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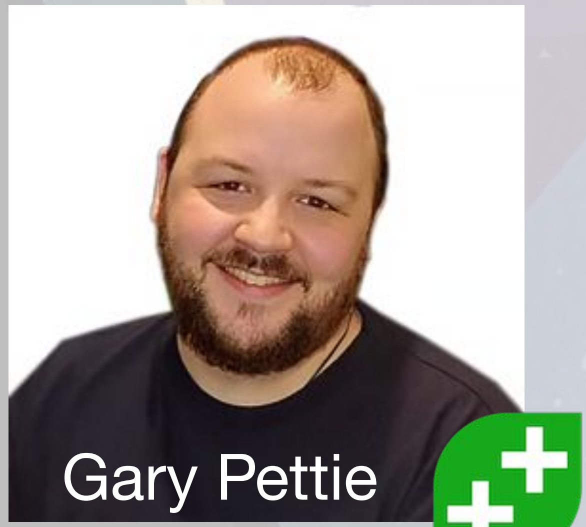
Laser Defender Section



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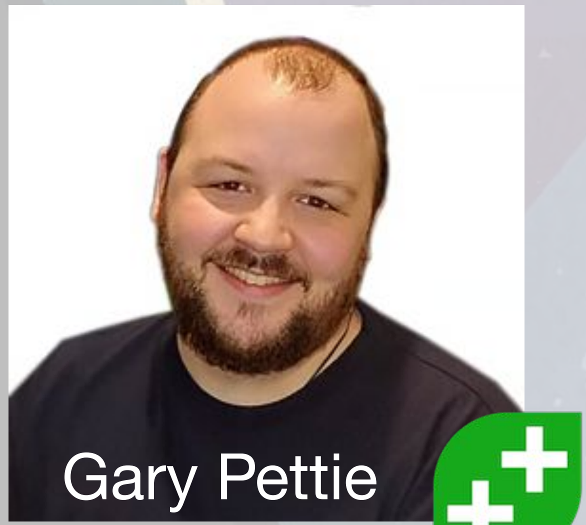
Section Intro - Laser Defender



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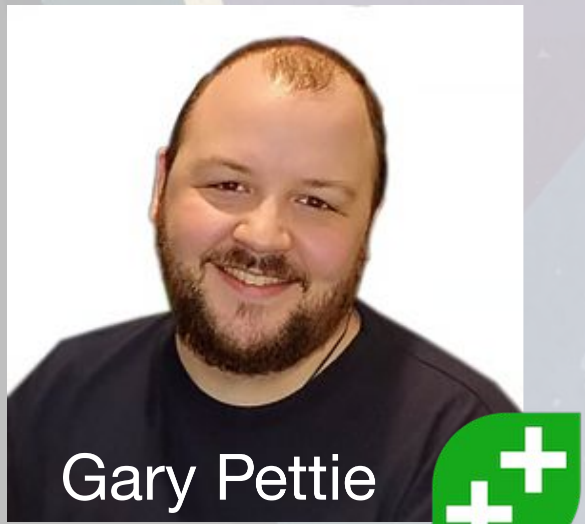
Game Design - Laser Defender



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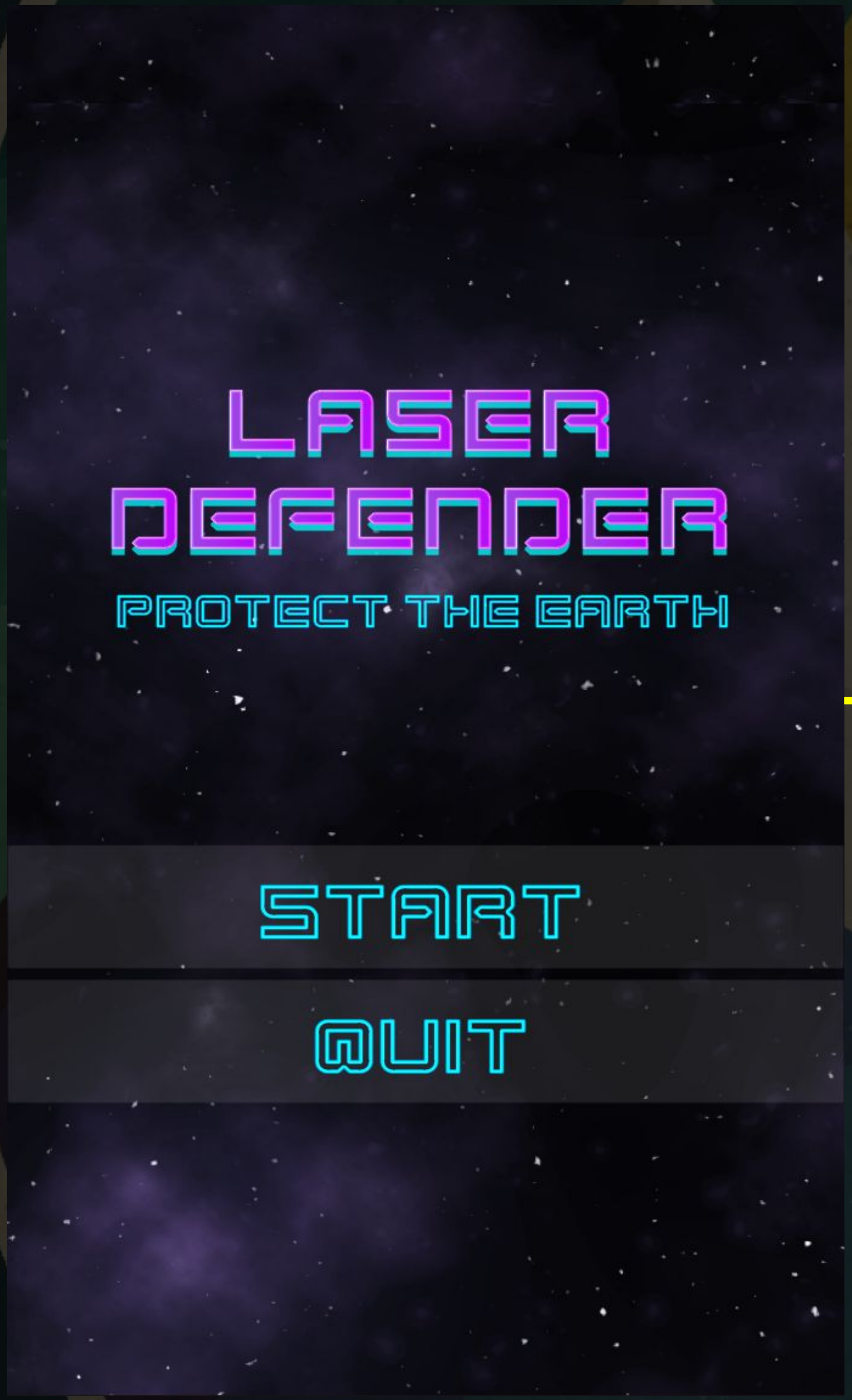
Game Design Document

