak utama dan rakan-rakannya mengembara ke lokasi-lokasi fantasi dan akhirnya menyelamatkan dunia dari krisis kejahatan. Namun kekerapan pertembungan dengan raksasa yang tipikal di fasa pertempuran, menyebabkan pemain menjadi cepat bosan dan penat. Objektif projek ini adalah untuk membangunkan satu sesi pertempuran sebagai demonstrasi proses bagaimana perlawanan antara pemain dan raksasa berlaku, dan yang kedua untuk mengadaptasikan kepintaran buatan di fasa pertempuran bagi menjadikan permainan lebih dinamik dan menyeronokkan. Fasa pertempuran di bangunkan dengan XNA Game Studio 3.0 dan Visual C# 2005 dalam suasana 2D. Sebagai konklusi, dengan mengintegrasikan kod-kod kepintaran buatan ke dalam fasa pertempuran, permainan akan lebih mencabar dan mampu membuang sedikit perasaan bosan bertembung dengan raksasa di dalam RPG.

## TABLE OF CONTENTS

<b>SUPERVISOR'S DECLARATION .....</b>	<b>I</b>
<b>DECLARATION.....</b>	<b>II</b>
<b>DEDICATION.....</b>	<b>III</b>
<b>ABSTRACT .....</b>	<b>IV</b>
<b>ABSTRAK .....</b>	<b>V</b>
<b>TABLE OF CONTENTS .....</b>	<b>VI</b>
<b>LIST OF FIGURES .....</b>	<b>X</b>
<b>LIST OF TABLES .....</b>	<b>XII</b>
<b>LIST OF APPENDICES .....</b>	<b>XIII</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>XIV</b>
<b>CHAPTER 1 .....</b>	<b>1</b>
<b>1.1 Introduction.....</b>	<b>1</b>
<b>1.2 Problem Statement.....</b>	<b>2</b>
<b>1.3 Objective .....</b>	<b>2</b>
<b>1.4 Scope.....</b>	<b>2</b>
<b>1.5 Thesis Organization .....</b>	<b>3</b>
<b>CHAPTER 2 .....</b>	<b>4</b>
<b>2.1 Introduction.....</b>	<b>4</b>

<b>2.2</b>	<b>General Concept of Role Playing Game (RPG)</b> .....	<b>6</b>
2.2.1	Case Study on Elder Scrolls IV: Oblivion .....	8
2.2.2	Case Study on Final Fantasy X .....	14
<b>2.3</b>	<b>General Architecture of RPG</b> .....	<b>19</b>
2.3.1	Characteristic of Role Playing Game .....	19
2.3.2	Technology involved in developing RPG .....	23
2.3.3	Artificial Intelligence Techniques involved in RPG .....	24
<b>2.4</b>	<b>Development Elements</b> .....	<b>29</b>
2.4.1	Development Methods .....	29
2.4.2	Tools .....	32
<b>2.5</b>	<b>Discussion</b> .....	<b>39</b>
<b>CHAPTER 3</b> .....		<b>41</b>
<b>3.1</b>	<b>Introduction</b> .....	<b>41</b>
<b>3.2</b>	<b>Software Development Life Cycle Method</b> .....	<b>42</b>
3.2.1	Planning/Initiating (Concept) .....	42
3.2.2	Requirements Gathering and Analysis (Pre-production) .....	44
3.2.3	Design (Pre-production) .....	44
3.2.4	Implementation/Build (Production) .....	53
3.2.6	Testing (Post-production) .....	55
3.2.7	Operation and Maintenance (After Market) .....	55
<b>3.3</b>	<b>Software and Hardware Specification</b> .....	<b>56</b>
3.3.1	Hardware Specification .....	56
3.3.2	Software Specification .....	57
<b>CHAPTER 4</b> .....		<b>58</b>
<b>4.1</b>	<b>Introduction</b> .....	<b>58</b>
<b>4.2</b>	<b>The Character Implementation</b> .....	<b>59</b>
4.2.1	The Character Animation .....	59
4.2.2	The Character Combat Code .....	61
4.2.3	The Character Data Code .....	62
<b>4.3</b>	<b>The Monster Combat Code</b> .....	<b>62</b>
<b>4.4</b>	<b>The Artificial Intelligence Implementation</b> .....	<b>63</b>

