

# CS 547 Project 1: Design Document Empire Wars

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## 1 Introduction

In this document, we have documented the design features of our game "Empire Wars". Section 2 gives a brief overview of the game and describes the game's UI and the entities. Section 4 and 5 describe the low and high bar items.

## 2 Game Description

### 2.1 Description of the game:

Empire Wars is a 2D multi-player online battle arena video game. There are two teams in the game: Red team and the Blue team, and the objective is to acquire as many flags as possible in the field. The flags are located at different positions in the game field. Each team should at least have two players. The players start from the opposite sides of the field, and they can move in all four directions (Left, Right, Up and Down) and can fire bullets at their opponents. The game field has different terrains like plants, and bricks. The player has to go around the walls and the plants and cannot walk through them. Initially, all the flags in the field are inactive (grey). As the player reaches the flag, a timer starts running. The player has to wait for 5 seconds for the flag to change color. By making the player wait, we solve the conflict that might occur when two players of different teams fight for the same flag. The flags once changed to a team's color can be acquired by the other team. The players can fire bullets at the opponent team players which in turn decreases the player's health. Each player has three lives and the player is off the game when he loses all the three lives. A countdown timer keeps running through the game, and the team with the highest number of flags when the time elapses is the winner. The game also ends when all the players in a team lose all lives.



Figure 1: A very simple figure that illustrates what the game will look like. It also shows the major entities in the game, although the sprites might look different in the final game.

## 2.2 Camera Position:

A simple layout of how the game will look like is shown in the Figure 1. Unlike the figure, our game will have a bigger world, and the screen will scroll forward following the speed and direction of the player character, and can also scroll backwards to previously visited parts of a stage. The characters cannot see the entire map, and the game will adjust the screen with the character's movement, making the character off-center in the opposite direction of its movement, showing more space in front of the character than behind. The users will use the arrow keys to move around the play field and the key "J" to fire the bullets.

## 2.3 Mechanics and Interactions of the game:

Two teams of at least 2 characters, selected before the match, fight against each other, with the goal to acquire as many flags as possible before the others do the same. Both teams have to fight their way through enemy players, and creeps (a unit controlled by the game's artificial intelligence in a multi-player online battle arena). The maps contain different types of terrain like grass and walls which constrains the player's movement. Upon death, the player may re-spawn back at their base after a short delay. There is also a tower (AI) for each team, that shoots out fire at the opponent team's players when they get near the flags that are closer to the tower. When attacked by the opponent players, the players end up in limbo and has to remain idle for a definite amount of time until he is released. The maps include health pickups and extra life power ups which appear at random times in random locations.

## 2.4 Visual entities in the game

- **Player:** The player's are either colored red or blue depending upon the team they belong to. A health bar along with the name of the player is displayed above the player. Health is the amount of damage the player can take before dying. Each player has their own amount of health. Each section of the health bar above the character's head represent 15 health points. The health point decreases when attacked by the opponent team's crepes. Health can be increased by capturing the bananas that can be found at random locations on the map. The player loses a life when the health bar becomes empty.
- **The Flags :** The flags are initially inactive (grey) when the game starts. The flag changes to the color of the player's team when the player has been in contact with the flag for 10 seconds. There is a timer running on top of the flags that denote how much more longer the player has to wait for the flag to change its color. The opponent player can shoot at the players while they are waiting for the flag to change its color, which will send them to the jail.
- **Bullets :** When the player is shot by the enemy player and he dies, he is sent to limbo and has to remain idle until the time transpires (say 20 seconds). When the players of the same team shoot at each other the bullets are nullified. The player's bullets can kill the crepes.
- **Towers :** The towers are located at both the ends of the maps. The towers start shooting fire at the opponent players when they arrive at a certain distance from the tower. This makes it difficult for the players to acquire the flags that are closer to the tower. Instead of shooting fire at the player's directly the tower shoots around the player. The player has to go around the fire to survive. Colliding with the fire decreases the player's health points rapidly and the player has to move away from the fire as soon as possible. The towers cannot be destroyed.
- **The crepes :** Crepes are the game units which are controlled by the AI. There will be one crepe per team, and the crepe chooses one opponent player at random and follows him. The crepes also have health bars above them and have only 6 health points. The crepes can be killed by the players when shot 6 times. Once they are killed they re spawn from their tower after some delay and continues to follow a player randomly.
- **The Walls :** There are also some stone blocks that appear in the game field and they cannot be destroyed with bullets. The characters have to find a path around the walls to move past them. The bullets cannot pass through the walls.
- **The plants :** There are green patches of trees in the game field which are similar to the walls.

