

Requirements and Analysis Document for Super duper Omega tower Defense

Samuel, Oskar, Erik, Behroz, Sebastian

October 23, 2020

1.0.1

Contents

1	Introduction	3
1.1	Definitions, acronyms, and abbreviations	3
2	Requirements	3
2.1	User Stories	3
2.1.1	Priority 1	3
2.1.2	Priority 2	6
2.2	User interface	8
3	Domain model	10
3.1	Class responsibilities	11
4	References	11

1 Introduction

The purpose of this program is to create a tower defence game where there is a war between the factions of the fishes and the alliance of the bears as per request of the client. The client wants to be able to command the bears on how they should protect their base from the attack of the fish. Any player interested in Tower defense will benefit from this project since they can play it once it is finished.

1.1 Definitions, acronyms, and abbreviations

- **Tower** - Reference used for refer to the Bears whom the player will command
- **DOT** - Abriviation common in games, stands for Damage Over Time.
- **HP** - stands for Health Points and refers to an enitites life.
- **AOE** - stands for Area of effect. Common for exploison like effects in games.
- **Hitscan** - When a tower damages the enemy directly, without shooting a projectile.
- **Heat seeking** - When a projectile seeks out a target by changing its velocity depending on how the target moves.
- **Wave** - A predetermined sequence of enemies.
- **Buff/Debuff** - A positive/negative effect applied on a tower or enemy.

2 Requirements

2.1 User Stories

The user stories that are done (represented by id) are 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, (partially done) 13, 14. The parts that are done in 13 are "Flying fish" and "Tank Sinatra".

2.1.1 Priority 1

1: Add towers

As a player I want to be able to have towers that attack enemies because it is interesting

- There is a map with a path and non-path tiles.
- There are towers on the map.
- Enemies are periodically spawned at some position of the map.

- Enemies follow a marked path and disappear when they reach the end of the path.
- The towers periodically attack the enemies.
- When an enemy has been attacked it is removed.
- The towers have a limited range in which they can attack enemies in.
- The map, towers and enemies are shown to me in an application window.

2: Defend base

As a player I want to have a base that enemies can attack so that I can lose

- There is a base on the map that I can defend with my towers.
- When the enemies reach the base they damage it.
- I can lose if enemies attack my base enough times.
- I can see how close I am to losing.
- I can see how much health each enemy has.

3: Add projectiles

As a player I want towers to be able to attack enemies with both projectiles and hitscan

- Some towers can shoot projectiles at enemies.
- When projectiles collide with enemies, they do damage the enemy.
- Projectiles get removed when they hit enough enemies or get outside the map.
- Towers “track” their target by facing towards them.
- Hitscan towers display a particle effect to show that they attacked.

4: Buy towers

As a player I want to be able to buy towers and place them on the map since that makes the game require strategy

- I can only place towers on valid spots on the map.
- I can see if a spot is valid or not on the map if I hover over the tile with my mouse.
- Placing towers cost currency.
- I can see how much currency I have.
- I cannot buy towers if I cannot afford them.
- I get money when my towers kills enemies.

5: Start game

As a player I want to be able to start a new game

- There is a map to play on.
- I can choose to start a new game.
- I can exit from in-game to the main menu.
- There is a main menu I get to when I start the application.

6: Tower panel

As a player I want a panel with a selection of multiple towers that I can place because that improves the games creativity

- There is a panel that I can select towers from.
- I can select and place at least 3 different towers.
- When I have selected a tower, I can see a "ghost version" (range, size and transparent image) of that tower on the map when I hover over the map.
- I can use keyboard numbers to quickly select towers from the tower panel.
- I can use arrow keys to switch page on the panel if there are more towers that fit on one page.
- Right-clicking deselects selected tower.

7: Implement waves

As a player I want the enemies to be divided into waves that I can start when I want because that gives me extra time to buy towers

- I can start a wave.
- Enemies do come out when a wave has started.
- The waves are predefined (not random).
- I can see what wave I'm on.
- There are an infinite amount of waves.
- I can start a new wave when a wave is already present.
- I do get rewarded when I start a wave when the current one is not finished.
- That is reward based on the total health of the remaining enemies.
- There is a bar that indicates how much of the currently activated waves are left.
- The series of waves are always the same every time you play the game.

2.1.2 Priority 2

8: Basic towers

As a player I want multiple attacking towers in order to defend my base.