6.2 Future Development ..... 85

REFERENCES..... 87

## LIST OF FIGURES

<b>figure 2.0:</b> The Basic Phase In Rpg Game	7
<b>Figure 2.1:</b> Screenshot of Elder Scroll IV: Oblivion	10
<b>Figure 2.2:</b> The Flow of Main Quest in Oblivion	11
<b>Figure 2.3:</b> The Flow of Sub Quest in Oblivion	12
<b>Figure 2.4:</b> The Flow of Basic Battle Phase in Oblivion	13
<b>Figure 2.5:</b> The Basic Menu uses Atb System in Final Fantasy IV	16
<b>Figure 2.6:</b> The Basic Menu uses Ctb System Implemented Final Fantasy X	16
<b>Figure 2.7:</b> The General Process of Battle Phase in Final Fantasy X	17
<b>Figure 2.8:</b> The Basic Process of Battle Phase	18
<b>Figure 2.9:</b> The World of Fallout 3, Epicting The Aftermath Of Nuclear War In The World	22
<b>Figure 2.10:</b> The Concept of Artificial Neural Network	25
<b>Figure 2.11:</b> The Pseudo Code For GA Calculation	27
<b>Figure 2.12:</b> The Example of Rule Based Structure	28
<b>Figure 2.13:</b> The Process of Making Commercial Game	31
<b>Figure 2.14:</b> The Interface of 3d Studio Max	32
<b>Figure 2.15:</b> The Interface of Blender	34
<b>Figure 2.16:</b> The Interface of Xna Game Studio 3.0 in Visual C#	37
<b>Figure 3.1:</b> The General Design of Rpg	45
<b>Figure 3.1a:</b> The Design for Introductory Phase	46
<b>Figure 3.1b:</b> The Design for Roaming Phase	47
<b>Figure 3.1c:</b> The Design for Battle Phase	48
<b>Figure 3.1d:</b> The Design for Leveling Phase	49
<b>Figure 3.1e:</b> The Game Termination Phase	50
<b>Figure 3.2:</b> The Pseudo Code for AI Calculation	52
<b>Figure 3.3:</b> The Pseudo Code for AI Targeting Calculation	52
<b>Figure 3.4:</b> Modules in The Game Engine	53
<b>Figure 4.1:</b> Sprite Sheet for Kai Walking and Idling.	59
<b>Figure 4.2:</b> Sprite Sheet for Kai Battling	60
<b>Figure 4.2:</b> The Structure of Xml Definition File for a Character	62

<b>Figure 5.1:</b> The Start Screen for Rpg Battle Phase, Titled Spellblade: This Is The Dark Times	67
<b>Figure 5.2:</b> The Starting Point Where The Main Character Spawns Beside An Npc	68
<b>Figure 5.3:</b> The Character in a Village That Has A Shop and Inn For Rest.	68
<b>Figure 5.4:</b> The Sandy Beach and Slop.	69
<b>Figure 5.5:</b> Kai, As The Main Character in Rpg Battle Phase	70
<b>Figure 5.6:</b> The Statistic Interface.	71
<b>Figure 5.7:</b> The Equipped Gear.	72
<b>Figure 5.8:</b> The Spell Book Interface	72
<b>Figure 5.9:</b> Inventory Interface.	73
<b>Figure 5.10:</b> The Quest Interface.	73
<b>Figure 5.11:</b> The Battle Phase Interface	74
<b>Figure 5.12:</b> Kai Performing The Melee Attack To His Enemy.	75
<b>Figure 5.13:</b> Kai Performing Defend Stance While Receiving Attack From The Enemy.	75
<b>Figure 5.14:</b> The Magician In Player's Party Cast An Ice Bolt Spell Toward Goblins.	76
<b>Figure 5.15:</b> A Goblin That Runs Out Of Health Point, in A Dead State.	77
<b>Figure 5.16:</b> The Interface of Leveling Phase, Kai Receives Short Sword Plus and Two Minor Healing Potions	77
<b>Figure 5.17:</b> The Pseudo Code for AI Calculation	78
<b>Figure 5.18:</b> The Pseudo Code for Monster AI Defensive Action	79
<b>Figure 5.19:</b> The Pseudo Code for Monster Offensive Action	80



**LIST OF TABLES**

<b>TABLE 2.1:</b> The comparison between the tools in rpg	38
<b>TABLE 3.1:</b> The Attributes And Its Effect.	42
<b>TABLE 3.2:</b> The specification of classes and special moves	43
<b>TABLE 3.3:</b> AI guide table for monster action	51
<b>TABLE 3.4:</b> Description for each module in the game engine	54
<b>TABLE 3.5:</b> List of hardware for the development of the project	56
<b>TABLE 3.6:</b> List of software for the development of the project	57
<b>TABLE 4.1:</b> The constructor and method in combatantplayer.cs	61
<b>TABLE 4.2:</b> The constructor and method for artificialintelligence.cs	63
<b>TABLE 4.3:</b> Table for constructor and method involved in the combat engine	64

