

Requirements and Analysis Document for Sniper-Monkey

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1 Introduction

This document is a description of the requirements and goals for our project and acts as a general understanding of the structure. In this project we wanted to create a 2D fighting game. The game consists of several different fighters with unique abilities and a handcrafted map. However, there exists several fighting games of similar kind and thus, we wanted to create something unique. The result was a game mechanic where each player has two fighters that can be switched mid-game for greater depth to the experience. The game is primarily directed towards people who play games such as Super Smash Bros or Street Fighter and we hope to give them a fresh experience with our unique mechanic.

1.1 Definitions, acronyms, and abbreviations

- Knockback
 - Means that a person gets moved backwards when taking a hit. In this instance a fighter gets knocked backwards when taking damage.
- Cooldown
 - Means that an ability or attribute cannot be used for a certain amount of time. For example, when an attack is on cooldown, I cannot use it for the specified time.
- Fighter
 - An object in the program that resembles the player's "fighter". This object is controlled by the player and is used to attack the opponents fighter.

2 Requirements

The following is the requirements and goals for the program set by the developer team.

2.1 User Stories

2.1.1 User story

Story Identifier: UST001

Story Name: Fighter visibility

Status: Fully implemented

Description

As a player I want my fighter to be visible on the screen to see where it is and what fighter I'm using.

Confirmation

Functional

- Is my fighter visible?
- Is my fighter at the correct position?
- Does my fighter's appearance reflect what type of fighter it is?
- Does the appearance change when my fighter changes?
- Is my selected fighter visible in the character select screen?

Non-Functional

Availability

- Is the fighter visible during the entirety of the game?
- Are my chosen fighter visible during the entirety of the selection phase?

Security

- Is there no way to remove the fighter's view during the game unless the player object itself is removed?

Tasks

- Create fighter views.
- Create animations and sprites and connect them to fighter.
- Place fighter on screen.
- Make sprite update each frame depending on player data.

2.1.2 User story

Story Identifier: UST002
Story Name: Move fighter
Status: Fully implemented

Description

As a player I want to move my fighter to and from my opponent in order to attack and dodge attacks.

Confirmation

Functional

- Can I move my fighter left, right, up and down via the keyboard?
- Does my fighter have a maximum speed?
- Does my fighter's speed factor influence my movement speed?
- Does my fighter have some sort of gravity?
- Does my fighter have some sort of drag?

Non-Functional

Availability

- Am I unable to move my fighter when executing an attack or blocking?
- Am I unable to move my fighter when the game is paused?
- Am I unable to move my fighter when the game round has not started.

Security

- Are the players unable to override the movement-block while using an ability such as attack or block?

Tasks

- Create an input handler.
- Create methods for moving.
- Connect selected movement keys to movement methods.

2.1.3 User story

Story Identifier: UST003

Story Name: Platform

Status: Fully implemented

Description

As a player I want to have a platform so that I won't fall off the map when I start the game.

Confirmation

Functional

- Can I stand on the platform without falling through?
- Can I see the platform?

Non-Functional

Availability

- Can I stand on the platform throughout the whole duration of the game?
- Can I view the platform throughout the whole duration of the game?

Security

- Are the players prevented from creating new platforms during the game?
- Are the players prevented from removing platforms during the game?

Tasks

- Get sprites for platform.
- Make the sprite a game object.
- Assign game objects a hitbox and render them every frame.

2.1.4 User story

Story Identifier: UST004

Story Name: Player collision

Status: Fully implemented

Description

As a player I want to collide with the other player and not be able to stand in the same position as them so it's not unclear who is who.

Confirmation

Functional

- Does my fighter stop if I try to move into the other player's fighter?
- Does the collision work both horizontally and vertically?
- Are both player's stopped if we try to move into each other instead of one player having priority and is able to push the other?
- Do different fighters have different hitboxes depending on their size?

Non-Functional

Availability

- Is the player always unable to move into the other player with no exceptions?

Security

- Are there no easy exploits that can be used to phase through the other player?

Tasks

- Give each fighter a hit box size.
- Give each player a hit box.
- Update the size of the hit box based on the active fighter's.
- Store key value pairs of object and its related hit box.
- Store static objects in a spatial hash.
- Store dynamic objects in a hash.

- Create a method that whether a given hit box and nearby hit boxes collides based on the spatial hash.
- In the same method check if the given hit box collides with any dynamic objects.
- Return a list of all the objects it collided with.
- Make a method that given a velocity and position and hit box return a new position and velocity that takes the other hit boxes into account and alters the position and velocity based on whether it collides or not.
- Make player use the method that gives a new position and update its position based on its result.

2.1.5 User story

Story Identifier: UST005

Story Name: Stamina

Status: Fully implemented

Description

As a player I want my fighter to have stamina that is used for attacks so that it's not possible to rely on spamming attacks to win the game.

Confirmation

Functional

- Is my stamina drained if I attack?
- Am I prevented from attacking if my stamina isn't high enough?
- Does my stamina regenerate over time determined by the active fighter's speed?
- Does my stamina stay within its range?

Non-Functional

Availability

- Is my stamina available throughout the entirety of the game except for when I'm dead?

Security

- Is the other player prevented from accessing my stamina?

Tasks

- Store stamina data.
- Create upper and lower bounds for stamina.
- Increase stamina data every frame.
- Connect stamina data to player.
- Decrease stamina on player attack.
- Make so player can't attack if stamina data is lower than the stamina cost of an attack.

- Create a view representing the stamina data.
- Connect the view to the stamina data.

2.1.6 User story

Story Identifier: UST006

Story Name: Health

Status: Fully implemented

Description

As a player I want my fighter to have health so that the game doesn't go on forever.

Confirmation

Functional

- Is my health points drained when I get attacked?
- Can I drain the other players health points when I attack?
- Does the game end when one fighters health is reduced to 0?

Non-Functional

Availability

- Does my health not decrease while the game is paused.
- Does my health not decrease while the game has not started.

Security

- Are the players prevented from reducing health with the exception of attacking?

Tasks

- Store health data.
- Connect health data to the player.
- Make each attack have some type of attack data.
- Make the player take damage when the attack has hit the player.
- Make the player decrease the health data when taking damage.
- Notify the game when a player has a health below or equal to 0 and end the game.

