Game Design Document

High level context

The game will be a recreation of SWIV, a vertical scrolling shoot 'em up game. It will support 2-player local co-op where players take control of different ship types with differing control characteristics.

Key Features

Co-op

2 player local co-op will be able to be toggled for all levels on level selection. Players will control different ship types that will feature different abilities and constraints such as environmental collisions for player 2.

Power-Ups

Power ups will spawn with a random chance upon enemy deaths. There will be multiple power up types that the player can cycle through by shooting the spawned power up.

Levels

The game will feature multiple levels that the player will be able to select from. The levels will feature set enemy spawn locations, as well as differing enemy types per level. The levels will also have a number of environmental obstacles that the second player will have to avoid. These obstacles will include water, buildings, and other vehicles.

Graphics

The game will feature a 2D sprite based art style. It will make use of simple sprite animations for dynamic elements in the game, such as explosions.
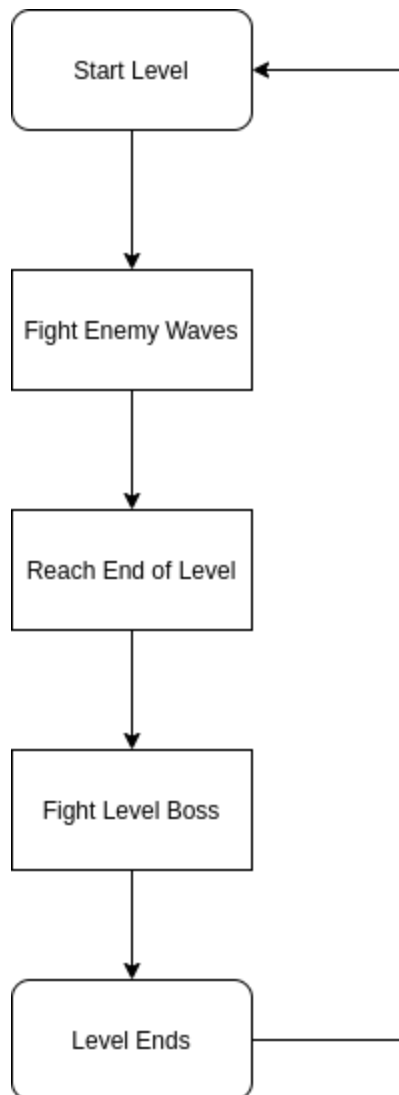
Sound

The sounds will consist of contextual sound effects for elements such as the user interface (UI), explosions, and bullets being fired. Background music will also be present in both the menus, and in game states.

Input

The game will feature the ability for players to rebind the layout of their different control schemes to their preferred key bindings for any in-game controls.

Gameplay

Basic Game Loop

```
┌─────────────────────┐
│    Start Level      │◄──────────────┐
└─────────────────────┘               │
           │                          │
           ▼                          │
┌─────────────────────┐               │
│  Fight Enemy Waves   │              │
└─────────────────────┘               │
           │                          │
           ▼                          │
┌─────────────────────┐               │
│  Reach End of Level  │              │
└─────────────────────┘               │
           │                          │
           ▼                          │
┌─────────────────────┐               │
│   Fight Level Boss   │              │
└─────────────────────┘               │
           │                          │
           ▼                          │
┌─────────────────────┐               │
│     Level Ends       │──────────────┘
└─────────────────────┘
```

Objective

The objective of each level will be to fight through waves of enemies to reach the boss at the end and to defeat the boss with all of their lives intact. Players will gain score throughout the

level, and by achieving a higher score than other players, they will be placed on a high-score list that is displayed to players at the end of each level as a "hall-of-fame".

Progression

Once a level is beaten, it will unlock the next, more challenging, level for the player to partake in. Each level will have an individual high-score list, which will increase level replayability and add to the potential challenge of each level.

Additions

Trains / Carriages

Trains have connected carriages that will each have an individual health pool. If one carriage gets destroyed, the whole train would get destroyed. A train running all across the width of the screen would fully block the player movement, forcing the player(s) to focus fire on a single carriage. It will also serve as a wall protecting other enemies from being shot at by players until the train is taken out. Each carriage can support a gun as well, or could have turret type enemies set up behind them to offer an additional challenge to focusing fire while on the move avoiding enemy bullets.

Mechanics

Health

Both player and enemies can have health, if an enemy has more than one health, it will be shown to the player through a health bar that will appear on screen. The players will be shown how much health they have at the top of the screen.

Invulnerability

Players will become temporarily invulnerable when they take damage. This will be to prevent them from getting damaged repeatedly by more dangerous enemies. Players will also not be able to pick up power-ups whilst invulnerable, this will be to prevent them from getting damaged on purpose and easily picking up the power-ups safely.

Certain boss types of enemies may become invulnerable for a short period to allow the bullets and spawned enemies on screen to disappear and give time for the player(s) to prepare for the next stage of the boss fight.