**LIST OF APPENDICES**

APPENDIX A: Gantt chart	88
APPENDIX B: User guide manual for RPG Battle Phase	89
APPENDIX C: Sprite sheets for Kai walking, idling and battling	93
APPENDIX D: The character combat code	96
APPENDIX E: The character data code	101
APPENDIX F: The monster combat code	102
APPENDIX G: The artificial intelligence code	107
APPENDIX H: The battle phase code	113

**LIST OF ABBREVIATIONS**

RPG	-	Role Playing Game
AI	-	Artificial Intelligence
PSP	-	Playstation Portable
PC	-	Personal Computer
MOD	-	Modification
EA	-	Electronic Arts
FPS	-	First Person Shooter
2D	-	Two Dimensional
3D	-	Three Dimensional
CTB	-	Conditional Turn Based
ATB	-	Active Time Battle
HP	-	Health Points/Hit Points
NPC	-	Non-Playable Character
HDR	-	High Dynamic Range Lighting
ANN	-	Artificial Neural Network
GA	-	Genetic Algorithm
3DGS	-	3D Game Studio
SED	-	Script Editor
MED	-	Model Editor
WED	-	World/Level editor
SDLC	-	Software Development Life Cycle
XML	-	Extensible Markup Language

# CHAPTER 1

## 1.1 Introduction

Battle Phase in Role Playing Game (RPG) using rule based artificial intelligence approach is a project focused on designing a proper A.I that will provide challenges to human player. RPG is very popular genre in game industry. World known RPG game titles such as Elder Scroll 4: Oblivion, Final Fantasy Series and Fallout prove that millions of people enjoyed playing this genre. There are many elements that made this kind of game successful, but the main reasons are the storyline, character design, and battle system. This project will look into the depth of RPG battle system or more likely the battle phase. The implementation of artificial intelligence technology will make it more challenging, realistic and human like actions. A.I need to be diverse in action and at the same time providing a chance to player to beat it. In other words, having fun with the game.

## 1.2 Problem Statement

RPG is a game that needs the player to interact with the computer competitively. The A.I makes the game play livelier since a human player like challenges in every way they do, and normally challenges in RPG comes in the battle phase. Battle phase is a process that pits the human player against enemy, where player must struggle to beat the A.I.

RPG game normally implements A.I that react with the same move based on certain rules such as character health or class. Without an A.I, monster in the game may not be able to move at all or simply just attacking at random interval based on simple coding structures. Repetitive moves in the game will made human player bored and soon left the game. By using Neural Network technology, the movements of the A.I controlled character will be more diverse and complex providing a wide range and unpredictable actions. Human player will feel more confident that there is actually fighting a human-like thinkable monster. At the same time, this new proposed A.I must be configured to be entertaining instead of being hard to beat, which means with proper techniques and in-game skills this A.I is beatable.

## 1.3 Objective

- a) To develop Battle Phase for a RPG game.
- b) To implement A.I technique in Battle Phase.

## 1.4 Scope

- a) The game involve battle phase and a simple model of a character design
- b) No map level involve in this game, but since the battle phase need to demonstrate the A.I in action, the will be a specific map or arena modeled for the process.
- c) The main characters in the game are the human controlled player and monster controlled A.I.
- d) This game will only involve one player.

- e) A.I technique will be used to guide the monster providing challenging moves as based on human action.

## **1.5 Thesis Organization**

This thesis consists of five (6) chapters. Chapter 1 will discuss on introduction to the system. Chapter 2 is about the literature review of the system. It explains the research done on existing system and the technology used. Chapter 3 will discuss about the proposed technology and its justification that want to be implement in the system. Implementation of the project discuss in Chapter 4, where the structure of the system will be shown in detail. Chapter 5 states the results and discussions of the project. This chapter will also review the limitation and enhancements of the system. Lastly, Chapter 6 as the conclusion part of the project. This chapter also review the future plans for improvements of the RPG Battle Phase.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

Role Playing Games is one of the game genres in the game industry. RPG games prove to be successful in its field having millions of fans from the gamer's community because of its unique story telling method and the ever changing quests make the game very interesting and have a long playing duration. Popular titles such as The Elder Scroll 4: Oblivion for the PC, Final Fantasy series for the Playstation, Zelda series for the Gamecube and Gameboy, Metal Gear series for Playstation Portable (PSP) are some of many worth mentioning games that change the perception of thousands of people about what games can deliver today.

The creation of game nowadays has change to open source and as a serious hobby for computer enthusiasts, tools for game making emerged in the internet providing anyone in the world to create their own game. With a creative mind and limitless effort, one can development a full fledge game and can publish it for free or sell it in the market. Technology sharing between the industry and gaming community had given birth to group of people called 'Moders'. Mainly Moders create "Mods" or modification for certain game, integrating new modules of function or scripts such as new maps, weapons, characters, plots, quests and objects in the game.