2.1.7 User story

Story Identifier: UST007

Story Name: Health Bar

Status: Fully implemented

Description

As a player I want a health bar on screen so I can keep track of how much health my character has left.

Confirmation

Functional

- Is my health bar updated when my health changes?
- Does my health bar stay within its range?

Non-Functional

Availability

- Is my health bar visible for the entirety of the game?

Security

- Is the other player prevented from modifying my health bar in any way?

Tasks

- Create a view for the health bar with some data.
- Connect this view to a player's health data.
- Make the view become notified when the health changes.

2.1.8 User story

Story Identifier: UST008

Story Name: Attacks

Status: Fully implemented

Description

As a player I want my fighters to have 2 different types of attacks so the gaming experience doesn't become too uniform.

Confirmation

Functional

- Can my fighter attack?
- Do the attacks damage the other player?
- Does my fighter have two separate attacks?
- Are my own attacks prevented from hitting me?

Non-Functional

Availability

- Am I able to access both of my attacks during the entirety of the game?
- Am I unable to execute a new attack if I am currently attacking or have attacked only a little while ago?

Security

- Are attack stats unable to be tampered with during the game?

Tasks

- Create attacks and assign them to their corresponding fighter
- Create attack functionality
- Add collision detection to attacks
- Add views for projectile objects
- Show how to perform attacks in the GUI

2.1.9 User story

Story Identifier: UST009

Story Name: Switch fighter

Status: Fully implemented

Description

As a player I want to be able to switch to a secondary fighter so that the gameplay becomes more dynamic and I might get an advantage over my opponent.

Confirmation

Functional

- Is my fighter switched when I want it to, with the exception of it being on cooldown?
- Do my attacks change when I get a new fighter?
- Do my stamina and health-bar stay the same when I switch fighter?

Non-Functional

Availability

- Can I see when I am able to switch fighter?
- Can I see which fighter I can switch to?
- Can I see what I must do to change fighter?

Security

- Is my opponent able to switch my fighter?

Tasks

- Create functionality in player to switch fighter.
- Add a new button in playercontroller to switch fighters.
- Add a delay to switching fighters.
- Add button to GUI

2.1.10 User story

Story Identifier: UST010

Story Name: Time limited rounds

Status: Fully implemented

Description

As a player I want the rounds to be time limited so that the game can't go on forever and camping is prevented.

Confirmation

Functional

- Does the timer begin when the game begins?
- Does the game end if it goes on for a predetermined amount of time?
- Does the player with the most health left win the game if the time runs out?
- Is the remaining amount of time shown to me?

Non-Functional

Availability

- Is the timer active throughout the entire match?
- Does the timer stop counting when the game is paused?

Security

- Are the players prevented from altering the timer during the game?

Tasks

- Create a timer class.
- Add timer functionality.
- Add GUI functionality to display timer.
- Stop the game if timer reaches 0.

2.1.11 User story

Story Identifier: UST011

Story Name: Block Damage

Status: Fully implemented

Description

As a player I want to be able to block my opponents attacks in order to not take the full damage hit.

Confirmation

Functional

- Does blocking reduce the damage taken when getting damaged from an opponents attack?
- Is the effectiveness reduced when blocking for a longer period of time?
- Does blocking regain its effectiveness while not blocking?
- Am I unable to attack, move or jump while blocking?
- Can I see the current effectiveness of my block?

Non-Functional

Availability

- Am I unable to block while performing an attack?
- Am I unable to block for a short period of time after blocking?

Security

- Are the other players unable to influence my block's effectiveness without a block-crunching attack?

Tasks

- Store block data.
- Create a blocking state.
- Connect block data to blocking state.

- Connect blocking state to player.
- Connect block data to player.
- Make player take less damage based on block data while in blocking state.
- Decrease block data while in blocking state.
- Increase block data while not in blocking state.
- Create a timer that keeps track of how long it has been since going from blocking state.
- Disallow going to blocking state unless timer has finished.
- Create a view representing the block data.
- Connect the view to the block data.

2.1.12 User story

Story Identifier: UST012

Story Name: Input UI

Status: Fully implemented

Description

As a player I want to see which buttons I need to press in order to execute different moves and attacks.

Confirmation

Functional

- Are all the relevant buttons visible on screen?
- Are the correct buttons shown according to the keybinds that are set?
- Are the players shown different buttons?

Non-Functional

Availability

- Are the buttons shown on the UI for the entirety of the game?

Security

- Are the buttons on the UI unable to change during the game so they cannot be tampered with?

Tasks

- Create a screen that displays all different keybinds and their effect on press.
- Create a button to switch to this screen in the main menu.
- Create a button to go to the last screen within the screen that displays all keybinds.

2.1.13 User story

Story Identifier: UST013
Story Name: Four Fighters
Status: Fully implemented

Description

As a player I want to be able to choose between at least four different fighters to get variation in my playing.

Confirmation

Functional

- Do I have four or more characters to choose from when playing?

Non-Functional

Availability

- Can I see the four different characters?
- Can I choose between the four different characters?
- Can I see what I must do to choose the fighter?

Tasks

- Create fighters.
- Make a character selection view.
- Make so character can select fighter.
- Make a view for the selected character.
- Make so player can switch the selected fighter if they regret their decision.
- Store selected fighters.
- Send selected fighters to fighting state when ready.

2.1.14 User story

Story Identifier: UST014
Story Name: Attack Cooldown
Status: Fully implemented

Description

As a player I want cooldown between attacks so that the game doesn't become about who can click the attack buttons the fastest.

Confirmation

Functional

- Am I unable to attack for a short while just after performing an attack?
- Do more powerful attacks have longer cooldowns?
- Can I see how long cooldown my attacks have left before I can attack again?

Non-Functional

Availability

- Are the cooldown system available throughout the entire game?

Security

- Are the players prevented from altering their cooldowns in order to cheat and attack faster?

Tasks

- Create a timer.
- Start the timer when the attack is performed.
- Nullify other states if the counter is counting.
- After counter has finished resume as usual.

2.1.15 User story

Story Identifier: UST015

Story Name: Available attacks

Status: Fully implemented

Description

As a player I want to see the abilities my fighter has and performs during the game to be able to defeat my opponent.