- Bigger game = more detailed GDD

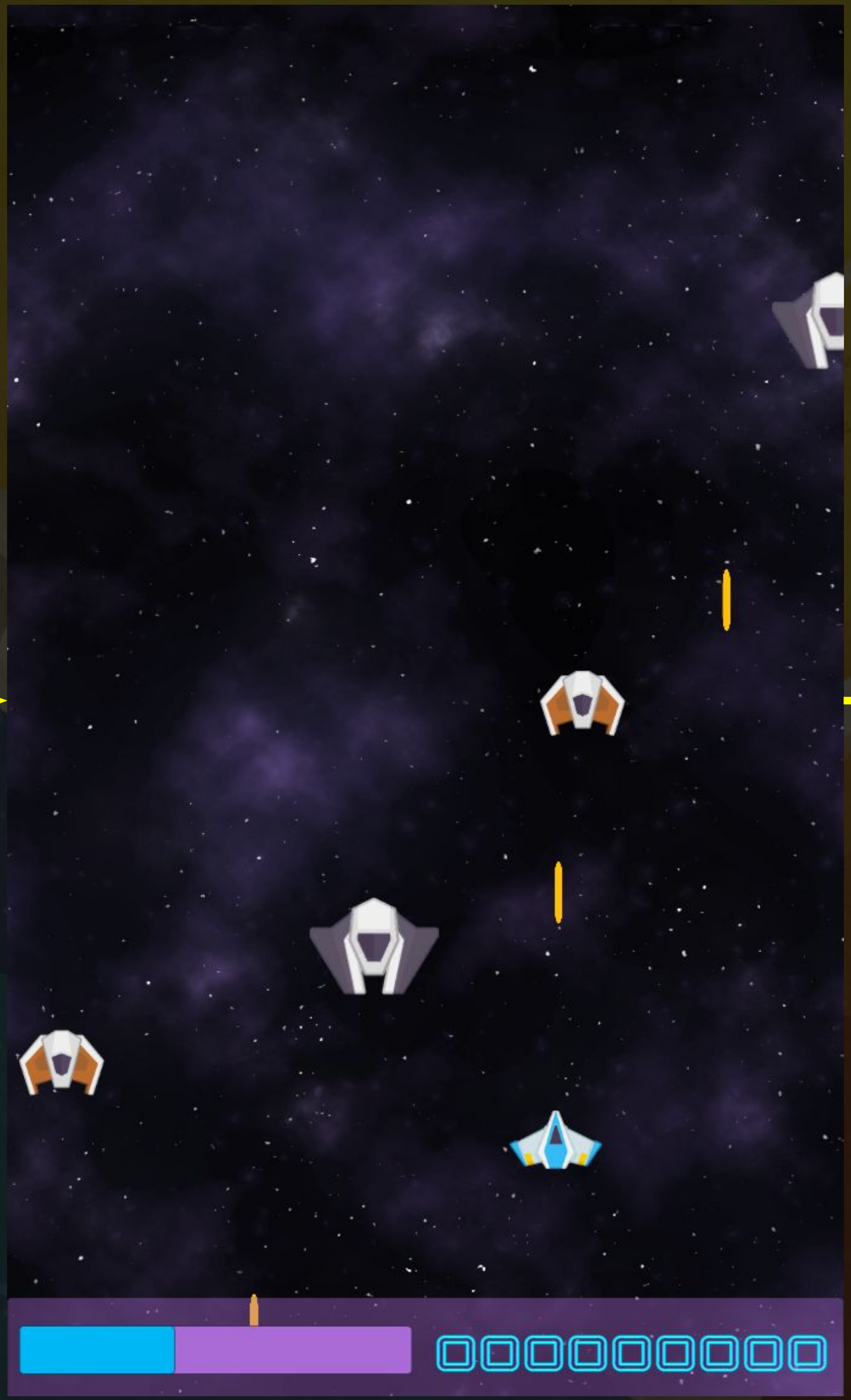
Concept

- Space shooter
- Avoid waves of enemies for as long as possible
- Shoot enemies to score points

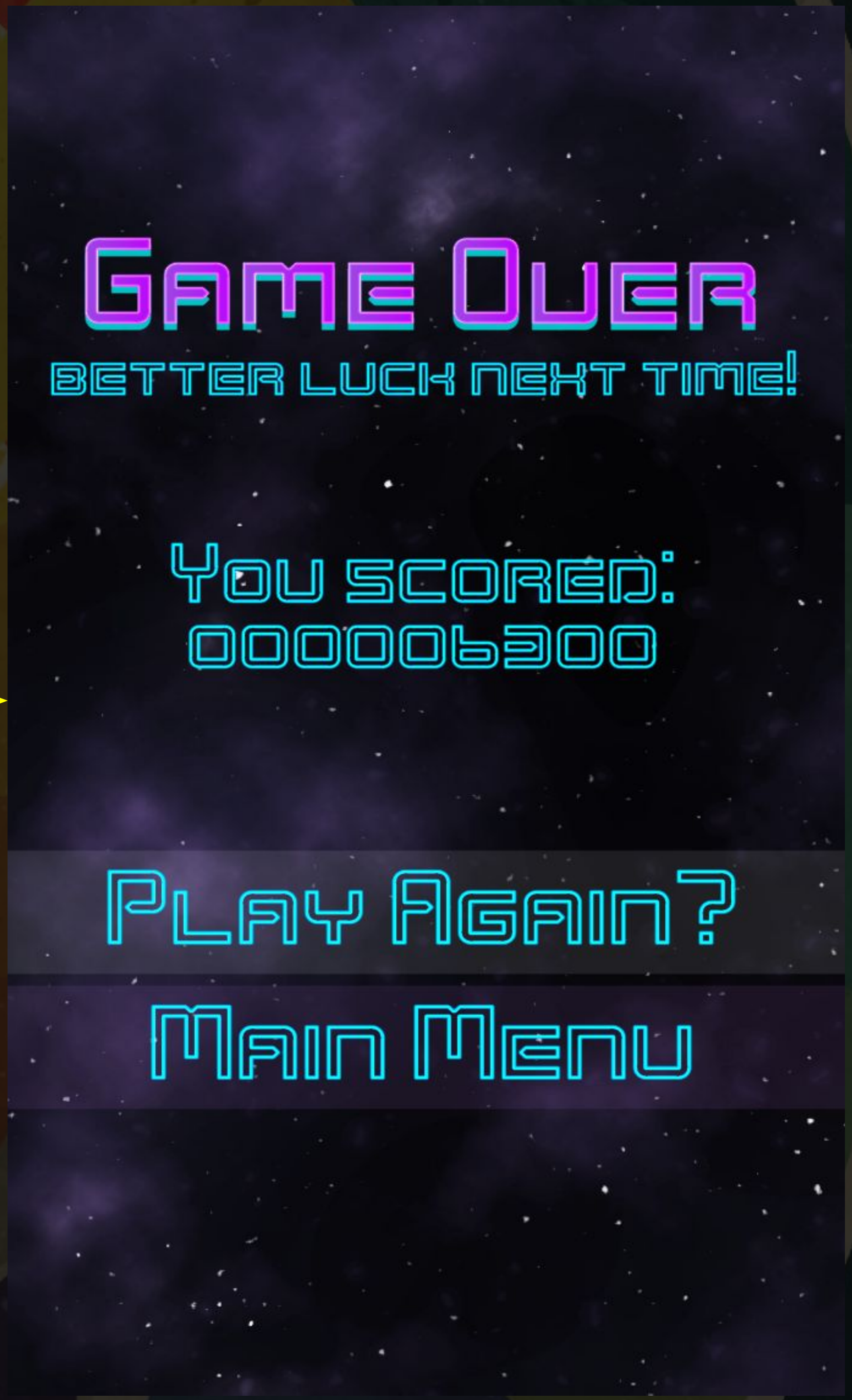
Game Overview



Main Menu



Game

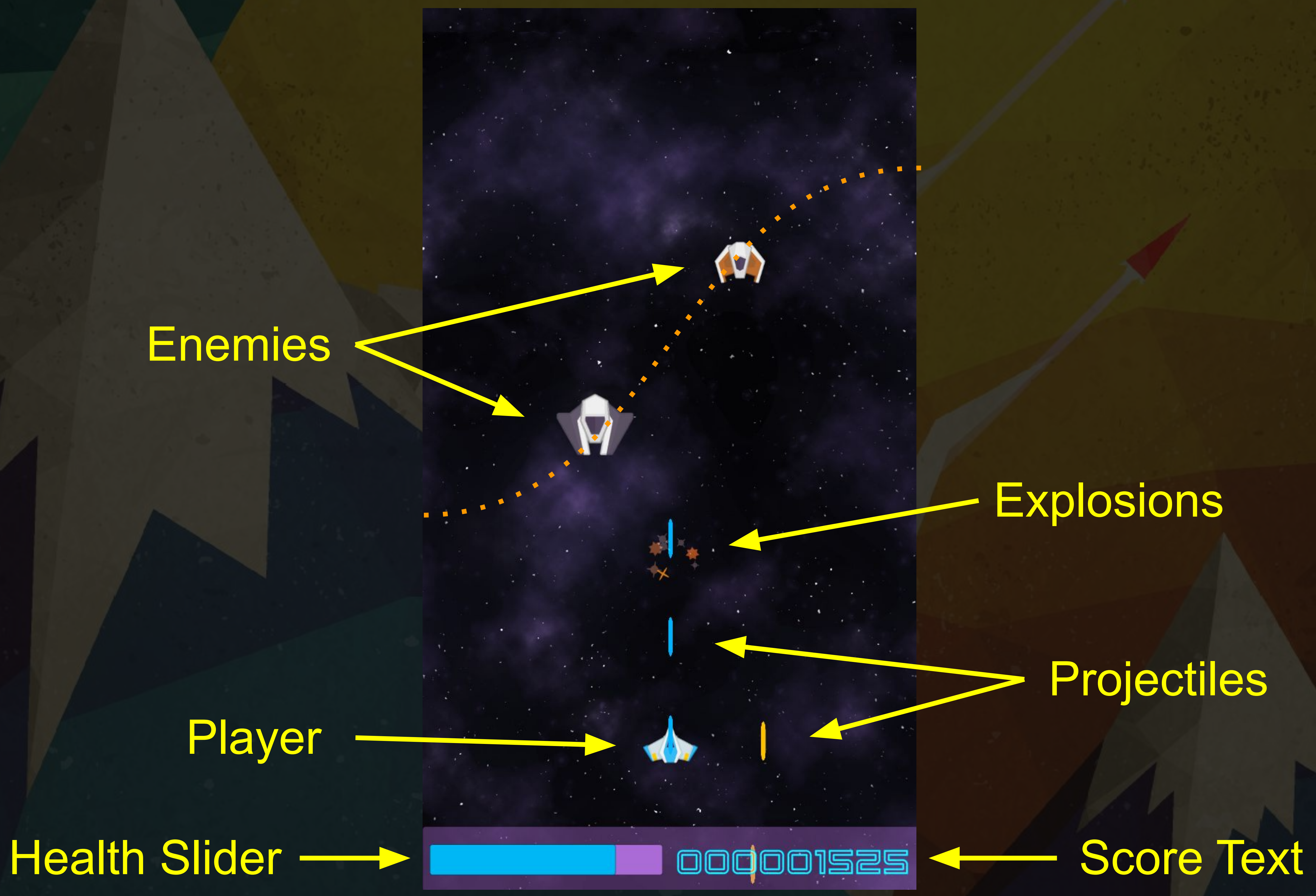

GAME OVER

BETTER LUCK NEXT TIME!

