



# Bilkent University

## Cs 319

### Object-Oriented Software Engineering Project Analysis Report (First Draft)

Section 1 / Group 1H

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## **1) Introduction**

Battle For Middle Earth is an arcade game similar to well-known game ‘Space Invader’.

We’ll basically stick the basics of gameplay of the original game. Our game’s aim will be similar to the original game, which is killing all the enemies but in a Middle Earth Theme.

Instead of bombing, we'll use weapons suitable to Middle Earth environment. There will be three types of races which are humans, elves and wizards. Respectively weapons are swords, arrow and staff. The main object of the game is to reach the final checkpoint on the map. Map representation will have a similar structure to candy crush level map, however in a Middle Earth manner. Within each level the user will begin the game at the bottom of the screen and the enemies will occupy the first couple of rows from the top of the screen. The user can attack the enemy, likewise the enemy can attack the user. The user's health will be indicated by a health bar, while his armor will be represented by an armor bar.

To complete the requirements of the course and make game a better, we will make the following additions to the original game.

- Power ups
- Extended Weapons
- Enhanced and various characters
- Music and sound options
- Ammo boxes
- Middle Earth Environment

The target platform of the game is JAVA SE. Keyboard and mouse will be used to control the game.

## **2) OverView**

### **2.1) Game Play**

In "Battle for Middle Earth" you are the last hope to defend Middle Earth against the orks invaders and bring back peace to the land. "Battle for Middle Earth" is an arcade game inspired by the then popular game known as 'Space Invaders'. In this game you, the user, would be

required to shoot at the waves of orks armies until all of them are eliminated. But in order to carry their invasion forward the orks too can fire back at the player. The player would be allowed to step in the shoes of different characters (Humans, Wizards and Elves) and play as them. Each of these characters will possess a unique abilities ,in order to aid for the task. The player would start off his journey by being positioned at the bottom of the screen and would be allowed to move in all directions. Whilst the enemies will appear at the top couple of rows of the screen, whose movement will only be restricted to the left and right side. This game consists of 5 Levels. For the first four levels the user will face off against normal soldier orks and finally in the fifth level the user will face against the orks King, whose abilities will be far greater than a normal soldier orks.

## **2.2) Levels / Map**

The game includes a game map with a middle earth theme. This map will be similar to the level map representation of candy crush where the players can see the levels of the game. At the beginning of the game all levels except the first one is locked. To unlock these other levels players should pass the levels one by one. The Battle for Middle Earth will include 5 different levels. The arrangement of these levels are in the order of difficulty meaning While the levels goes up the enemies gets more powerful and it gets comparatively harder to destroy them. This level system allows the user to experience the game in a more entertaining environment and makes the game experience more challenging.

## **2.3) Characters**

Three different characters are offered for players. This diversity of the choosing characters offer players more detailed game play.. These characters are from the middle earth theme.

Players can choose whether they want to play as a wizard, elf or a human. Each of these characters will possess unique and special features. In addition in order to distinguish each character, the image representation of each character will be different.

## **2.4) Weapons & Ammo**

Weapons in this game have some resemblance to both original space invaders and Lord Of the rings film series. While users choose their character, they will also select the weapon automatically because weapons are specific to Middle Earth Races. Basically, as we mentioned we have three races which are humans, elves and wizards. Each possessing its respective weapons such as sword for humans, arrow for elves and staff for wizards. As user progresses in game, new weapons (specific to character) may come up during the battle moments. In other words, user can gain new items synchronously with the game. Also, experience coming from achievements will enable users to upgrade their weapons (This will be mentioned more detailed in Power-ups sections).

During the game if user can hit the target 5 times without taking any damage, this will also change the structure of weapons in a more damage manner. Weapons can be changed also with the character changed. In our game, ammo will not be infinite, and must be refilled by catching drops (as will be mentioned later).

On the enemy side, weapons will also be specific to characters and they will fire their weapons in a random order.

If we have a time, we may also make the weapons sensitive to type of enemies. For example that: wands may cause more damage to orcs with swords more than other weapons.