Confirmation

Functional

- Can I see the attacks my current fighter can perform on the screen?
- Is it clear how to perform the attacks the current fighter has?
- Can I see when my fighter performs an ability, such as an attack?
- Can I see the cool down of the my ability?

Non-Functional

Availability

- Can I see the attacks my current fighter can perform on the screen during the fighting state?
- Is my secondary fighter's attacks hidden while it's not active?

Tasks

- Create a view for a general key that represents the cool down of the ability as well as the corresponding ability name.
- Connect each ability cooldown to each key.
- Connect each ability keybind to each key view and display it.
- Notify the corresponding key when the timer (cooldown) changes.
- Visually change the view when the cooldown changes.
- Notify the view when the player swaps fighter.
- Change the ability names when the player swaps fighter.

2.1.16 User story

Story Identifier: UST016

Story Name: Pause during gameplay

Status: Fully implemented

Description

As a player I want to be able to pause the game so I can leave and do something else for a while.

Confirmation

Functional

- Is there a key on my keyboard I can press to pause the game?
- Does the game timer stop when the game is paused?
- Are the players prevented from moving during pause?
- Can I unpause?

Non-Functional

Availability

- Can I pause throughout the entirety of the game?

Security

- Are there no ways for players to exploit the pause and move during it?

Tasks

- Create a pause state for the game.
- Do not update the game when in pause state.
- Wait for a specific key to be pressed, when pressed notify the game that the game must go into pause state.
- Create a view for the pause screen that displays that the game is paused with a resume button.
- Display the view when the game goes into its pause state.

- When the resume button is pressed or the key on the keyboard is pressed, make the game go into its playing state.
- Make the pause screen disappear when the pause state finishes.

2.1.17 User story

Story Identifier: UST017
Story Name: Knockback on hit
Status: Not implemented

Description

As a player I want my opponents fighter to take some knockback when I attack it so that I know that my attack was successful and did some damage.

Confirmation

Functional

- Does my opponent get moved back when hit?
- Does my fighter receive no knockback when I block?
- Does my opponent receive more knockback the more damage it takes?

Non-Functional

Availability

- Am I unable to move forward when receiving knockback?

Security

- Will my opponent be able to make my fighter take knockback without hitting me?

Tasks

- Create knockback functionality
- Connect knockback to when player collides with other players attack
- Move player backwards on hit

2.1.18 User story

Story Identifier: UST018
Story Name: Main Menu
Status: Not implemented

Description

As a player I want a main menu where I can start the game, change setting, and turn it off because I might not always want to jump into the game immediately after starting the application.

Confirmation

Functional

- Am I presented with a menu when starting the application?
- Does the menu have a start button?
- Does the menu have a settings button?
- Does the menu have an exit button?
- Do the various buttons take me to the correct screen or exit the game?

Non-Functional

Availability

- Is the menu visible and interactable unless I go to a different screen?
- Is the menu visible and interactable if I chose to go back to it after a game has ended or I chose to quit it?

Security

- Is the player unable to bypass the main menu?

Tasks

- Create view for main menu.
- Create main menu functionality.
- Make functionality to move to other views.

2.1.19 User story

Story Identifier: UST019

Story Name: Settings

Status: Not implemented

Description

As a player I want a game screen with settings before starting the game where I can change game related values like match time, player health, damage multiplier and choose what map to play.

Confirmation

Functional

- Can I change game values?
- Can I choose between different maps to play?

Non-Functional

Availability

- Can I change the game values and select the map inside the settings screen?
- Can I change the game values inside the settings screen?
- Can I pause the game and change the settings from a settings screen in the pause menu?

Security

- Can the player change game values outside of the settings screen?

Tasks

- Create config files.
- Create functionality for writing to config files.
- Create view to display settings.
- Add functionality to change settings in view.
- Store new data in config files.

2.1.20 User story

Story Identifier: UST020

Story Name: Background music

Status: Not implemented

Description

As a player I want to listen to epic game music to get in a fighting spirit.

Confirmation

Functional

- Is there music playing in the background?
- Is the music epic and contributes to increasing the players fighting spirit?
- Are there different songs playing depending on which screen I am on?
- Are there multiple songs to choose from?

Non-Functional

Availability

- Can I hear the music?
- Can I change the volume of the music?
- Do I hear different songs depending on the game screen?

Security

- Can the player change the music to songs not decided by the developers?
- Can the player access the song and download it locally?

Tasks

- Store audio data.
- Create functionality to play audio.
- Notify the music player to play different audio based on different events, such as switching screens.
- Create a view and controller for changing the audio levels.
- Connect the controller and music player to change audio levels based on user input.

2.1.21 User story

Story Identifier: UST021

Story Name: See attributes on character selection

Status: Not implemented

Description

As a player I want to see the different fighters attributes when choosing them to be able to plan my strategy better?

Confirmation

Functional

- Can I see the attack attribute of fighters in the character select screen?
- Can I see the defense attribute of fighters in the character select screen?
- Can I see the speed attribute of fighters in the character select screen?

Non-Functional

Availability

- Can I see the attributes throughout the entirety of the character select phase?

Security

- Are the attributes shown unable to be tampered with so they always correctly reflect the gameplay attributes?

Tasks

- Create functionality in character selection view to show attributes for selected fighter.
- Connect attribute for fighter to be shown on screen.
- Update attributes when selecting other fighter.

2.2 Definition of Done

The criteria for being completely done with a user story is common for all stories. Before a user story is created, you must create a separate branch in GitHub. The naming convention for the branch is *feature_(name-of-feature)*. For the user story to be considered done, ideally all code must be written, all public code must be documented well with Javadocs[1] and all code must be tested with JUnit[2]. When these criteria are fulfilled, the feature branch can be merged with the main branch and thus go into production. However, before merging, a pull request is done so that the code is reviewed by the developer team before going into production.

2.3 User interface

The start menu is very simplistic and has only three buttons. These three buttons are to either start the game, change settings in the game or exit the game, see figure 1. The exit button shuts down the game. The settings button changes the view to a new page where the player can change settings such as volume, resolution and key-binds. The start game button changes the view to a game customisation view where the players can change the in game settings such as the timer, the stamina change, the speed and much more. However, this feature is only planned and not yet implemented.