The following towers and their theme and style are in the game:

- Grizzly Bear, basic tower possibly cheapest, throws rocks
- Sniper Bear, hitscan, long range, low fire rate, high dmg
- Mage Bear, heat seeking small explosions, medium dmg, decent range, medium attack speed
- AK Soviet Bear, shoots in bursts. 1 second burst and 2 second reload
- Bazooka Bear, shoots rockets which explode, AOE damage, slow fire rate, High dmg
- Barbearian, a short range (melee) tower that has high attack damage X-or attack speed

9: Debuff towers

As a player I want multiple towers that can debuff enemies because that increases the strategy of the game.

The following towers and their theme and style are in the game:

- Witch Bear, DOT effect, makes enemies walk backwards a short distance
- Fire Bear (Ozai), shoots high damage fire
- Bearnaisesås, Slows down enemies
- Polar Bear, freezes enemies (aoe slow down or projectile that freezes)

10: Support towers

As a player I want multiple towers with support abilities because that forces me to prioritize between them and attacking towers.

The following towers and their theme and style are in the game:

- Rubix Cube Bear, buff tower (attack speed, etc.), stacks additive
- Bear Grylls, increases nearby ranges, stacks additive
- Beer, gives buff/debuff depending on the bear.
- Bearon, a tower that “collects taxes” which gives money to the player. Amount of money depends on the number of towers in its range.
- Bee bear, throws bees, every damage it does generates 1 health or 1 money

11: Info panels As a player I want to be able to see information about selected tower types and new enemy types because that allows me to get a better idea of what is going on in the game

- There is a panel on the left dedicated to showing tower information.
- There is a panel on the right dedicated to showing enemy information.
- The tower information panel shows information (image, name, range, fire rate, damage/buffs and a short description) about the last selected tower.
- The enemy information panel shows information (image, name, speed, health points, death reward and a short description) about the latest new enemy.

12: Upgrades

As a player I want to be able to buy upgrades to my towers that I can improve my defense even when all tiles are used

- I can level up my towers which increases the tower's damage and fire-rate
- A tower can be leveled up an infinite number of times with each levelup costing exponentially more.
- Some towers have special upgrades which adds an ability to it, like a new attack.
- All towers have a targetting upgrade which allows the user to prioritise which enemy they should target: [first, last, strongest, closest]

13: Basic enemies

As a player I want there to be enemies with different strength because that forces me to build more defenses

The following enemies and their qualities exist in the game:

- Fishsticks, very low hp
- Swordfish, low hp
- Fish and chips, medium hp
- Fish in a boat, average hp
- Sailfish, super fast and medium hp
- Shark, fast and high hp
- Fish in fish tank, very high hp

14: More enemies As a player I want there to be enemies with special abilities because that forces me to build more strategic defenses

The following enemies and their qualities exist in the game:

- Flying fish, super weak, flies over small parts of the map

- Blobfish, high HP, explodes when killed which does High AOE damage to other fish
- Jellyfish, slow, regens overtime
- Blowfish, periodically blows up, 95% damage reduction but super slow then
- Planefish 747, fairly weak, flies over large parts
- Cyberfish, shield which regens
- Fin diesel, motorcycle, boss, fast
- Tank Sinatra, high HP, boss, slow

15: Map loading

As a player I want to be able to choose from multiple maps so I can have different difficulties/experiences between games

- There are at least 3 different maps that I can choose from.
- The maps are defined in and loaded from .map files.
- The maps are displayed as previews when I start the game.
- I can select the map to start a new game on.

2.2 User interface

The application will have a start screen where the player can select a map to play on. See figure 1. It will also have a start button, which will move the player to the game screen with the selected map. The start screen will also have a quit button, for if the user feels the need to exit the application.