## **2.5) Power Ups**

There will be some power up packs. Power up packs will appear on random places, between the character and its enemies, and they will appear for only some certain time period. When the power up run out of time, it will disappear and can not be reachable. There are three types of power up packs. They will affect player's weapon, health or armor. The power ups can be taken by just moving your character on that power up. When the player gets the power up, it will affect immediately, which means power ups can't be controlled by player.

#### **2.5.1) Weapon Upgrade Pack**

When the player gets the weapon upgrade pack, character's weapon will be changed. As its changes, the damage of new weapon can be higher or lower than the previous one.

#### **2.5.2) Health Pack**

If player obtains the health pack, character's health points will be regenerated. The amount which health pack has will be determined randomly.

#### **2.5.3) Armor Pack**

The armor pack will appear the same as the other power ups. This pack increases character's armor points. The amount of armor that player will receive by getting armor pack will be determined randomly.

### **2.6) Health**

The character's initial health will depend on each character, thus each character will posses a different amounts of health points. Health of a character will be decreased by taking

hits from enemies. In order to help the player to observe his health, on the top of the game page there will be health bar.

## **2.7) Armor**

The strength of armor depends on character. Each character has different amounts of armor points. Simply, armor decreases the damage that is taken by enemies. Under the health bar, there will be a grey bar which represents character's armor. This bar helps user to see his armor level.

## **2.8) Atmosphere**

Our game will provide the user with Middle Earth Environment. Alongside the Middle Earth, because game dynamics will be similar to legendary game 'Space Invaders', feeling of nostalgia will take place. Battle screen background and map screen will be supported with images related to Middle Earth. Weapons structure will also be similar to ones in the movie. During the interactions between user and enemies, damage can be seen with some effects such as fire, incision... Characters and music will also be chosen among film.

## **2.9) Scoring System**

Like most games this game too includes a scoring system. The scoring system will be based by keeping track of the number of enemies killed by the user. Initially each enemy killed would be worth a single point, but later on as the player avoids getting hit and at the same time manages to score 5 kills, his score would increase proportionally to his 'perfect streak'. In a

scenario for example, initially each kill is worth 1 point but after 5 kills, while maintaining the perfect streak, each kill would be worth 2 points then 3 points and so forth as long as the player avoids getting hit.

### **3) Requirement Specification**

#### **3.1) Functional Requirements**

##### **3.1.1) Play Game**

Before starting the game, player have to choose his character. After choosing a character the game will start. Player's character will be located on the bottom of the screen and the enemies located on top of screen. The enemies will distributed and positioned randomly at the top of the screen. The amount of enemies and their shoot frequency is changed level by level. The enemies only objective is killing the character by shooting to it. While on the other hand , the player has to kill all of the enemies in order to finish the level. All levels have different difficulties, whose difficulty will increase after each level. The character has some health points and armor points depending on his type. When the player loses all his health points, the level will end and player will lose. However, he has the chance to play same level for infinite amounts of times. In order to kill an enemy, player needs to shoot it more than one time depending on enemies' health points. Some power up packs will appear at random times and on random



locations. Player would be required to hover his character over that power-up drop get that power up. These power-up can be one of three types ,armor pack, health pack and weapon pack. Player will get score points based on killing his enemies and the amount of ‘perfect streak’ as mentioned before. The main objective of the game is to stop the orks invasion by killing all enemies and finishing all levels.

### **3.1.2)Player Control**

The player’s movement will not be restricted, thus he/she would be allowed to move anywhere they please necessary. There is one exception to the above mentioned player movement rule, the player will not be allowed to move over the rows occupied by the enemies. This movement of the player would be done though the keyboard keys, more specifically through the up, down, left , right button. Shooting the weapon will be accomplished by pressing the ‘Spacebar’.

### **3.1.3) Settings**

The user will be allowed to change the game settings to his/her convenience while playing the game. Inside the setting options the user will have the authority to turn the game sound on/off.

### **3.1.4) Help**

Users who are new to game need to check the help section. Users will be able to get game information from this help menu. This menu helps users to learn which keys they need to use.