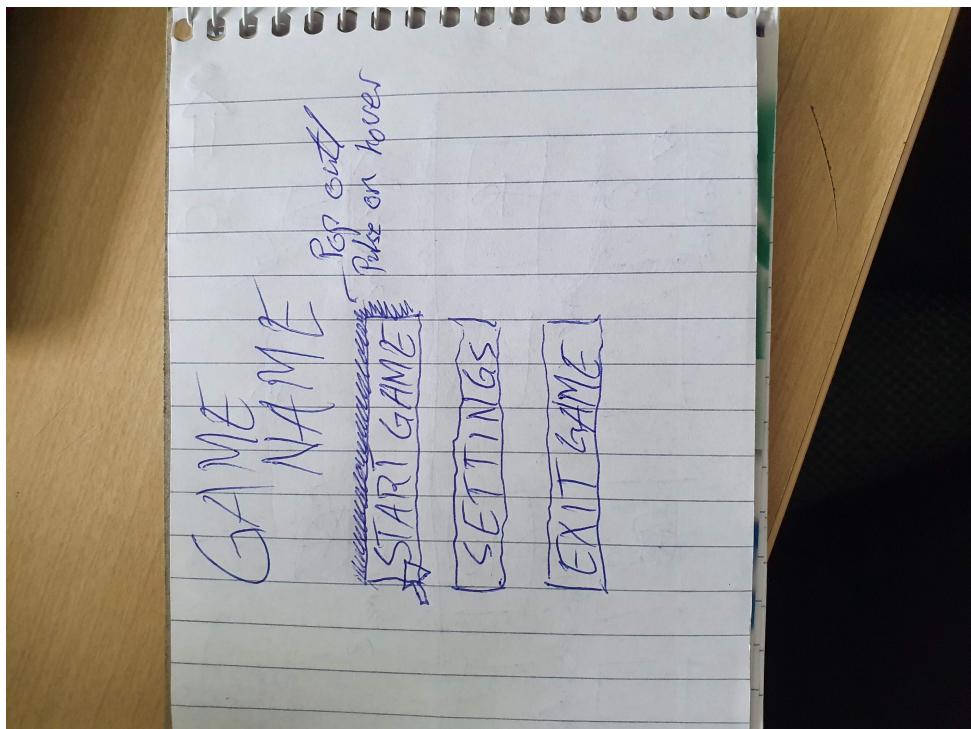


Figure 1: Low level sketch of the start menu

The game customisation view is one that comes after you press the start game from the main menu, see figure 2. This view lets the players modify the games base settings

so that the gameplay might vary. These base settings include the round-timer, the stamina drain, the speed factor, the damage multiplier and the ability to which map to play. After choosing the appropriate game settings the player presses a next button to get to the fighter selection view.

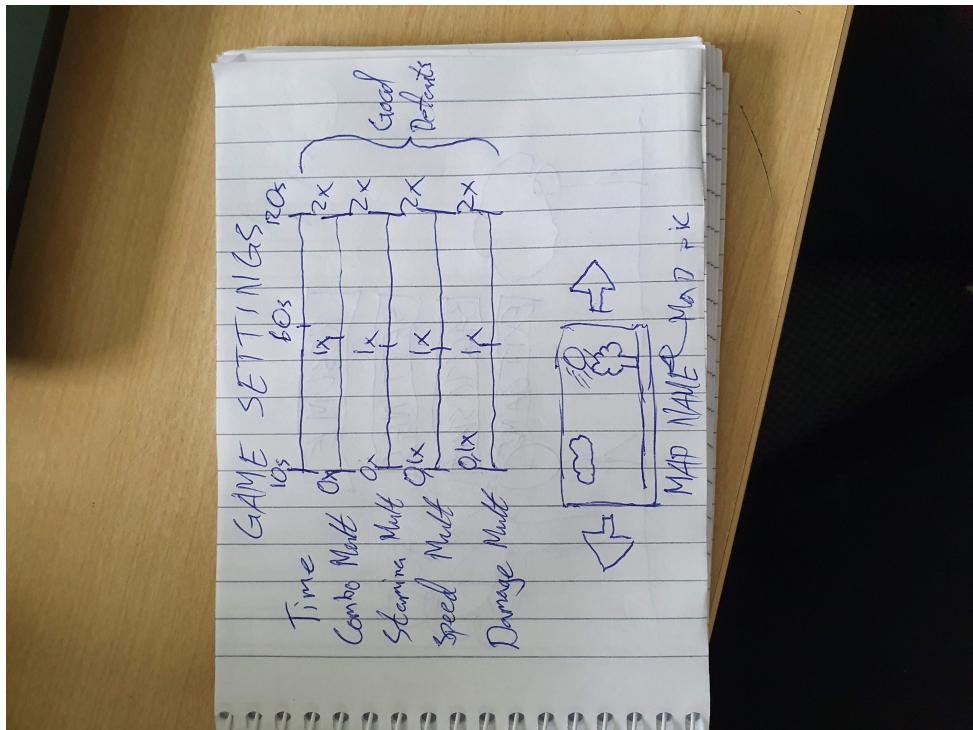


Figure 2: Low level sketch of the games customisation scene

The view after the game customisation view is character selection view, see figure 3. Here the players get to pick two fighters of their choosing to use in the game. These fighters all have different abilities and attacks and therefore could be some strategy in picking the right fighters to counter your opponent. In this view, you get a preview of your character, it's attacks and what the health and stamina multipliers are. When both players have chosen their fighters, the application changes to the arena view and the game starts.