The trend of current game industry has inclined to give full support to this group, making their game engine or source codes to be accessible by the public and allowing modifications to their game architecture. Take The Sims game for example, the game itself is about user content sharing. EA even provides tools to create and manipulate objects and characters in the game. Players can upload their work to the internet and share with other players. While The Sims is being played by controlling human lives and watching them grow (it is a simulation game), which means the game itself has a large domain of playability, let's look at other genres that focus more on certain tasks – shooting. FPS (first person shooting) games such as Half Life 2, where players take a role as a wicked professor shooting aliens and bad guys as he embarks on a dangerous journey to fight the big boss. The developer team, Valve, has made their Half Life 2 engine named 'SOURCE' to be accessible to whoever purchased copies of their game. This phenomenon has resulted in hundreds of interesting mods, which extend the playability, replayability and the plot in the main game. Valve was making the right choice since over 10 years after Counter Strike (CS) was launched it has made its way to the must-have title in all the famous gaming competitions like the World Cyber Game every year. The developer giving birth to a game, it were the fans keeping it alive.

Modders classify RPG games as the best and the most interesting type of game to create mods. RPG consists of many elements that made it more appealing than other genres. Mainly the storyline is the backbone of the game; often making players want to keep playing. The beautifully designed world and characters utilized the latest 3D engine to render them, resulting in stunning graphics. What makes this genre more interesting is the ability to mod all the elements in the game. Fans have come out with new storylines, characters, items and mobs, and surprisingly more complex and realistic artificial intelligence. A.I is the core of the game since almost 70% of the game play is spent interacting or fighting with monsters. Certain monsters are designed to lose and some to make players miserable. Challenges and fun are the factors that players are looking for, which means the monster can interact significantly with player actions and deliver appropriate reactions towards the character in a more humane way and logic. Developing perfect A.I that can imitate human actions is always a main objective in improving the game mechanics. In simpler words, the A.I needs to be challenging yet beatable. Basically A.I techniques will be affected by how the battle phase in the game took place and the location surrounding



environment. This is where moder's community comes into play by creating numerous types of A.I codes to be implemented in their favorite game.

In this section we will discuss about what is RPG is all about, characteristic of several RPG games that are available in the internet or in the market, a little bit of background story on each game, and more focus on the game play which consists of battle and leveling system where the A.I was implemented.

## 2.2 General Concept of Role Playing Game (RPG)

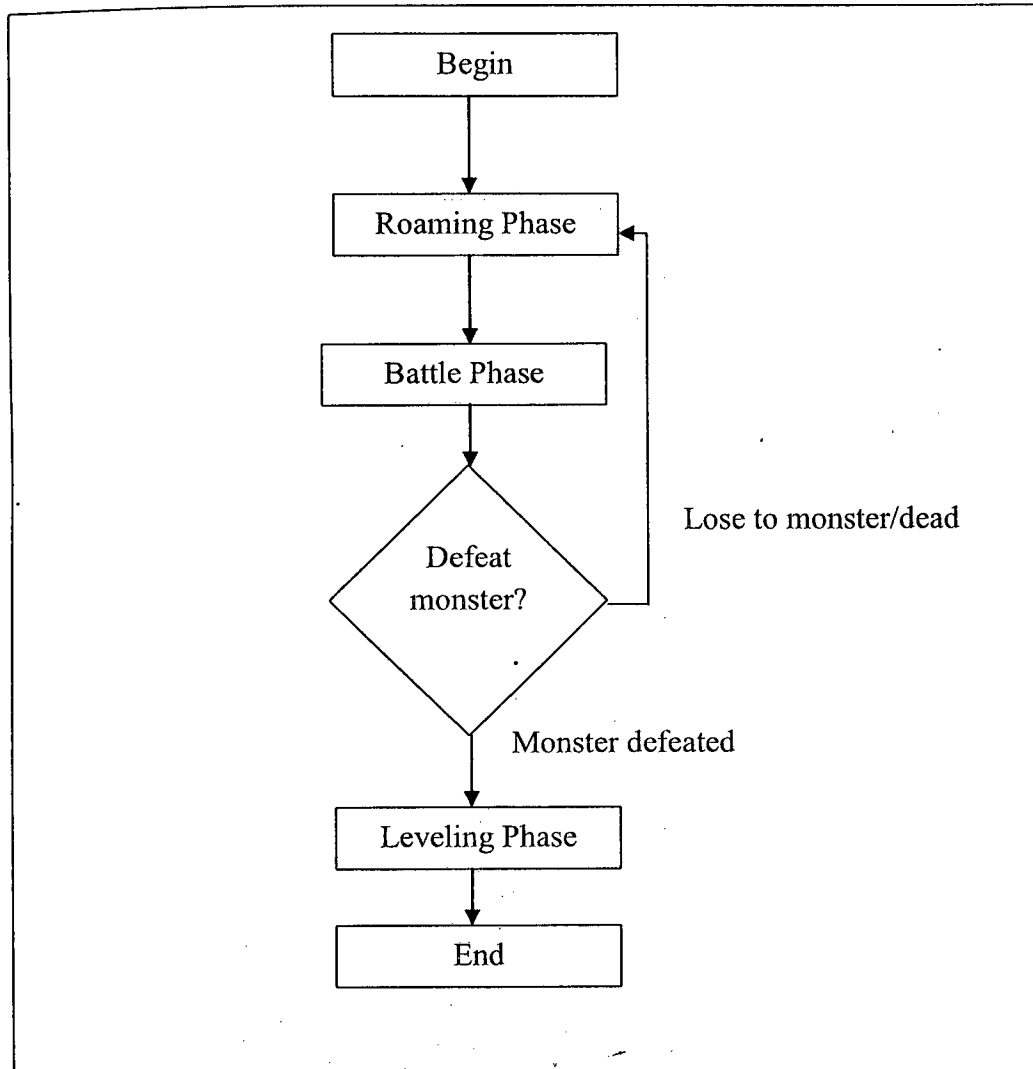
Role Playing Game is a type of game which the player takes in the role of one or more characters. Mainly, player is like an actor, controlling the character according to its abilities and personality. Player will lead the character through the storyline, determines how the character would react in certain situation and increasing the level as the character gain experiences through slaying monsters or completing quests.