YOU SCORED:
0000006300

Game Over

Game Overview



Enemies

Explosions

Projectiles

Player

Health Slider

Score Text

Game Design

Theme:

Space Shooter

Player Experience:

Frantic

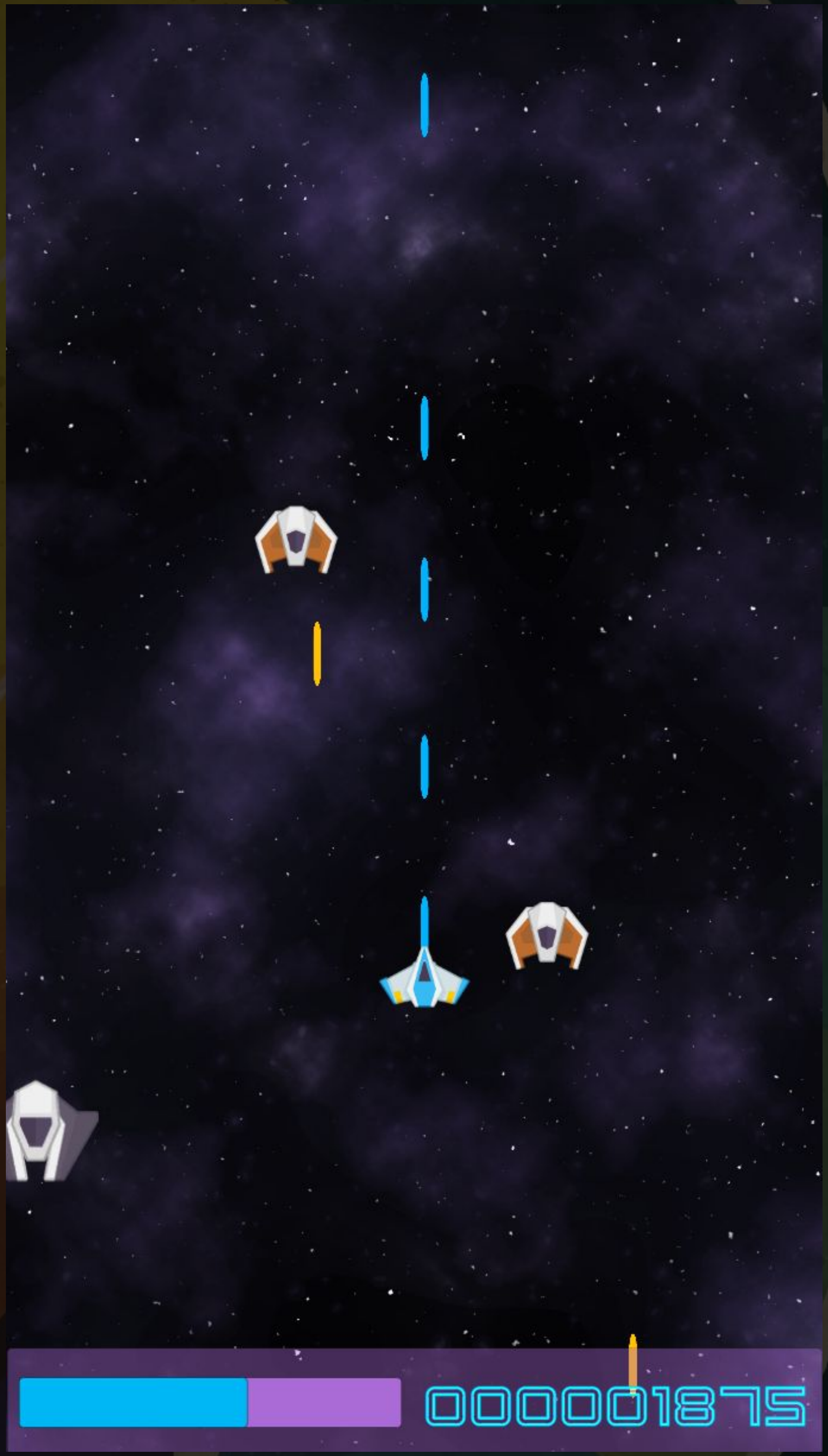
Core Mechanic:

Shoot enemies - Dodge bullets

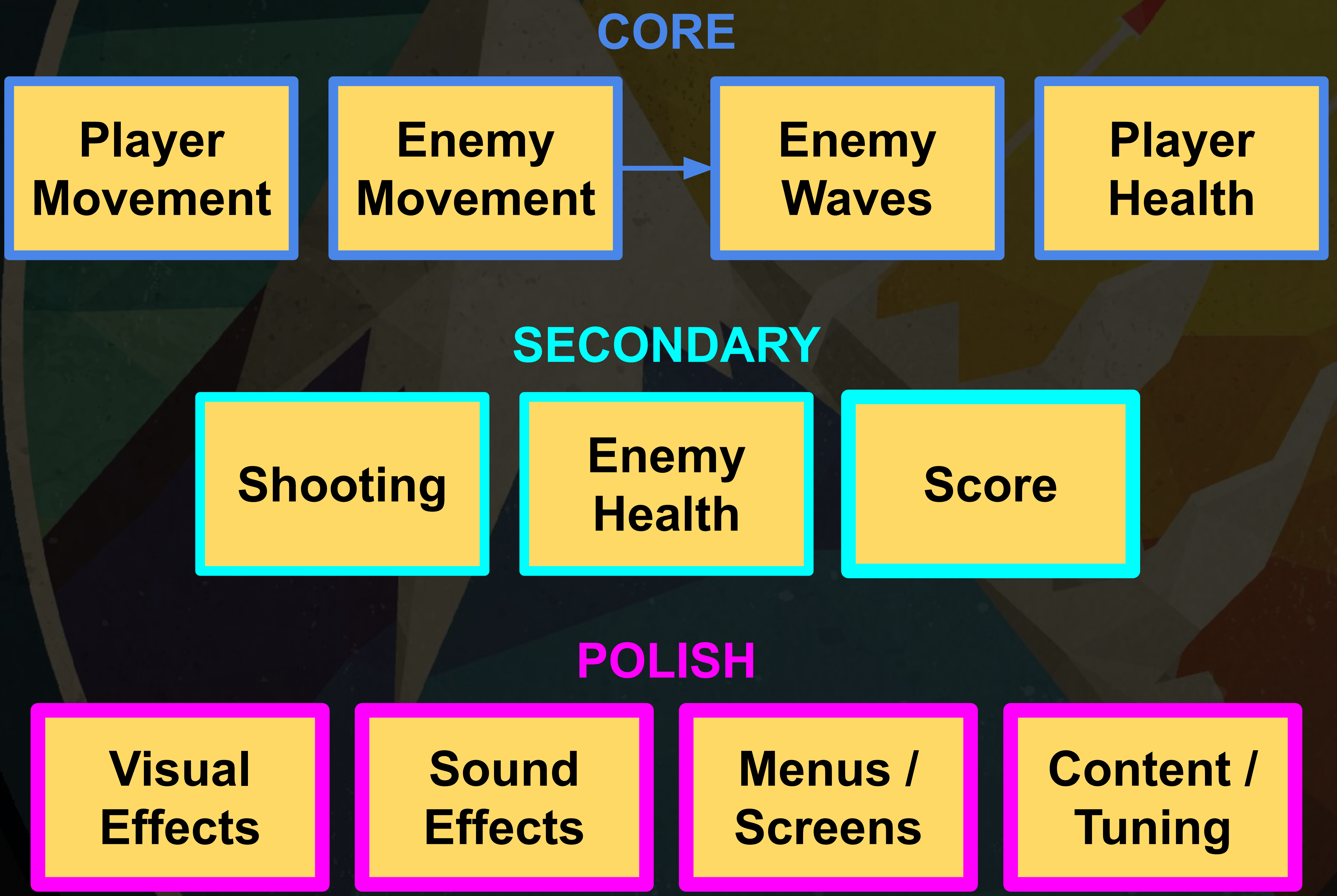
Game Loop:

Single level with endless enemy waves

Shoot enemies for points until health reaches zero and game ends



Feature Analysis



CORE

Player Movement

Enemy Movement → Enemy Waves

Player Health

SECONDARY

Shooting

Enemy Health

Score

POLISH

Visual Effects

Sound Effects

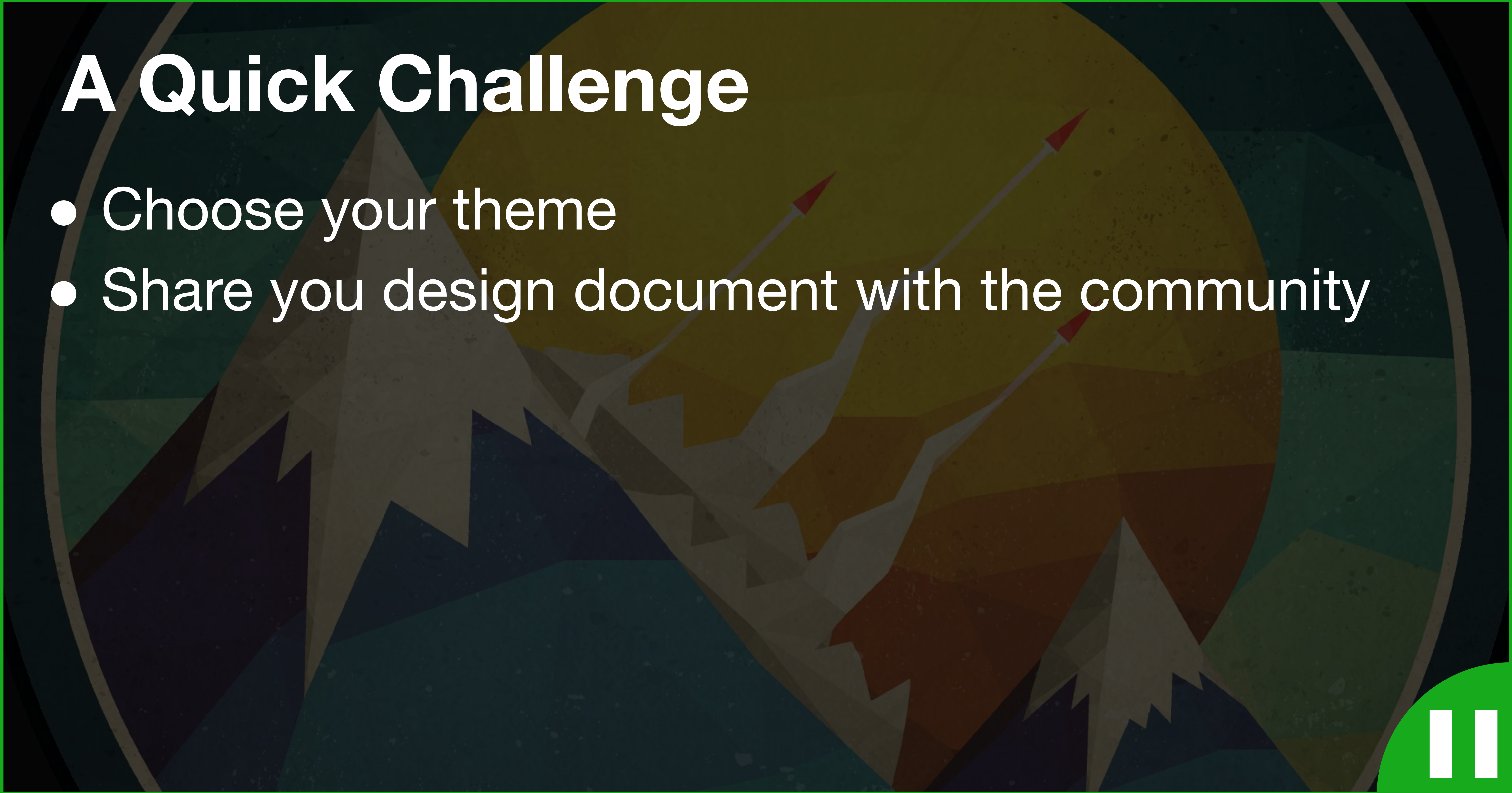
Menus / Screens

Content / Tuning

Art Assets

- Player ship
- Multiple enemy ships
- Projectiles (player & enemy)
- Background sprites
- Fonts
- UI sprites

A Quick Challenge



- Choose your theme
- Share you design document with the community

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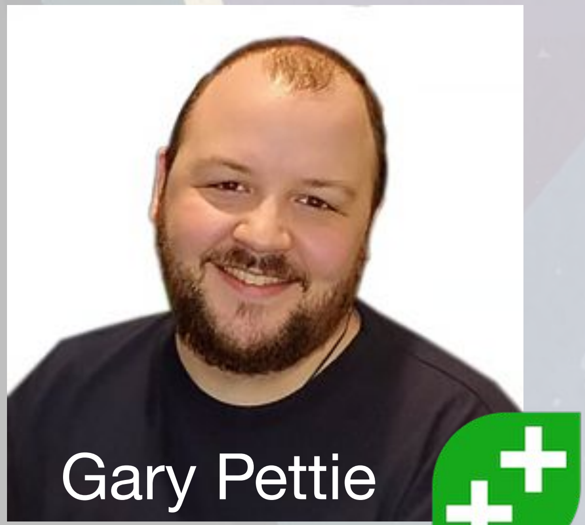
Project Setup



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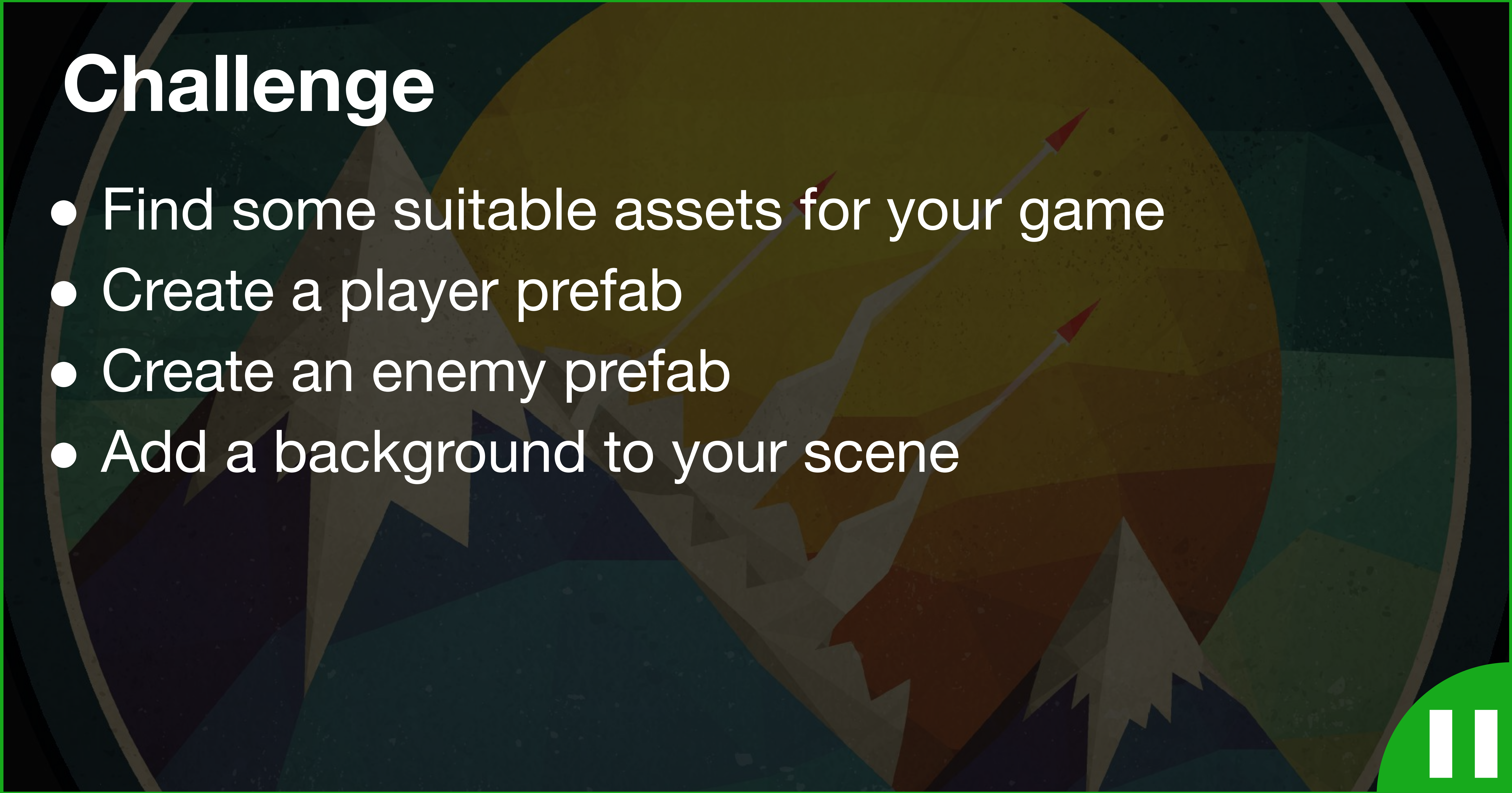
Challenge



- Find some suitable assets for your game
- Create a player prefab
- Create an enemy prefab
- Add a background to your scene

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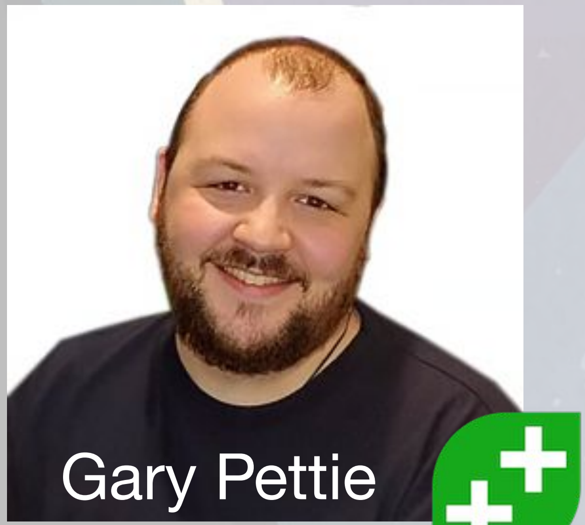
Input System