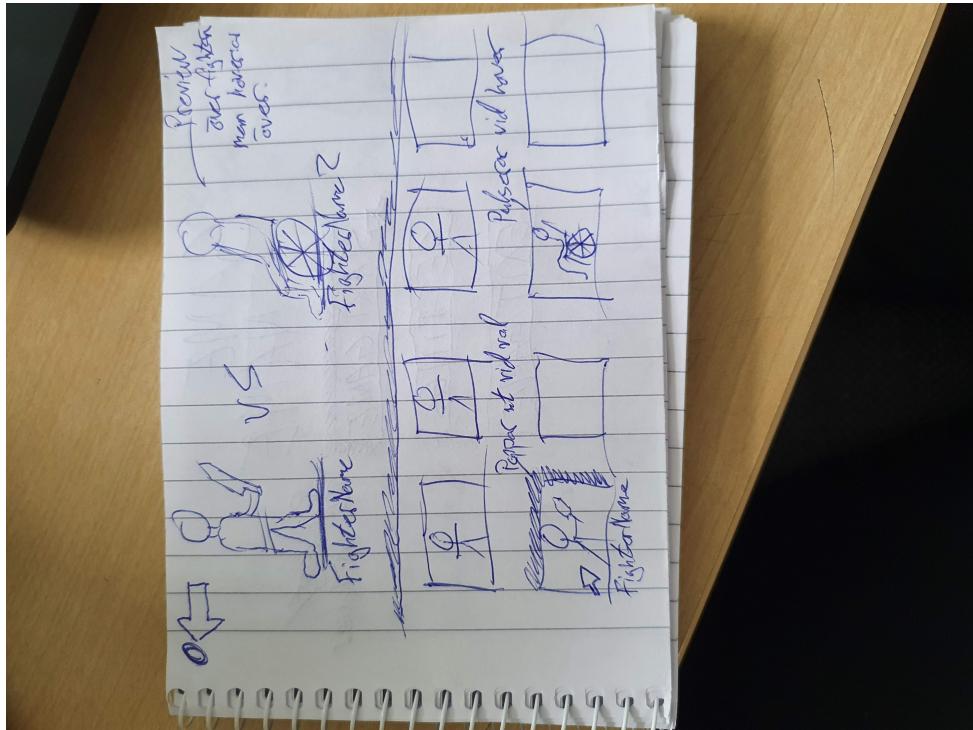


Figure 3: Low level sketch of the games' character selection screen

The arena view is the main view of the game where the actual fighting game takes place. Here, the two players use their fighters to battle until one wins either by reducing the other players health to 0 or by having more health when the timer runs out, see figure 4. The arena view will also show some sort of key-binds to the player so they know what buttons to press to play. This view is also considered to be the last step in the navigation since after this view, when someone has won, the application changes the view back to the main menu. However, a player can pause the game during the arena view and can choose to either resume, change settings or exit the game.

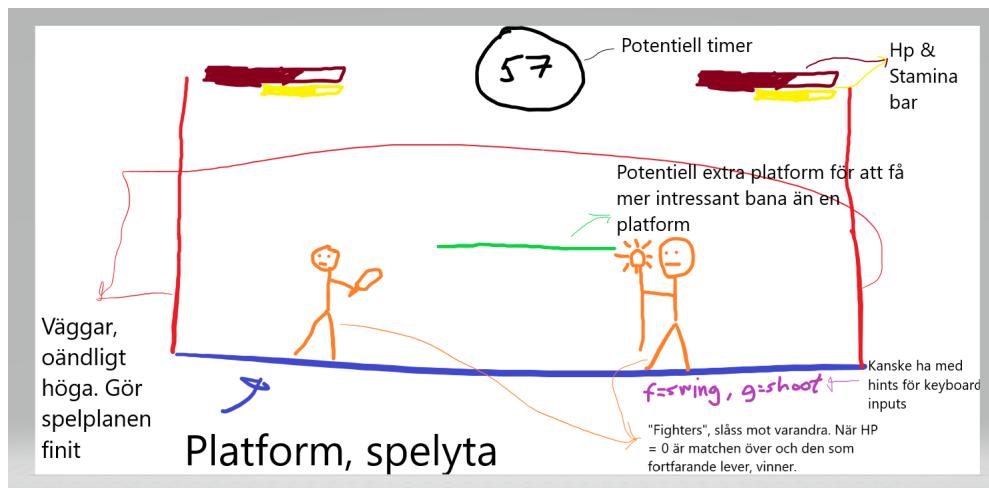


Figure 4: Low level sketch of the arena

The pause menu is one view that gets shown if the player chooses to pause the game during the fighting. Here, the player can choose to resume the game, change settings, go back to start och to exit the game entirely, see figure 5.

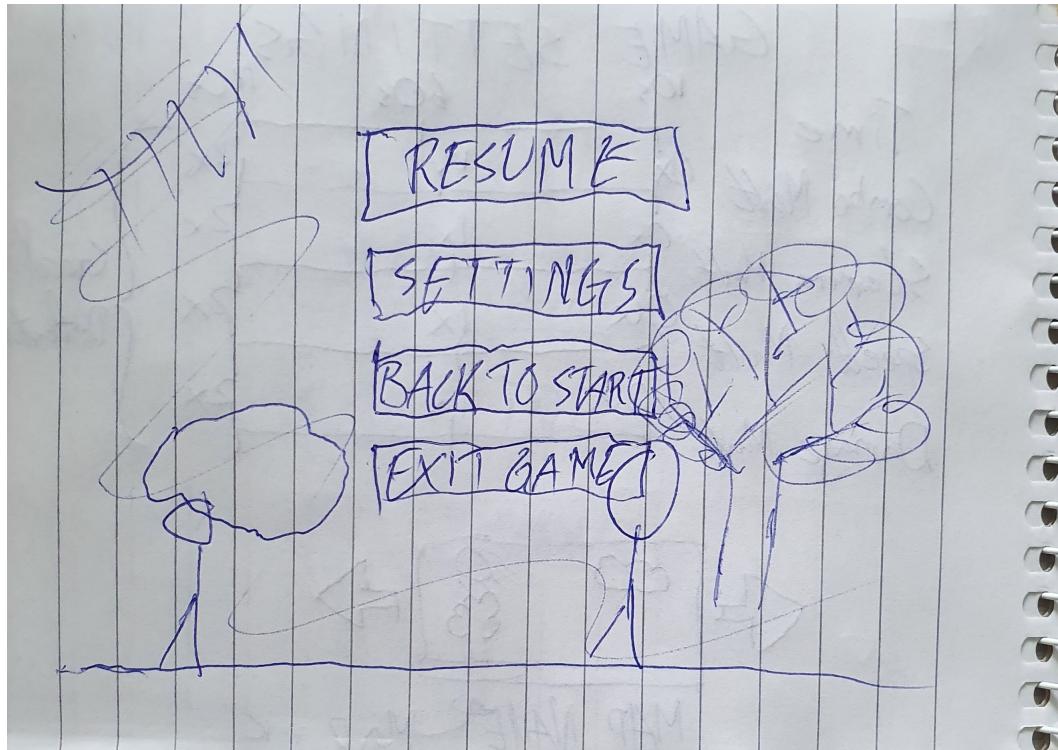


Figure 5: Low level sketch of the games' pause menu when in game

Some high level prototypes have also been created for the application using Figma. One example of these is the character selection view, see figure 6. This gives us a more

detailed description of how we want the selection view to look like. Here, you can also see the fighters different attributes, whether it has high attack and low defense etc.