Typical RPG sets on a fantasy or sci-fi world, the main character often selected to be a hero in the context of an immersive and emotional plot. The character goes on "solo" adventure and soon finds a party to team with. Party system allow player to control numbers of characters and utilize the skills and abilities of each character to overcome difficulties when completing missions or quest in the game.

The focus of RPG is character development. The character starts with a low level and soon will gaining experiences by doing activities in the RPG world. Is up to player to decide what the character will end up look like.

The critical part of the game is the battle phase. Let's be clear that before a player involve in a battle phase, players need to go through the explorations phase, where players run around the map searching for monsters by following the storyline. When players pit against a monster, then the battle phase begins. After a successful battle, the leveling phase follows. These three basic phase normally appear in all architecture of RPG game. High end titles such as Oblivion has addition actions in every phase, making the game to be considered a little bit

different from the others. In this study, we will focus on how the battle phase took place in RPG game and the implementation of A.I in monsters or foes. Figure 2.0 shows the general phases involved in RPG.



**Figure 2.0:** The basic phase in RPG game

### **2.2.1 Case Study on Elder Scrolls IV: Oblivion**

The Elder Scrolls IV: Oblivion, or simply Oblivion, is a single player fantasy-themed action-oriented computer role-playing game developed by Bethesda Game Studios and published by Bethesda Softworks/ZeniMax Media and the Take-Two Interactive subsidiary 2K Games. It is the fourth installment in The Elder Scrolls video game series. It was released on March 21, 2006 for Windows PCs and the Xbox 360. A PlayStation 3 release was shipped on March 20, 2007 in North America, and April 27, 2007 in Europe. One expansion pack, Shivering Isles, and a number of minor content releases followed. (1)

#### **2.2.1.1 The Story**

Oblivion's story focuses on a former prisoner drawn into a Daedric Lord's plan to invade the mortal realm of Tamriel. Gates to the hellish realm of Oblivion are opened, through which many daedra spur and crushed human cities one by one. The hero now had the King's trust to rescue his heir and shut all eight of Oblivion Gates.

#### **2.2.1.2 Gameplay**

Oblivion is an open ended game. Players free to create character according to their taste and have the option to choose whether to stick with the main quest or just leave it behind and doing other things. Not like other typical RPG game, players were confounded in a specific map and need to advance the story in order to access new maps; Oblivion let the player to roam everywhere possible in Cyrodiil. The world is so vast and no restrictions to gain access anywhere. As the sandbox concept prove to be innovative, the battle system also taken the level of playing RPG to new heights.

Enemies are not spawned but made. Player can choose to side with who and battle against it foes. If you join the Thief guild, you will made enemy of the city guards and people you stole things from. Dark Brotherhood faction made the player kill famous figures in the land, and soon

found wanted in every corner of cities. Daedra as the demon or monster in the game is the main enemy to confront with. Sometimes Daedras appear beside the Oblivion Gate guarding it.