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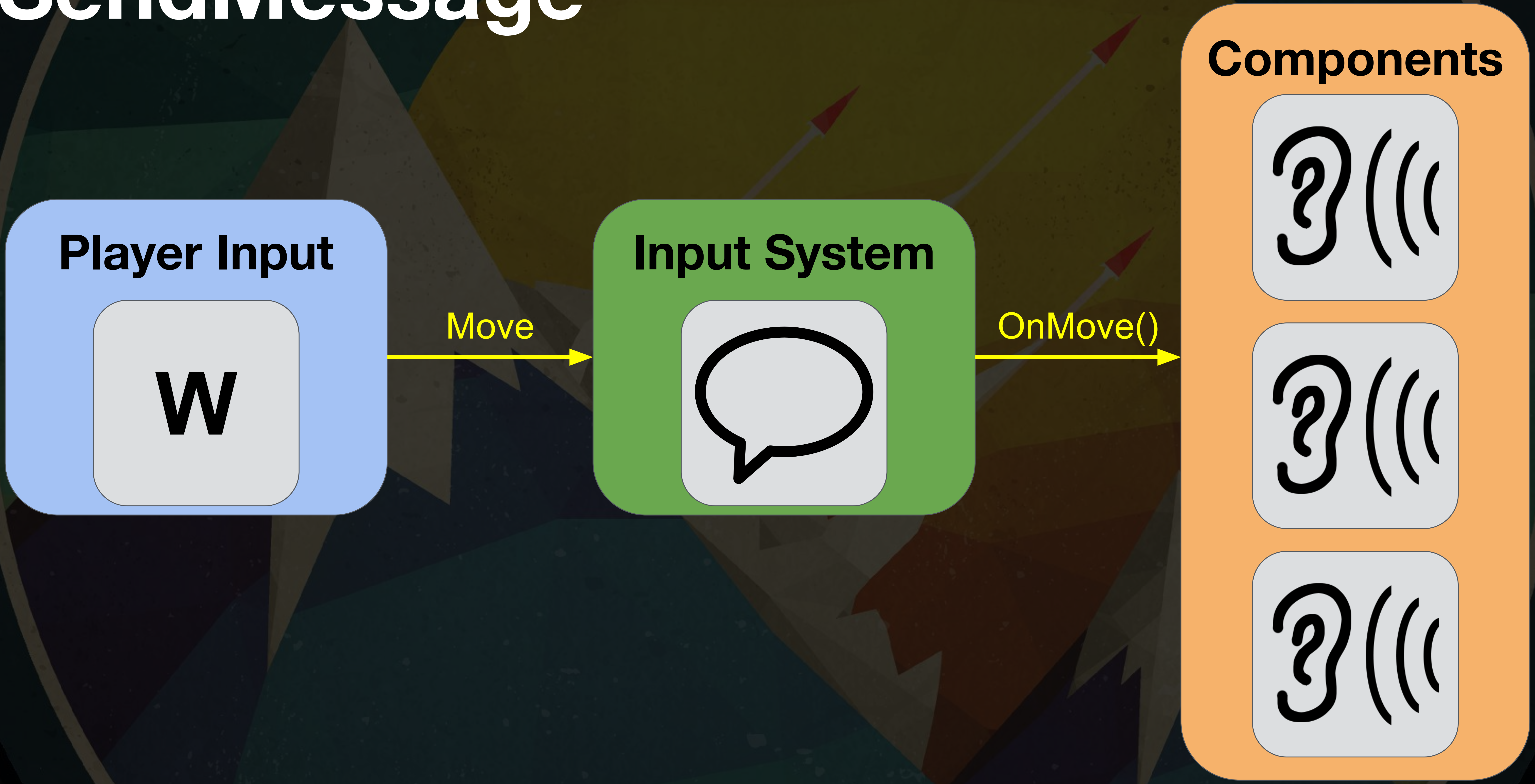
SendMessage



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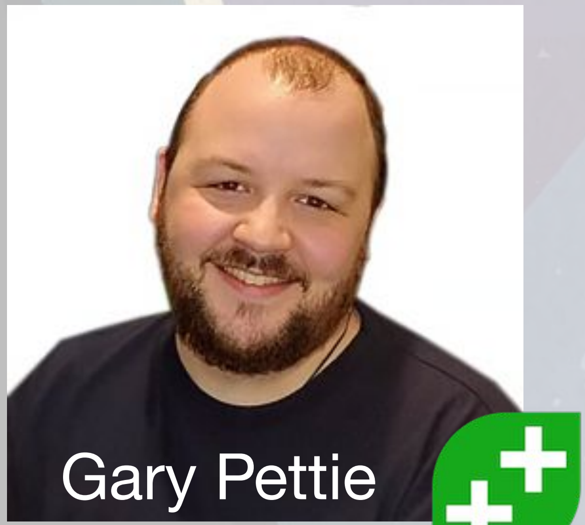
Boundaries



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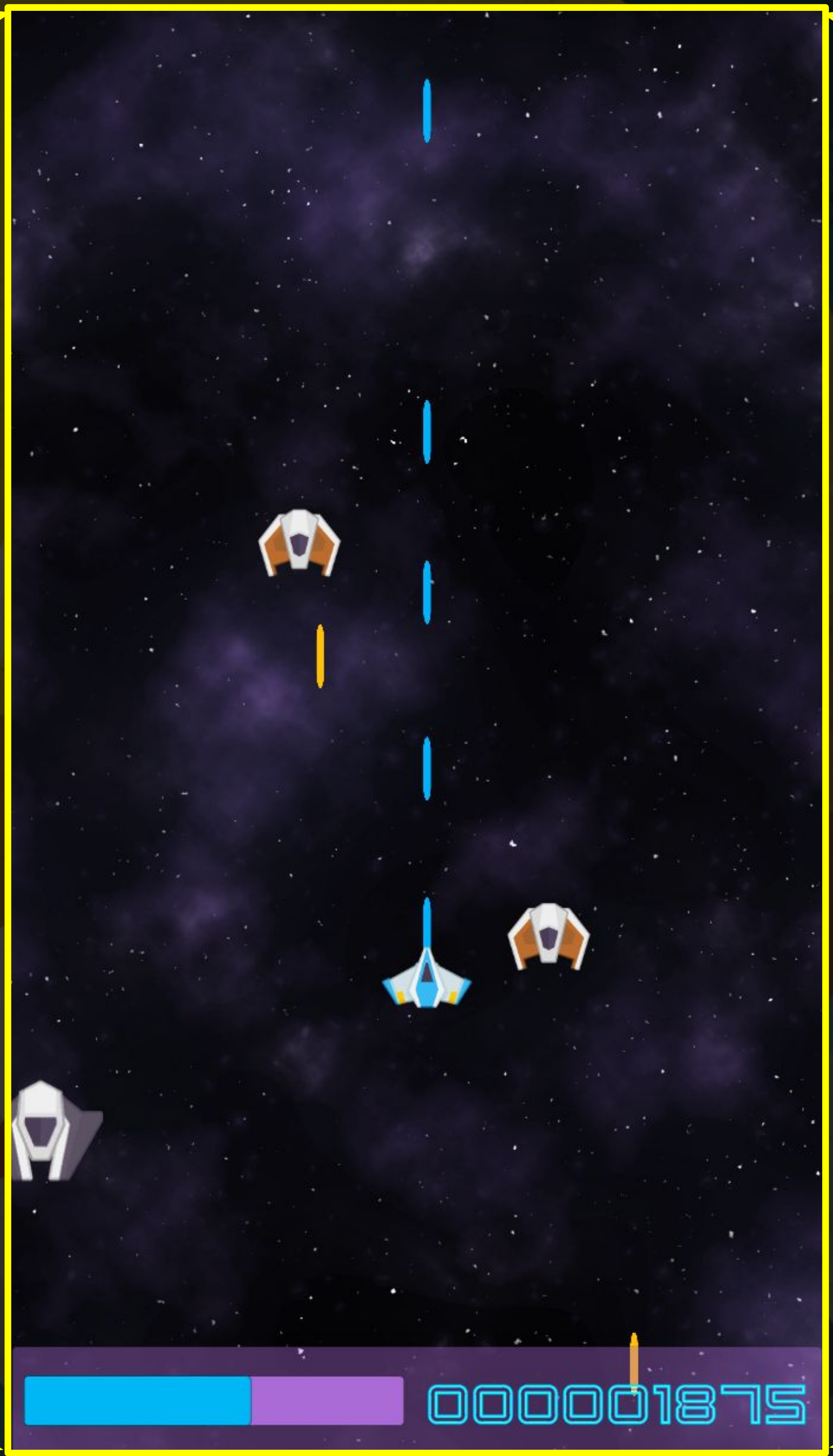
Viewport

- Viewport space represents a normalized position relative to the camera
- ViewportToWorldPoint converts a normalized position on the screen to a in 3D position in world space



Challenge

- Set up the maximum bounds
- This should be the top right corner of the viewport

Challenge

- Apply padding to the top and bottom of the screen
- Allow some extra room at the bottom for the UI

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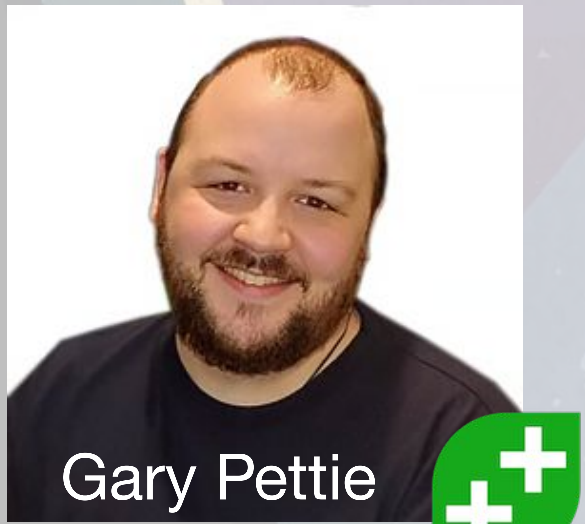
Enemies