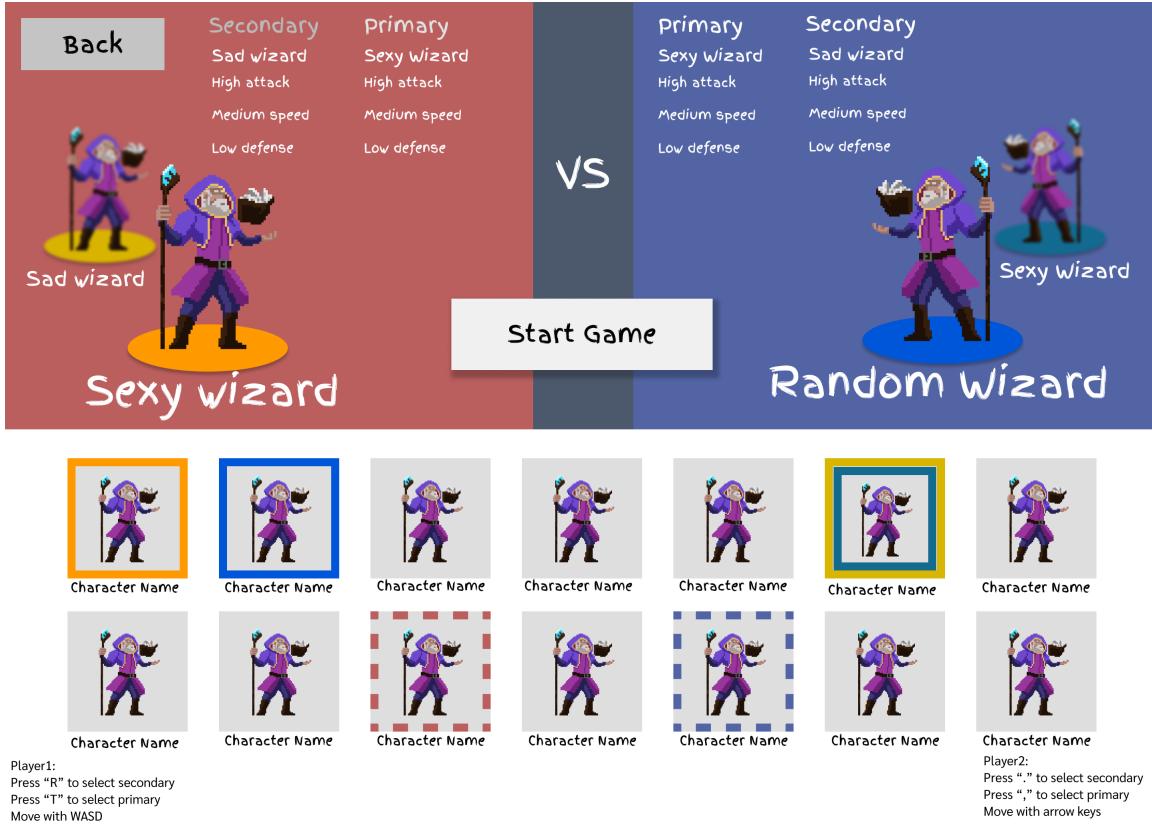


Figure 6: High level prototype of the games character selection screen

An other example of a high level prototype is the arena view, see figure 7. Like the last high level prototype, this shows us a more detailed description of what we want. The key-binds are shown at the bottom of the screen, the health and stamina-bars are shown at the top and it shows which fighter you can swap to during the game.