Also this menu shows the aim of the game and how they can complete the levels. In addition they will be able to learn what each power-up will represent

### **3.1.5) High Score**

Users can see high score table by clicking High Scores button. The ten high scores will be stored in database. The account names and their scores will be given in the table format.

### **3.1.6) Choosing Characters**

The screen of the choose character section opens after the play game screen. Before the players start the game, they have to choose which character they are going to play with. There are three different characters for players. In the choose character screen, players see three parts that explain all of the three specific character's features. In order to choose one of the characters they click the button which is located down below of them.

### **3.1.7) Save Game**

When the players login the game with their accounts, they can start the game at the level that they reached. While the players play the game they will not be allowed to save their games manually, but the game is saved when a user, for that specific account passes that level in order words, the passed level and the unlocked level is saved for this account. In order to save the levels that the players reach, database is used to keep the information of the account.

### **3.1.8) Create & Login Account**

Create Account & Login screen is the one of the main functional requirement for the game. Once account created, users will not encounter with this screen again unless logout. User information will be stored in database. By creating account, user will able to see their high score, latest level they played, preferences and other information. Below are the information, the user has to enter when creating or logging onto his/her account.

- Create Account
  - Enter User-name
  - Enter Password
  - Enter E-mail
- Login
  - Username
  - Password

## **3.2) Non-Functional Requirements**

### **3.2.1) Usability**

The game is really easy to understand how to play and finish it. The reason why it will be high in its usability, because there are a few keys to play the game, thus making the game more usable. Also users will be allowed to create a new account without any modifications to the previous account's data.

### **3.2.4) Supportability**

Since the goal of this project is to reach many people, supportability is an essential element for this software. The Battle for Middle Earth is designed with using Java language. Since the Java is suitable for the many platforms, people can run The Battle for The Middle Earth easily.

### **3.2.2) Reliability**

In terms of Robustness, our game will be focused on handling unexpected termination and unexpected actions. Users will be informed with proper error messages. Especially with the principle of robustness, during the battle screen, user will be able to see the fluent gaming experience. Also, as we see from our PL course, other programming languages ,such as python etc, are not flexible and give errors most of time at compile time. Therefore, with java our game will be safe and more error-free. However, if our program does encounters any error , programmers should be informed as quick as possible after error occurred.

### **3.2.3) Performance**

Transition between screens should be as quick as possible. System must support smooth characters changes if user wants. Run time performance of the game must be proper for user such as fast loading.

## **3.3) Pseudo Functional Requirements(Constraints)**

The game will not be made using any game engines but will be made the primarily by using Java. As Java will allow easier Memory management i.e allow us to avoid memory leaks. Another reason why Java has been selected to make this game is because the UI will be made

from scratch, which java will allow us to write in an efficient manner. For the Database part of the system the game will be implemented in SQL.