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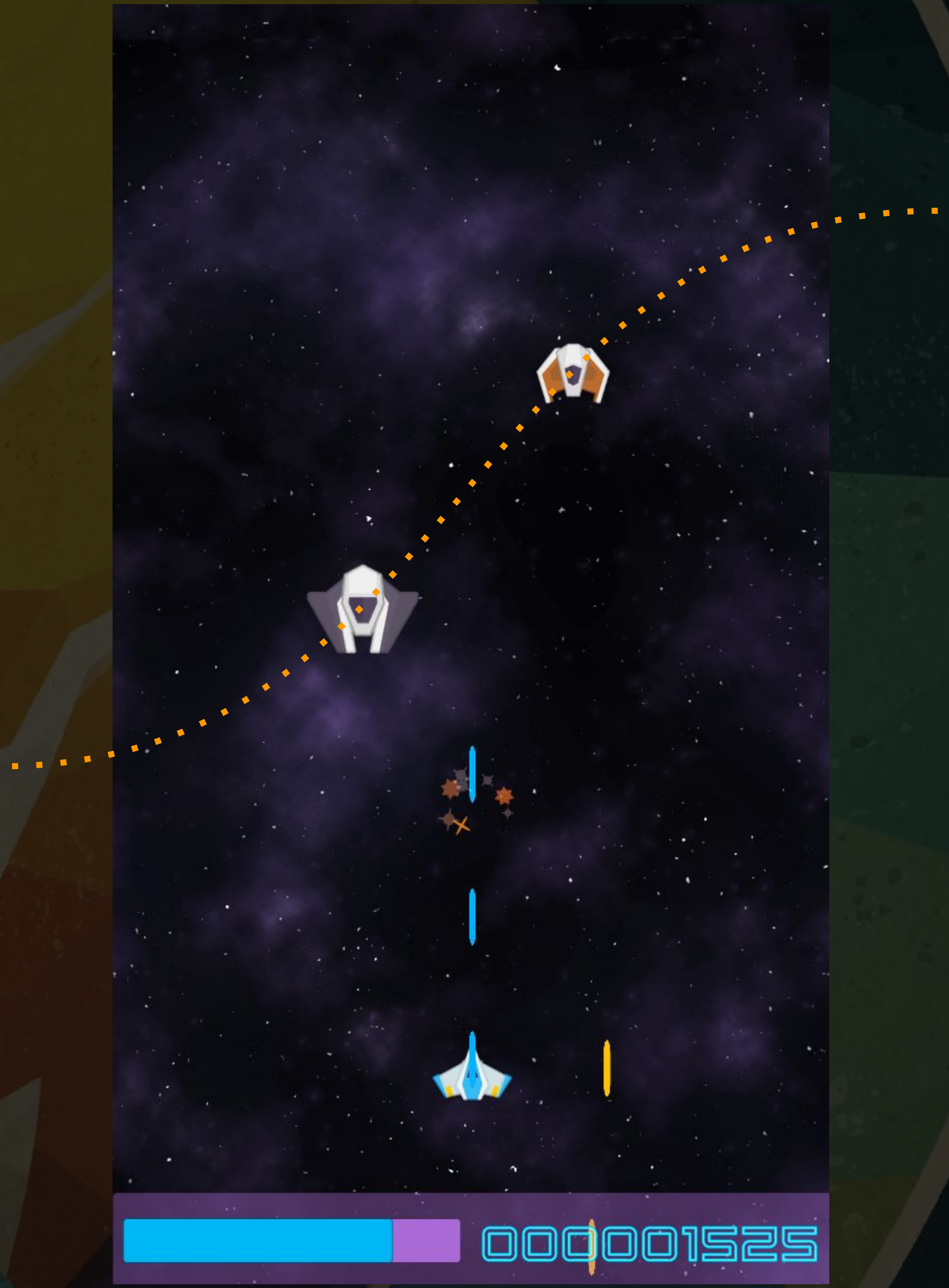
Enemies and Waves

Enemies

- Cause damage to the player
- Can have different attack behaviours
- Affect the players score
- Spawned in waves

Waves

- Self-contained “moment” of gameplay
- Spawn *n* enemies over time
- Enemies follow a set path



Scripts and Responsibilities

Wave Config

- Which enemies will be spawned
- The path to be followed
- Time between enemy spawns
- Enemy movement speed

Enemy Spawner

- Spawn enemy
- Order of the waves
- Time between waves

Enemy Pathing

- Moves enemy along the path

foreach Loop

for loop:

```
for(int i = 0; i < parent.childCount; i++)
{ //do stuff }
```

foreach loop:

```
foreach(Transform child in parent)
{ //do stuff }
```

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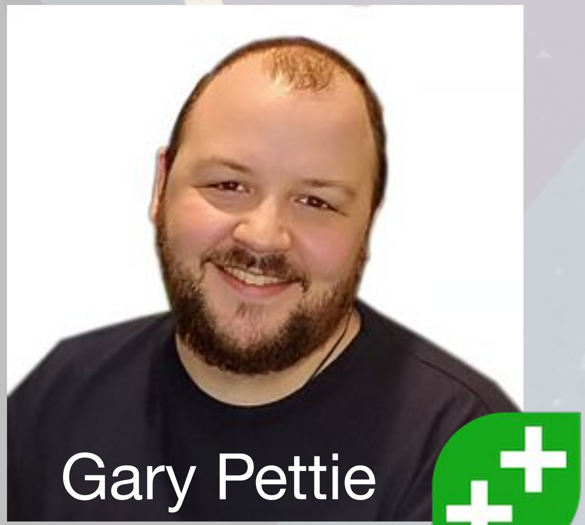
Pathfinding



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Challenge

- Create (at least) one new path for the enemies to follow
- Create (at least) one new wave config using your new path

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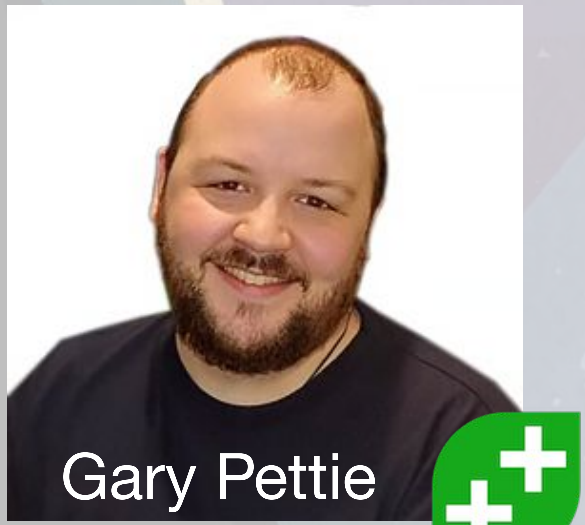
Instantiating Enemies



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Challenge

- Create a getter called GetEnemyCount()
  - Returns the number of enemies in the enemyPrefabs list

- Create a getter called GetEnemyPrefab(int index)
  - Returns the enemy prefab at the given index

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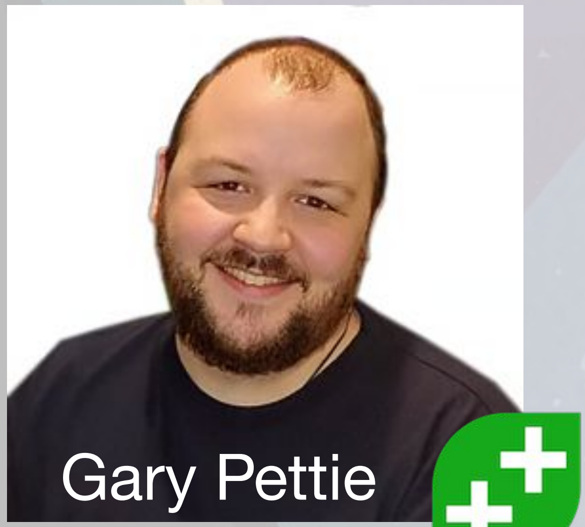
Coroutines



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Challenge

- Loop through a list of WaveConfigSOs
- Think about whether you can use a foreach loop for this

- On each loop:
  - Set the value of currentWave
  - Loop through all the enemies in that wave
  - Wait for the timeBetweenWaves

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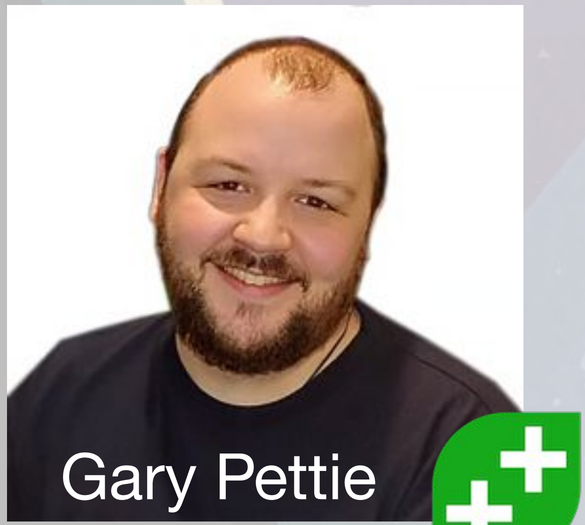
While Loops



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Types of Loop

- **for** loop
  - Runs a set number of times

  -
    ```
    for(int i = 0; i < transform.childCount; i++)
    { //do stuff }
    ```

- **foreach** loop
  - Works the same as a for loop but doesn’t track the iterator

  -
    ```
    foreach(Transform child in parent)
    { //do stuff }
    ```

Types of Loop

- **while** loop
  - Runs continuously while some condition is tru
  - `while(condition == true)`
    `{ //do stuff }`

Beware of infinite loops!