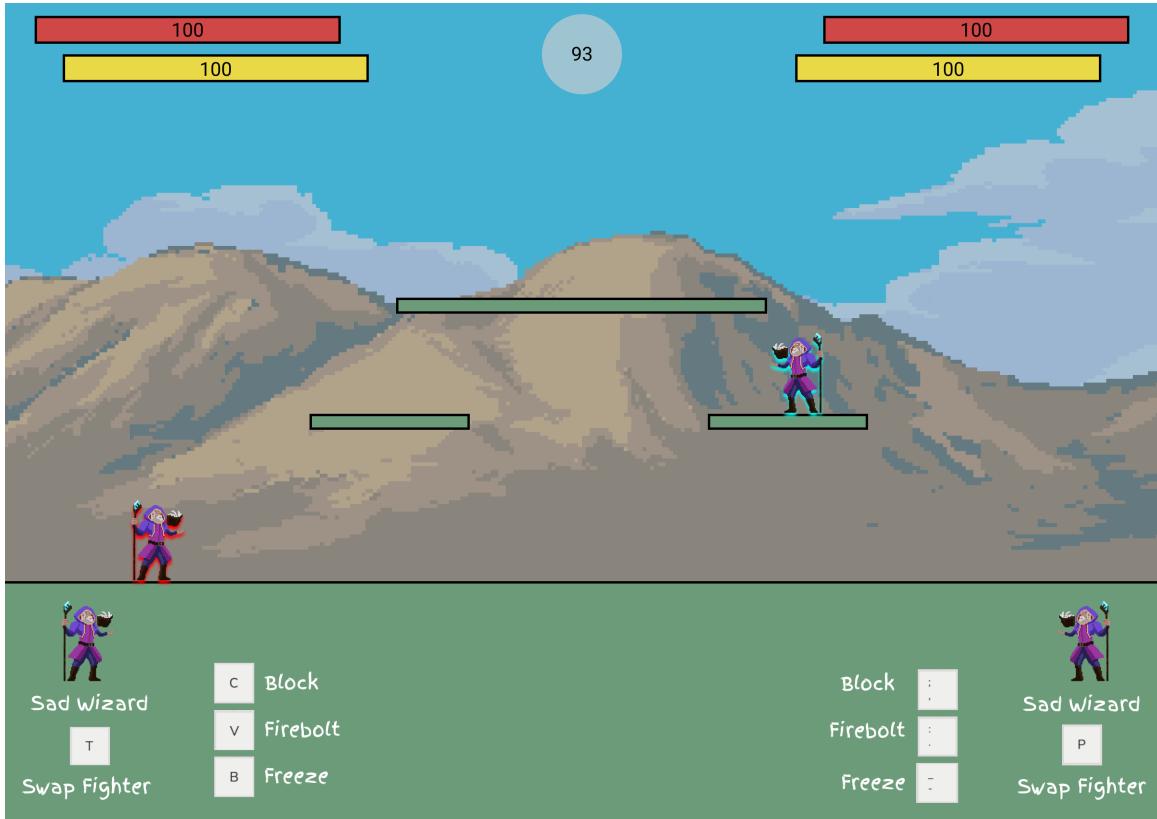


Figure 7: High level prototype of the arena

The current state of the character selection menu is not finalized but serves its purpose, see figure 8. Given more time the screen would inherit more from the high level figma prototype. The start menu is also nonexistent which is why this is the screen the users will initially start on, but given more time the first screen would be the start screen.

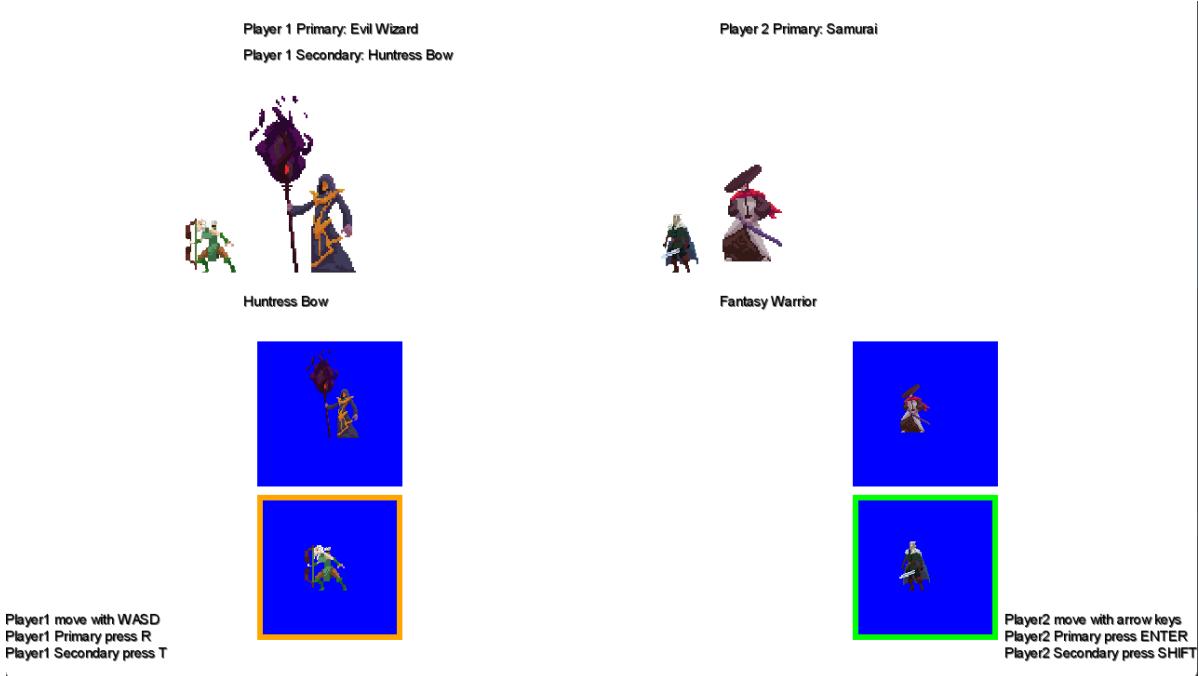


Figure 8: In-game view of the character selection menu.

The finished product of the arena uses different smaller tiles instead of large colored block, as well as introduce a bar for representing the effectiveness of the player's block ability, see figure 9. Each key now also displays the abilities cooldown, where a fully green key represent a usable ability. The users enters this view by having both users select both of their fighters in the character selection view. They then automatically switch to this view.



Figure 9: In-game view of the fighting arena.

The game now also displays a pause screen if the game should pause, as seen in figure 10. Currently the only way to enter the pause screen is to hit the ESC key on the keyboard. To exit the view you simply press resume or hit ESC again.