## **4) System Model**

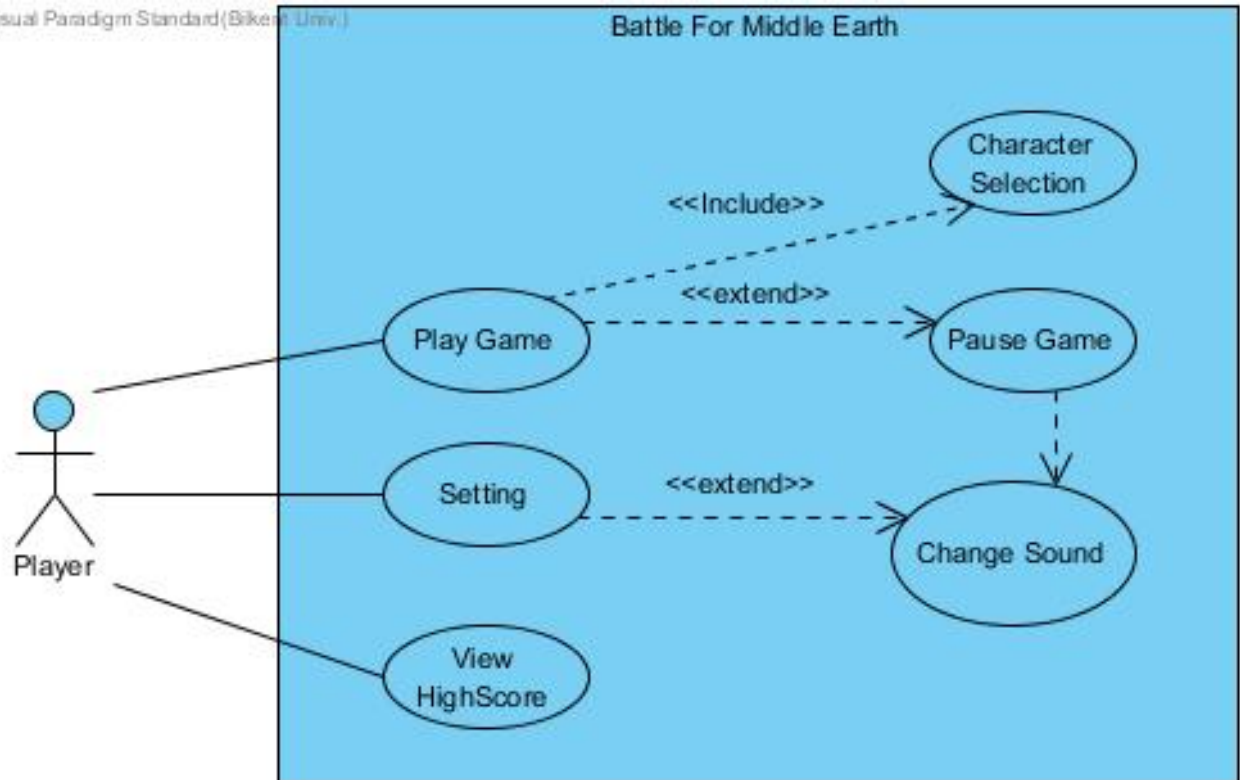
### **4.1) Use Case Model**

The Use Case Diagram is a graphical representation of the interactions among the elements of a system. It shows the relationship between the user and the program.

The Use Case Diagrams of the Battle For Middle Earth is below. There are two different Use Case Diagram for the Battle For Middle Earth. First one is for describing the game play and the other one is for the other steps of the game in detail.

#### **4.1.1) Play Game**

The first Use Case Diagram for the Battle For Middle Earth is demonstrates the steps of playing the game.



### Use Case#1

**Use case name:** Play Game

**Participating actor:** Player

**Stakeholders and Interests:**

- The objective of the player is to eliminate every enemy in each level and reach to the end of the game.
- Tracking of the player's score will be kept

**Pre-Condition:** The player should open the game, they should create or login their account. After that they can click the new game button from the main menu.

**Post-Condition:** The player should select a character from the choosing character screen. If they prefer they can click pause game option while they playing the game.

The player can also change sound of the game through the pause game sections.

**Entry Condition:** The player interaction with “Play Game” button which is in the main menu.

**Exit Condition:**

1. The player interaction with the “Go To Main Menu” button which is in the pause game section.
2. When the player dies during the game play, after which the player is directly sent to the ‘Main Menu’ screen.

**Main Flow of Events:**

1. Player logs-into his account
2. Players click the button to starts the game
3. The system loads the game
4. The player manages to eliminate all the enemies
5. Player advances to the next level until he reaches the end
6. The system returns the user to the main menu

**Alternative Flow of Events**

- The player closes the game,without ending the level

## **Use Case#2**

**Use case name:** Setting

**Participating actor:** Player

**Stakeholders and Interests:**

- Player wants to change the sound volume or music volume.

**Pre-Condition:**

- Player needs to be in main menu.

**Post-Condition:**

- Volume levels are updated.

**Entry Condition:**

- Player is in interaction with volume change buttons and mute button in ‘Setting’ menu.
- Player is in interaction with volume change buttons and mute button in ‘Pause Game’ menu.

**Exit Condition:**

- Player clicks Go Back button in Settings Panel.