- **do-whil**
  - ontinuously repeats while some condition

    `{ //stuff }`
    `while(condition == true)`

Challenge

- Create a new bool variable called isLooping
- Create a do-while loop that repeatedly loops through our waveConfigs list

```
do { //stuff }
while(condition == true);
```

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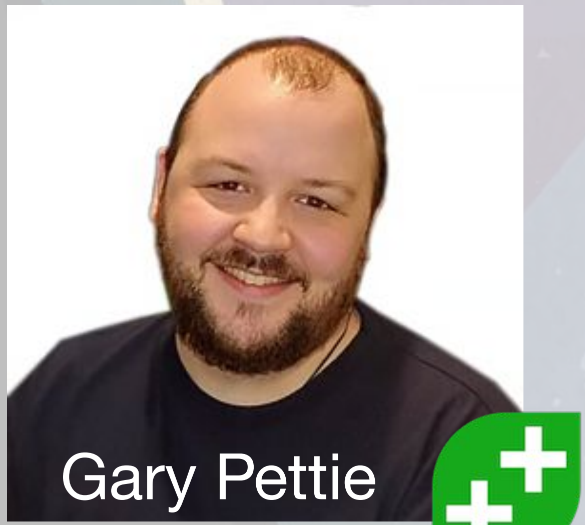
Taking Damage



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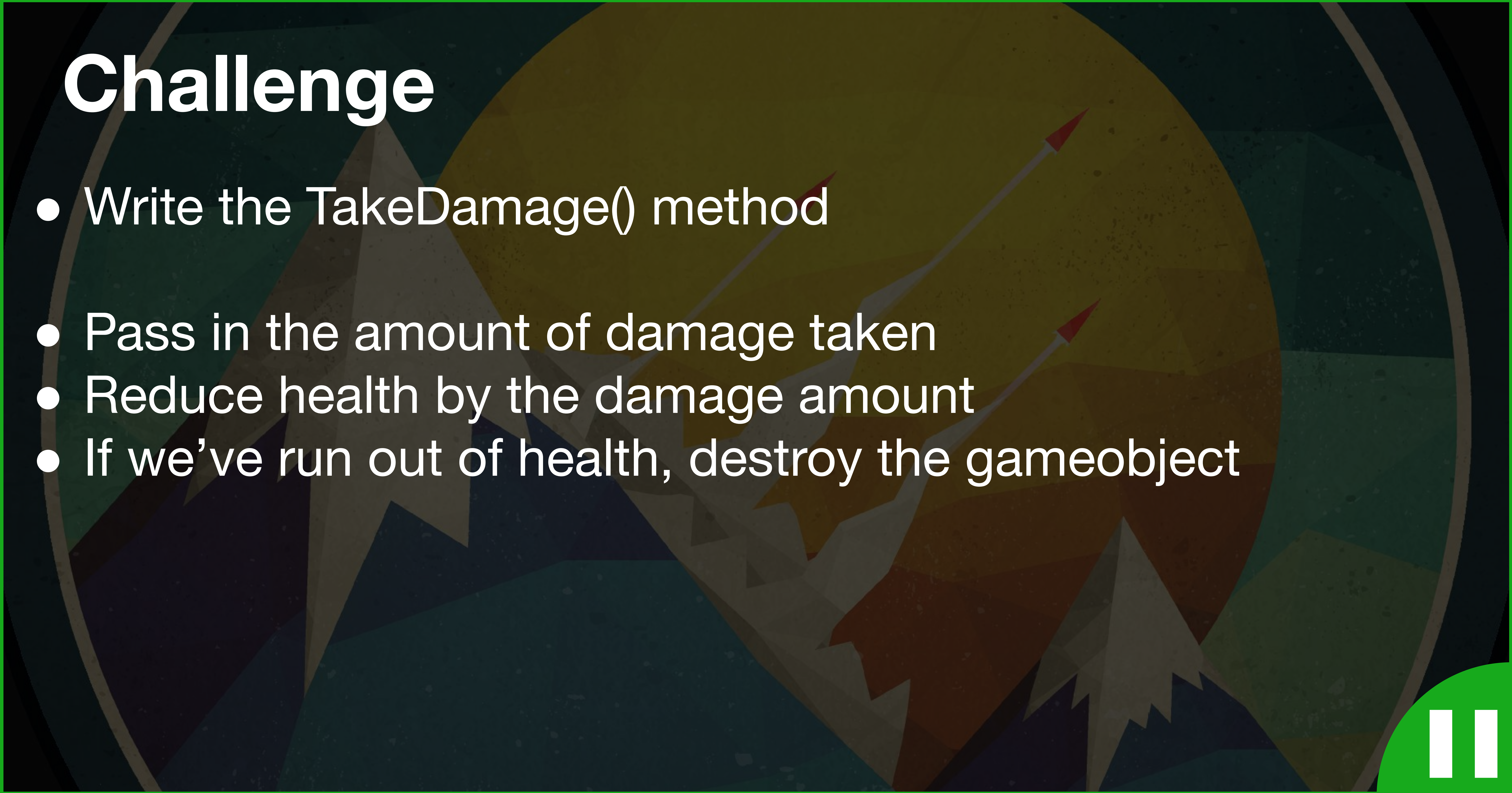
Challenge



- Write the TakeDamage() method

- Pass in the amount of damage taken
- Reduce health by the damage amount
- If we’ve run out of health, destroy the gameobject

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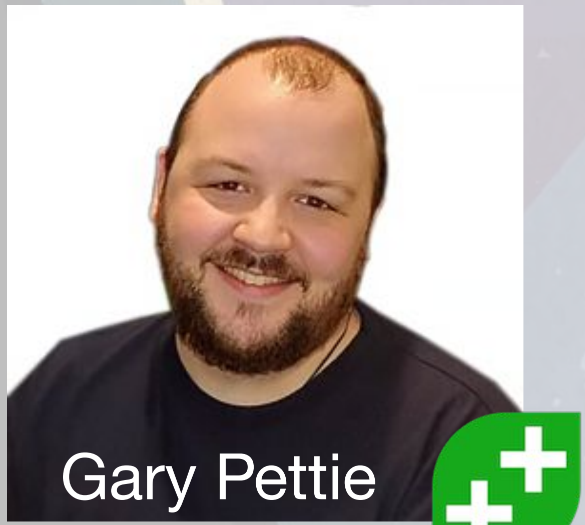
Projectile Setup



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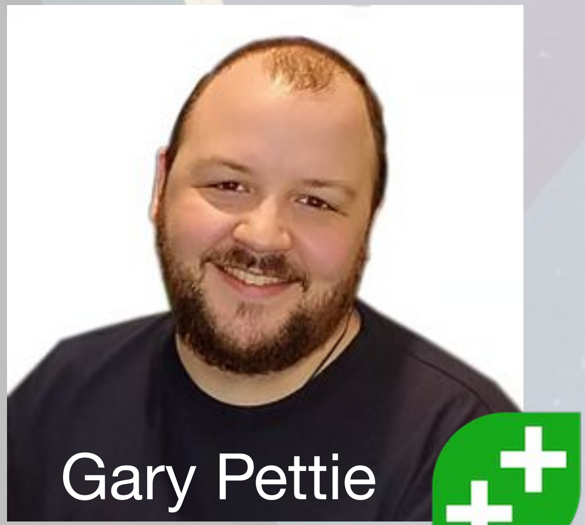
Player Projectiles



Gary Pettie

Challenge

- Write the FireContinuously() Coroutine
- This coroutine will;
  - loop indefinitely
  - Instantiate a projectile every loop
  - Destroy the projectile after the projectileLifetime has expired

    Hint: check out the overloaded versions of Destroy()
  - Wait for the time specified by the firingRate variable

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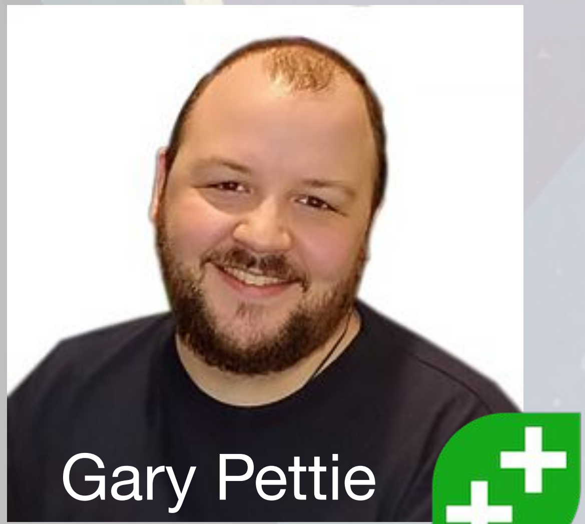
Enemy Shooting



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Challenge

- Modify our coroutine to wait for a random amount between projectiles

Hint:

- Use similar logic to the GetRandomSpawnTime() method in our WaveConfigSO
- Think about what new variables you'll need to make this work

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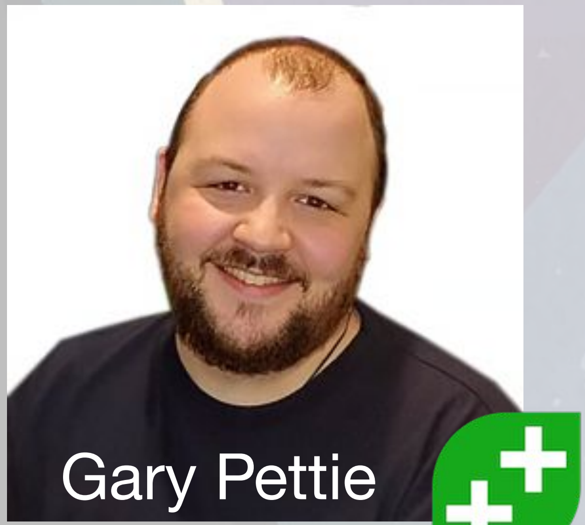
Particle Effects