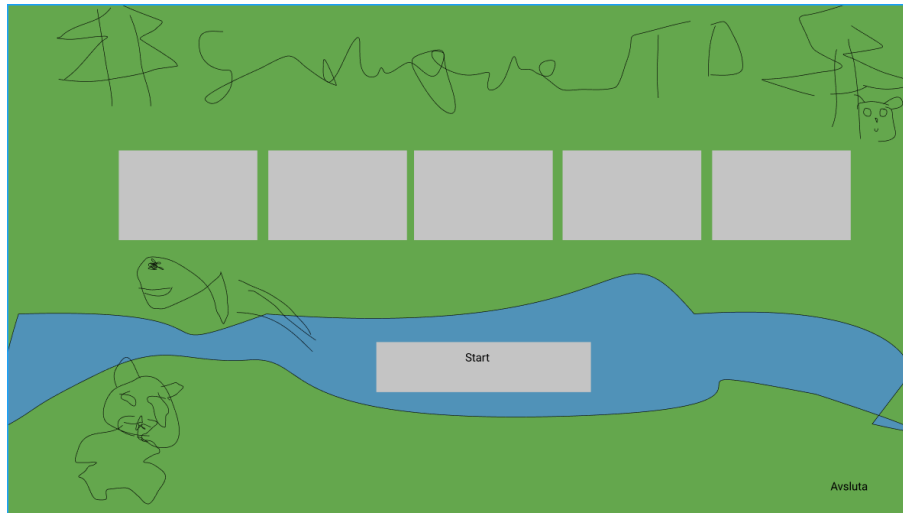


Figure 1: Sketch of the games preliminary start screen

When the player has selected a map, and clicked on the start button, the player will be redirected to the game screen. See figure 2.

On the game screen the player will be able to click on a tower, on the bottom of the screen, and click on one of the tiles, on the map panel in center top, to place a tower. On the right, close to the bottom, there is a play button, which will start the waves of enemy. This button can be clicked at all time, even if there is already a wave in progress. On the left and right of the map panel, there are two health bars, where the left one indicates the health of the player/base, and the right one indicates the health of all the enemies in all the active waves, combined. On the left of the green health bar, there is a panel for displaying tower info. This will display general info about the tower such as name, damage and attacks per second. On the right of the red health bar, there will be a display about which wave the player is on, and also statistics about new enemies that will come up through the play session.



Figure 2: Sketch of the the game

3 Domain model

The projects domain model, see figure 3, describes that the game/player should always only be one and be directly dependent on multiples of the other major parts of the model, such as the structures and collections of Enemies, Projectiles and Towers. The game/player is, according to the domain model, also dependent on the tiles that divide the map into a grid. Each of the many possible enemies, projectiles and towers should also be dependent on their position on the tile map.

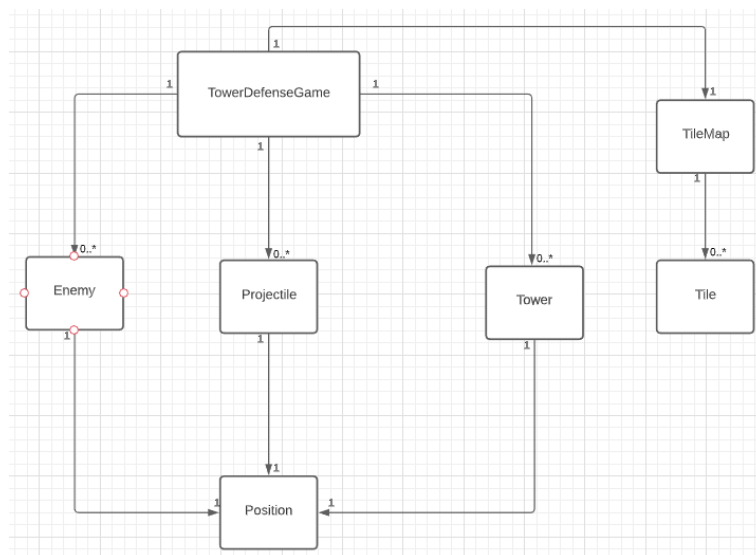


Figure 3: Picture of projects domain model

3.1 Class responsibilities

TowerDefenseGame in the diagram is represented by the Game class. A game keeps track of all the enemies, towers, projectiles, the map, and other things related to the state of the game.

Enemies have multiple different classes depending on the type of enemy. Enemies are responsible for moving along the path of the map.

Towers have also different classes based on which tower it is. Towers are responsible for finding enemies to attack and spawning new projectiles.

Projectiles also have different classes. Each projectile is responsible for checking when it has collided with an enemy (and then damaging it) or reached the end of the map.

The TileMap is represented by a class which contains a grid of Tiles. The TileMap describes things like the path for the enemies, the place that they spawn and the base which they try to reach.

4 References

List all references to external tools, platforms, libraries, papers, etc.

- Figma - Used for preliminary sketching of the program <https://www.figma.com/>
- Lucidchart - Used for creating domain model <https://www.lucidchart.com/>