**Main Flow of Events:**

- Player clicks settings button in Main Menu.
- System opens settings panel.
- Player changes volume by using volume slider.
- System saves volume changes.

**Use Case#3**

**Use case name:** View HighScore

**Participating actor:** Player

**Stakeholders and Interests:**



- The objective of the player is to view the high scores.
- System brings last ten highest point from the database.

**Pre-Condition:** The player should open the game, they can click view high score button from the main menu.

**Post-Condition:** High scores are shown.

**Entry Condition:**

- Player is in interaction with high score button in the main menu.

**Exit Condition:** Player clicks ‘Go Back’ button in the high score screen.

**Main Flow of Events:**

1. User interacts with the high score button in the main menu.
2. System brings last ten highest point from the database.

#### Use Case#4

**Use case name:** Pause Game

**Participating actor:** Player

**Stakeholders and Interests:**

- Player wants to pause the game.
- System displays Pause Game menu.

**Pre-Condition:**

- Player needs to be playing the game.

**Entry Condition:**

- Player needs to press ESC button while playing the game.

**Exit Condition:**

- Player needs to press ESC button in Pause Game menu.

**Main Flow of Events:**

- Player clicks the ESC button.
- System displays Pause Game menu.

- Player interacts with volume slider or mute button.
- System saves volume updates.