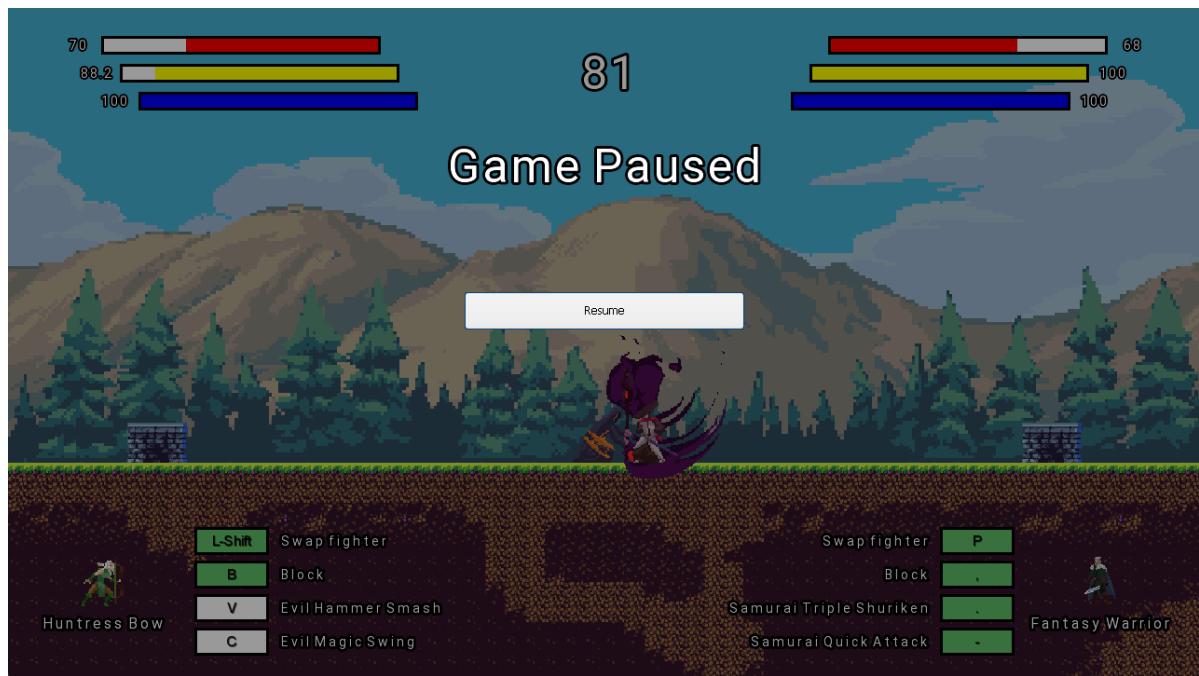
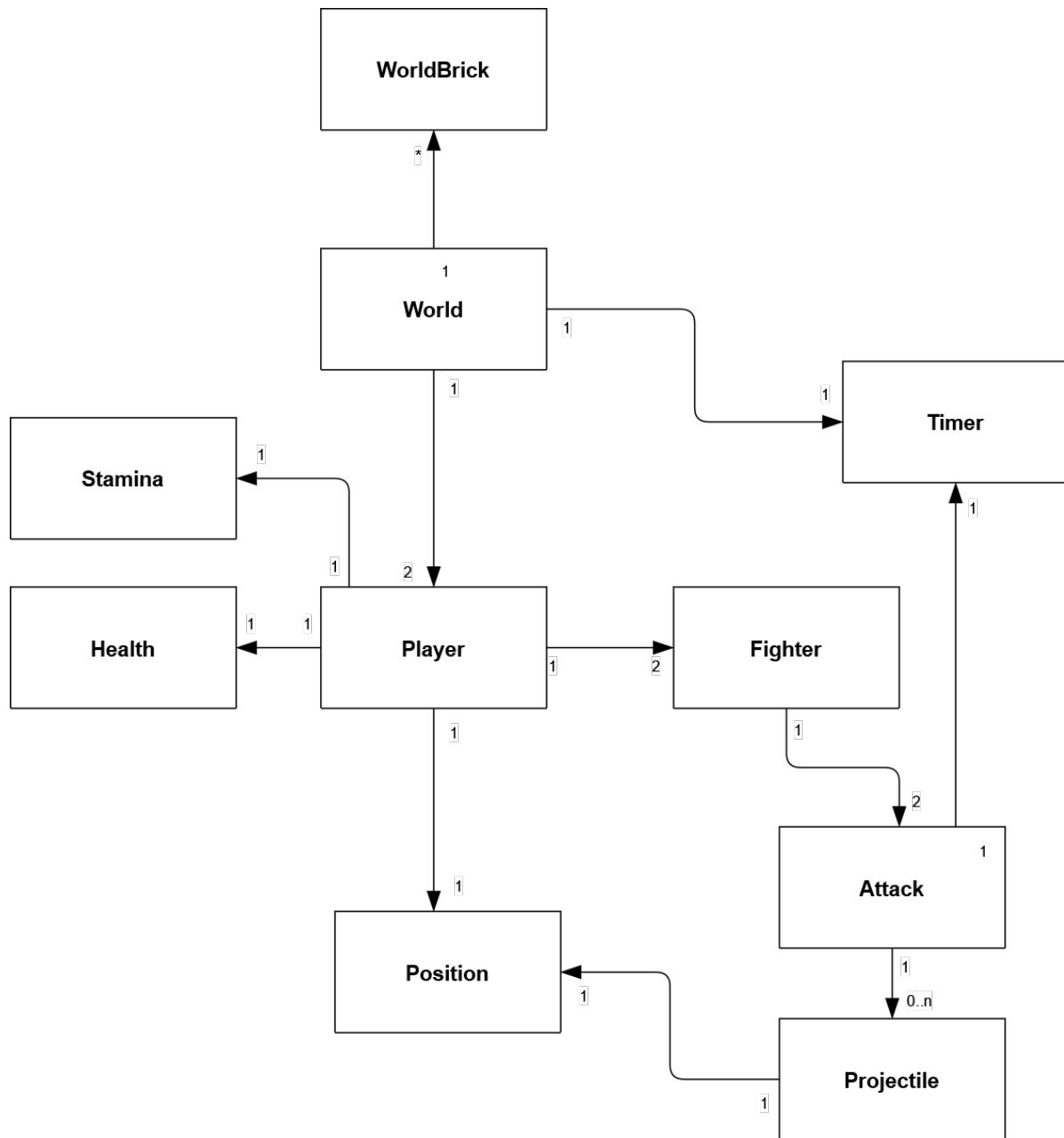


Figure 10: In-game view of the fighting arena in its paused state.

3 Domain model



3.1 Class responsibilities

The player class has the responsibility to move around, execute fighter attacks, and change and keep track of its health & stamina.

The health and stamina are responsible for making sure they stay within their defined maximum and minimum values as well as changing themselves based on possible re-

generation.

The fighter class is responsible for knowing the specific fighter's attributes such as speed, attack and defense but also their attacks and be able to perform them.

The attack class has the responsibility to know the base damage of the attack as well as knowing which projectile/attack object to spawn. Such as a sword, arrow or fire bolt.

The projectiles / attack objects are responsible for it's effect and the damage to give to the player when it collides with said player. It's also responsible to know and update its position based on its velocity.

The position is responsible for keeping track of where a game object exists in the world so that it can be drawn at the correct position.

The World class is responsible for keeping track and updating the game objects in the game, such as players, projectiles and platforms.

The WorldBrick class acts as a fundamental building block or tile that the game map is build of. It is responsible for keeping track of its own bounds and position so that other game objects can interact with it.

The timer class is responsible for keeping track of passed time and decide when a fighter no longer has hit stun and can attack again as well as keeping track the time left of a game round.

References

[1] Javadoc, [Software], Texas, United States : Oracle Corporation, 2021.

[2] JUnit, Version 4.13.2, [Software], Unknown : JUnit, 2021.