Apart from these basic entities there are also several power ups involved in the game. The power ups can appear in random positions of the game field and disappear after 20 seconds. The power ups are:

- **Heart** : Gives an extra life.
- **Banana** : Improves the health by 10 points.
- **Star** : Powerful bullets that can kill the crepes in one hit.
- **Cloak** : Hides all the flags acquired by the player's team.
- **Clock** : Freezes all the opponent characters for 5 seconds.
- **Shovel** : Adds a steel wall around the flags acquired by the player for 20 seconds.
- **Get out of Limbo** : Acts as a trump card. When having this power up the player can use it to get out of limbo before the 20 second duration elapses.

To add more suspense, some power ups are revealed only after they are acquired. The power ups may not always be beneficial to the player who acquired it. Some times the power ups can be power downs and they might have a negative effect on your team. For ex: the clock power up could freeze all the characters in the player's team instead of freezing the opponent's team.

### 3 Description of the technical showpiece:

- **Constrained Movement** : The characters in the game cannot move arbitrarily and they are constrained by the different terrains in the game field.
- **State-Based Behavior** : All the above mentioned power ups are responsible for the state based behaviour of the game.
- **Reasonable Pathfinding** : The crepes have to take the shortest path to the player and attack them. Also the tower has to track the player's position and shoot fire at them.
- **Collision Detection** : There are various types of terrains that has to be handled when the player collides. On colliding with the flag, the timer on the top of the flag has to be updated. Also the collision between the players and their enemies has to be handled. Sometimes even the bullets fired by the players of the same team collide into one another, however they will have no effects.
- **Networking** : Empire Wars will be a multi-player game. A game will be hosted by one of the players and other players will join the hosted game. The players will be assigned teams when they join a session.

## 4 High bar checklist

- **Isometric Limbo:** Players will go to the limbo when they die before they re-spawn back on the game. This limbo world will be constructed using Isometric Projection allowing it to have that 3D feel.

## 5 Low bar checklist

- **Networking:** Empire Wars will be a multi-player game player over the network. The networking infrastructure will have a server. The server will host the game. Other player can join the "session" as clients. We will use the UDP protocol to allow for packets to be sent between client and server.
- **Teams:** There will be two teams: Red and Blue teams. Players are automatically added to the teams when they join a session in a way that ensures equal distribution i.e. If there are 4 players, 2 players should be in the blue team and the other two players should be in the red team.
- **Foot Soldier:** The players will control the foot soldier using WASD/ arrow keys. The foot soldier sole purpose is to control as many territories as possible by changing the flags to their teams color. The foot soldier will have a health bar that decreases when he/ she collides with the crepes or is shot by another player.
- **Flags:** Flags are used to symbolize a territory that is controlled by the two teams. Flags will initially be grey in color and a "foot soldier" can change a flag to their teams color by walking up to it and waiting for 5 seconds.
- **Collision Detection:** We will have collision detection on the crepes, player, bullets and power-ups.
- **Power-Ups:** Power-ups are used to give its user an added advantage.
  - **Heart:** Gives an extra life.
  - **Banana:** Improves the health by 10 points.
  - **Star:** Powerful bullets that can kill the crepes in one hit.
  - **Cloak:** Hides all the flags acquired by the player's team.
  - **Clock:** Freezes all the opponent characters for 5 seconds.
  - **Shovel:** Adds a steel wall around the flags acquired by the player for 20 seconds.
  - **Get out of Limbo:** Acts as a trump card. When having this powerup the player can use it to get out of limbo before the 20 second duration elapses.
- **Tiled-Map:** This will be a scrolling maze centered on the player. The exception to that rule will be when the player approaches the edges of the map.
- **Tower:** The world will have two towers located on both ends of the map. The idea behind the towers is to make flags closer to a team's base harder to get to. The tower fires bullets at players from the opposite team.

- **Crepes:** Crepes are AI powered minions that help a team capture as many flags as possible. The minions will use path-finding to track the players from the other team and kill them.
- **Limbo:** Players will go to limbo for around 20 seconds when they die before they re-spawn back to their base.
- **Weapons:** The foot soldier's will be able to shoot at the crepes and other players.
- **Sound:** Sounds will be implemented to make the game more interesting. Sound will be used in the following cases:
  - Bullets are fired by the foot soldiers.
  - Bullets are fired by the tower.
- **Lives:** The player will start of with three lives. The lives reduce when the health bar reaches 0%.
- **Score:** A scoring mechanism that encompasses the number of kills and flags captured will be implemented. This will be used to decide the wining team.