Leveling come in an interesting way. The character had to sleep in order to gain level after an amount experience reached certain point. Find a spot, get to sleep and the leveling menu appears. Player has the power to decide about the ending of the game. Even after the main plot is finished, the game still continues.

### **2.2.1.3 Elder Scrolls IV: Oblivion Battle System**

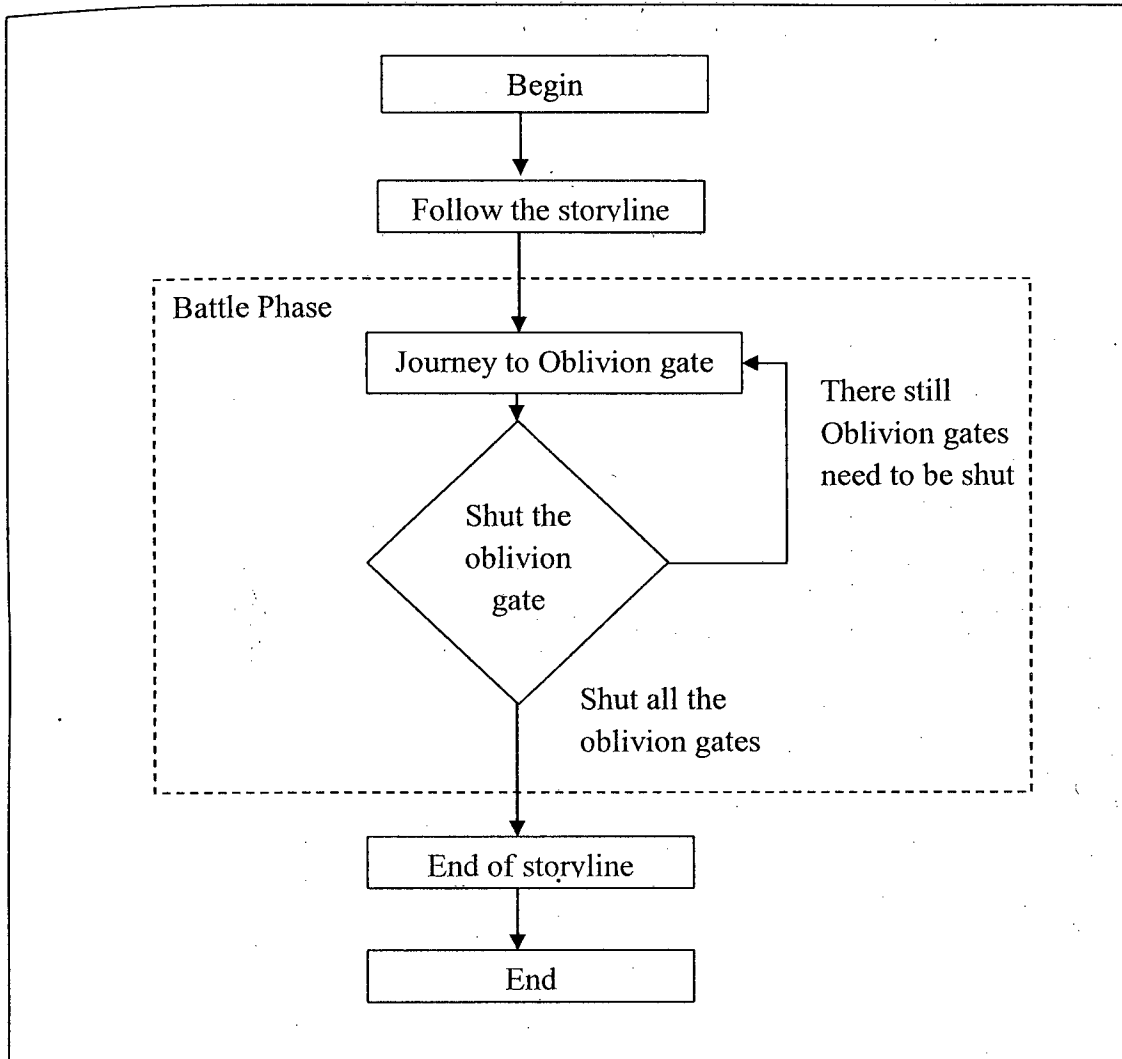
Oblivion defies the traditional battle system of RPG. Oblivion battle system more like to be an action game. Player can adjust to be in first or third person mode in the battle, making the battle more flexible. If player fighting with equipped sword, then third person view obviously the best, but if player want to shoot arrows, he need to switch to first person perspective, easier because of the aiming indicator appear. There is no specific environment change when a battle invokes, it took place where it is.