Movement

Movement will be the most important mechanic for players to master. Players will need to position themselves both out of harm's way and in position to damage and/or destroy enemies. If the players are adept enough at avoiding enemies and their bullets, players might even be able to get through certain levels without firing a bullet, however, evading bullets and enemies will not reward the player with score or a chance to gain a power up, so players will still be incentivised to destroy the enemies appearing on screen, unless they want to challenge themselves.

Environmental Obstacles

Inside the levels there can be environmental obstacles that block player movement or damage the player if moved into. In co-op mode there are certain obstacles that only block one player, but not the other, some of these obstacles can be damaged, to allow both players to pass over them once they are destroyed.

Shooting

Shooting will be the most convenient way for players to damage or destroy enemies. Players will shoot bullets that originate at their position. The bullets will move straight forward towards the top of the screen, unless a power-up changes the shooting pattern. Whichever shooting pattern the player may possess, the player will need to understand the pattern and position themselves in a way that makes their shooting pattern align with the enemy or the enemy's movement if the enemy's not stationary, which will also require an understanding of the speed at which the bullets move.
Enemies will also shoot bullets at the players, and enemy bullets work much the same way as the player bullets, but they will only damage the players. Players will need to avoid these through movement unless they are invulnerable or shielded.

Score

Players will obtain score by damaging enemies through hitting them with bullets and destroying them. Destroying an enemy will reward the player with a more significant score, incentivising players to destroy enemies, not just damage and avoid them if they want the highest possible score.
If the game is started up in co-op mode, the two players will have individual scores. Since the game is easier to play with two players, individual scores mean that if two players are playing the game would not be able to reach the highest score unless one was a non-participant. It also incentivises players to time their shots if they are competing for score, since the last bullet hitting the enemy will get the largest amount of score.

Power-ups

When an enemy will be destroyed there's a chance of a power-up spawning where the enemy was. Due to this power-ups may spawn close to dangerous locations, amidst other enemies or close to bullets fired by either the destroyed or other nearby enemies. This will add to the challenge of picking up power-ups, which can be a risk and reward element for the gameplay. In co-op mode, players will still have the same number of power-ups spawning, which can make players either compete for these power-ups or work together on safely picking them up, they can also work together by having one player shoot the power-up to change it to the desired one, while the other player is firing at enemies and/or moving towards the powerup.

Increase Fire Rate

This power-up will be used to increase the players shooting speed allowing them to destroy enemies with more hp easier. The buff will also be stackable allowing the player to collect more than one to boost their fire rate much higher than the base speed.

Enemy Types

Enemy Behaviours

Enemy behaviours will utilise the ECS systems to create sudo states and an efficient design tool. Simple tags will be applied to enemies and through a combination of these tags will create the desired behaviours. For this to work the behaviours will need to be made very specific so that they can be used in tandem. For example a Move Forward behaviour and a Rotate Toward Player behaviour could be used in tandem to create a seeking enemy. These can also be used as sudo states by using game logic to add or remove them at run time.

Seeker Enemy

This enemy type will follow and chase down any player within it's detection radius. If there are multiple players within its detection radius, it will prioritize the closest one. The player will lose a life on contact. The enemy will be destroyed on contact.

The main characteristics of this enemy will be the increased speed, however to balance this the health pool will be reduced for this enemy type.

Turret Enemy

This enemy type will be stationary and rotate to face players to shoot projectiles at them if they are within their detection radius. Players that come into contact with the bullets shall take contact damage, lose a life. The projectile will be destroyed on contact.

As this enemy will be stationary the player will be able to more easily target them. To balance this the health pool for this enemy shall be increased so as to absorb more player projectiles.

Boss

The boss will have two stages, in the first stage it will continuously shoot towards the players. Then it will stop for a brief period allowing for the bullets to clear and giving the players a short window to prepare before firing off a pattern of bullets. This second move will require more pattern recognition, but also leaves the boss more vulnerable. When the boss reaches half health, it will enter the second stage, in the second stage, after a short time, the boss will start alternating between charging at a player and firing off a pattern of bullets that is either the same as the one on stage one, or a different pattern that leaves it less vulnerable, increasing the difficulty of the fight.

Assets

Sprites

Player & Enemies

Kenney • Space Shooter Redux (no date). Available at: https://kenney.nl/assets/space-shooter-redux (Accessed: 26 April 2021).

Environment

Kenney • Sci-Fi RTS (no date). Available at: https://kenney.nl/assets/sci-fi-rts (Accessed: 26 April 2021).

Editor GUI

Omar (2021) *imgui: Graphical User interface for C++*. Available at: https://github.com/ocornut/imgui (Accessed: 26 April 2021).

Background Music

Search Art | OpenGameArt.org (no date). Available at: https://opengameart.org (Accessed: 26 April 2021).

Sound Effects

User Interface

Download Sound Effects | Soundsnap Sound Effects Library (no date). Available at: https://www.soundsnap.com/ (Accessed: 26 April 2021).

Explosions, Player & Enemy Projectiles

Kenney • Space Shooter Redux (no date). Available at:
https://kenney.nl/assets/space-shooter-redux (Accessed: 26 April 2021).