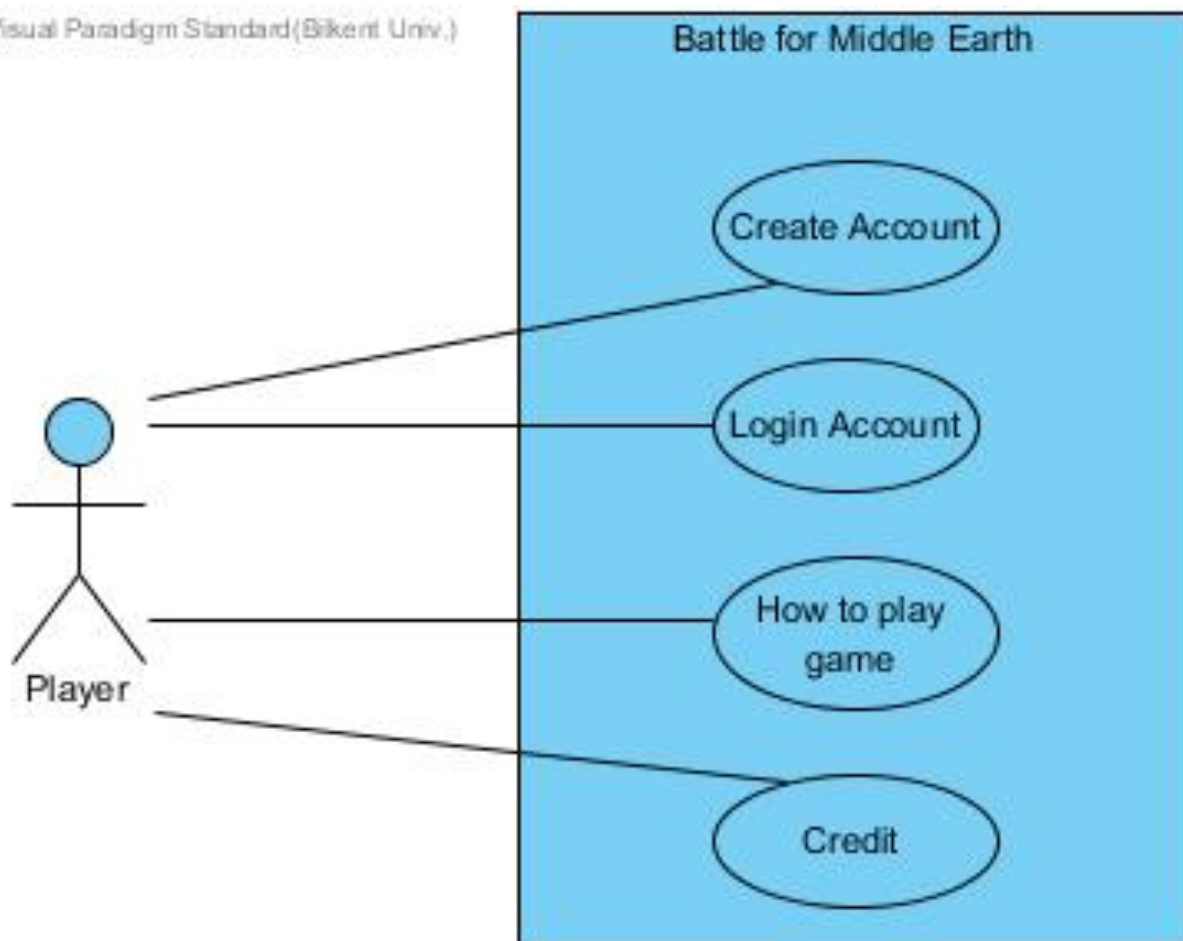
#### Alternative Flow of Events

- Player clicks ESC button.
- System displays Pause Game menu.
- Player clicks Exit to Main Menu button.
- System returns to Main Menu.

### 4.1.2)Non-GamePlay Interactions

The second Use Case Diagram for the Battle For Middle Earth is demonstrates the steps of create account, login account, how to play and credit sections.

Visual Paradigm Standard (Bilkent Univ.)



## **Use Case#1**

**Use case name:** Create Account

**Participating actor:** Player

**Stakeholders and Interests:**

- The player want to create an account in order to play the game
- System inserts the account detail into the database

**Pre-Condition:** None

**Post-Condition:**

- Account is created

**Entry Condition:**

- Player runs the application

**Exit Condition:**

- Player clicks Go Back button in Settings Panel.

**Main Flow of Events:**

1. The Player is directed to enter a non-existent user name and a password
2. The system confirms his creation of the account

**Alternative Flow of Events:**

1. User enters a username that already exists in the DataBase
2. A prompt is popped informing the user about the taken username
3. User is directed to enter the information again

## **Use Case#2**

**Use case name:** Login Account

**Participating actor:** Player

**Stakeholders and Interests:**

- The objective of the player is to enter existing account on the database.
- Game opens the game relative to the existing account, which the user has enter.

**Pre-Condition:** Played must create account before login.

**Post-Condition:** Game opens with existing account which user enter.

**Entry Condition:**

- Player is in interaction with entering existing username and password.

**Exit Condition:** Player should click the logout button.

**Main Flow of Events:**

1. User enter the login button
2. Write the username and password section, then click enter button.
3. System opens the game with existing account.

**Alternative Flow of Events:**

1. User enter the login button
2. Write the username and password section, then click the enter button.
3. System check the information with database and there will be no matched account
4. Proper error message will appear.
5. Steps goes back.

### **Use Case#3**

**Use case name:** How To Play Game

**Participating actor:** Player

**Stakeholders and Interests:**

- Player wants to get information about game
- System displays the information about the game and a button to go back the main menu.

**Pre-Condition:**

- The player should click the “How To Play” button which is on the main menu.

**Post-Condition:** -None

**Entry Condition:**

- The player interaction with “How To Play” button which is in the main menu.

**Exit Condition:**

- The player interaction with the “Go To Main Menu” button.

**Main Flow of Events:**

1. Player should click the “How To Play” button.
2. After the player learn about the game he/she should click “Go To Main Menu” button.

#### **Use Case#4**

**Use case name:** Credit

**Participating actor:** Player

**Stakeholders and Interests:**

- Player wants to get information about the developers.
- System displays the information about the developers and a button to go back the main menu.

**Pre-Condition:**

- The player should click the “Credits” button which is on the main menu.

**Post-Condition: -**

- Player must be in main menu

**Entry Condition:**

- The player interaction with “Credits” button which is in the main menu.

**Exit Condition:**

- The player interaction with the “Go To Main Menu” button.

**Main Flow of Events:**

1. Player should click the “Credits” button.
2. After the player learn about the game he/she should click “Go To Main Menu” button.