Fighting comes in simple ways of blocking and attacking and at the same time can move/run around the area. Subsequently player can cast spells to assists himself in dire situation. Magic can be created by mixing elements of fire, ice, wind, and earth. Supportive magic also available in the form of sleep, poison, confuse, summon and possessed. These custom in-game magic can be stock up in the player's magic arsenal and ready to be used anytime. There is no turn concept in Oblivion battle system. Player can hack as many times but, if his attack blocked and recoiled, the character left vulnerable to counter-attacks and received more damage. This is where player has to be creative in delivering attacks and magic.

Attributes and classes were the main factor that affects the overall battle. Different attributes favor different play styles. Oblivion is a complex RPG game and it has more than 12 attributes and 6 races to begin with. Messing with all the attributes will come out with a unique character and has its own strength and weakness.

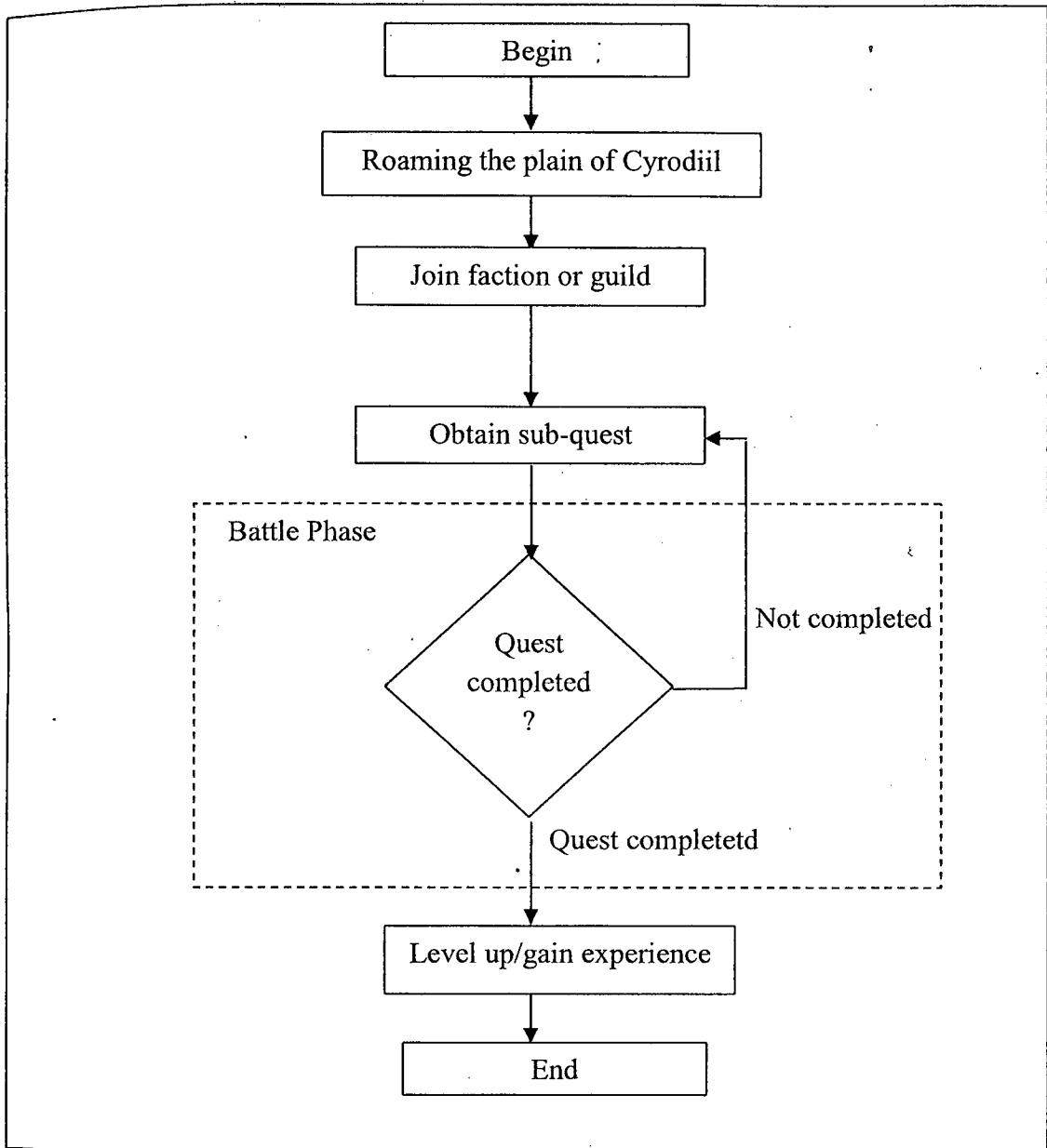


**Figure 2.1:** Screenshot of Elder Scroll IV: Oblivion



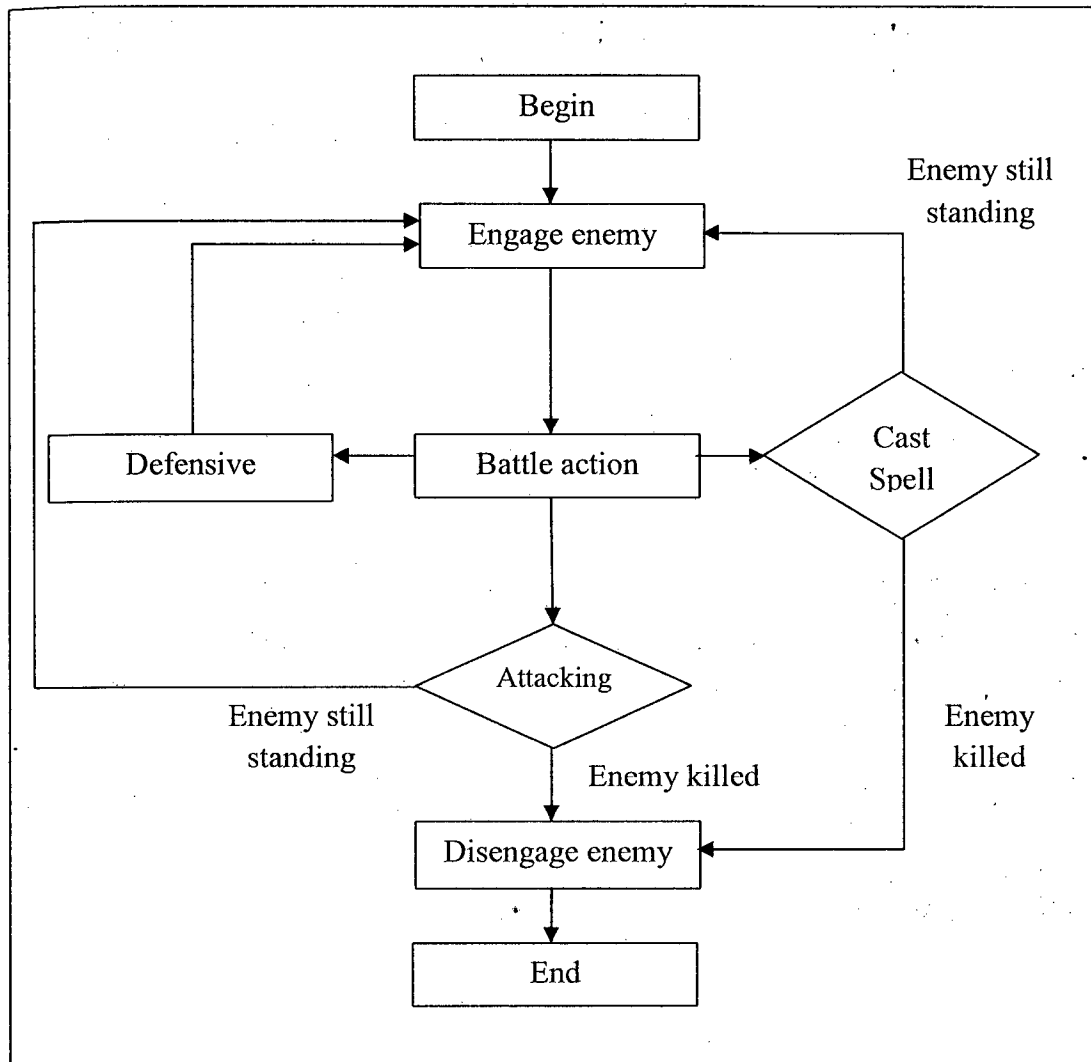
**Figure 2.2:** The Flow of Main Quest in Oblivion

Figure 2.2 describe the flow of main quest in Elder Scroll 4: Oblivion, where player will start with the main quest and storyline which eventually lead to shut down all the oblivion's gate in game.



**Figure 2.3:** The Flow of Sub Quest in Oblivion

Figure 2.3 describe the flow of sub quest in Elder Scroll 4: Oblivion. Sub quest is normally embedded in the main quest, and player has the option to complete it or not. By completing extra sub quest, player will be rewarded with rare items and equipments, such as legendary sword that will greatly help the player in the main quest progression.



**Figure 2.4:** The Flow of Basic Battle Phase in Oblivion

Figure 2.4 describe the battle activities in Elder Scroll 4: Oblivion, where player has the option to cast spell, attack or be in defensive position. The battle is consider over when the enemy is dead or unable to battle.