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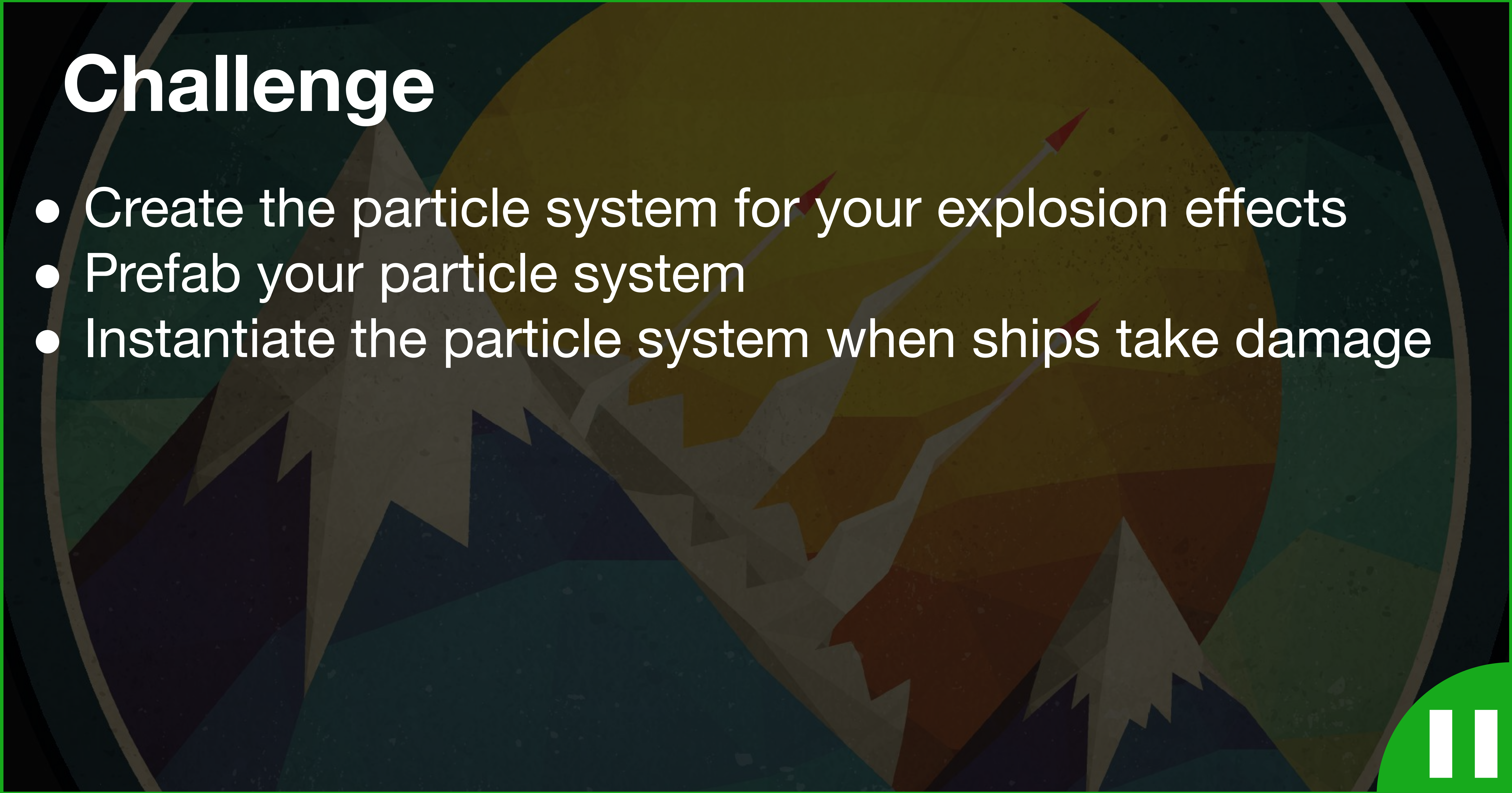

Challenge

- Create the particle system for your explosion effects
- Prefab your particle system
- Instantiate the particle system when ships take damage

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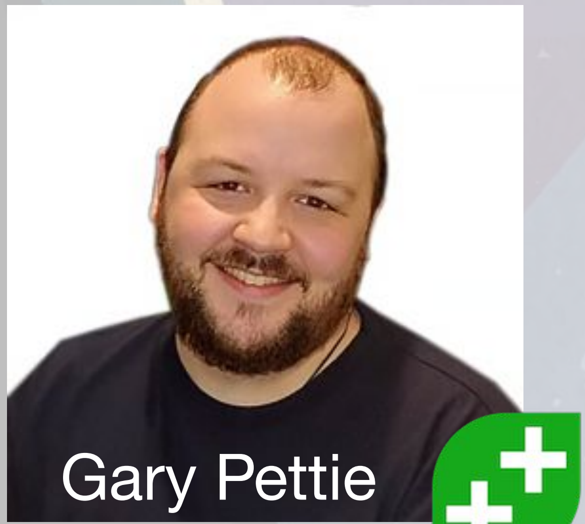
Screen Shake



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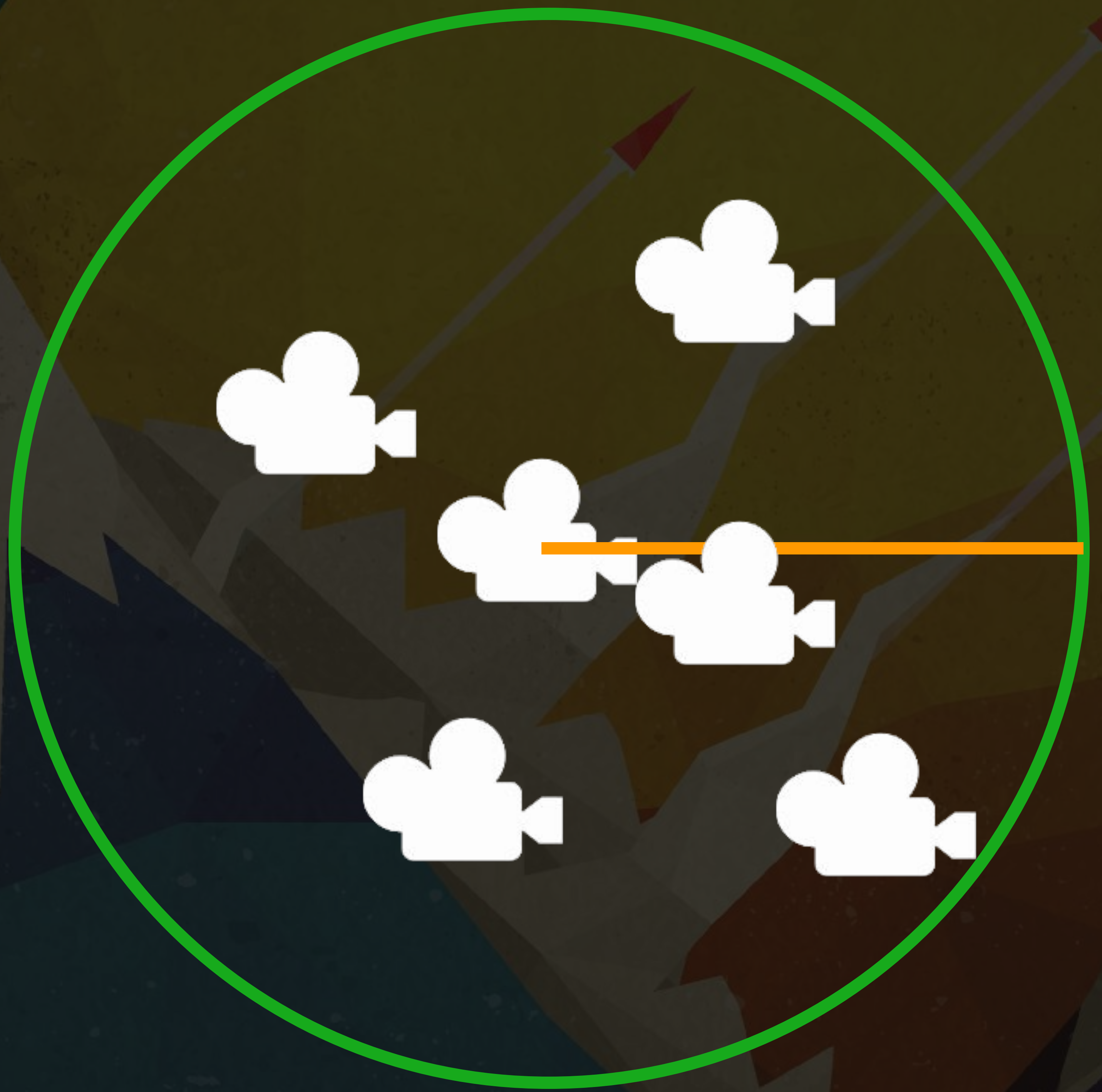
Camera Shake



Challenge

- Complete our Shake() coroutine.

Hint:

- Camera should shake for the shakeDuration.
- Yield until the next frame -> WaitFor...
- Once the loop has finished, reset the camera position.

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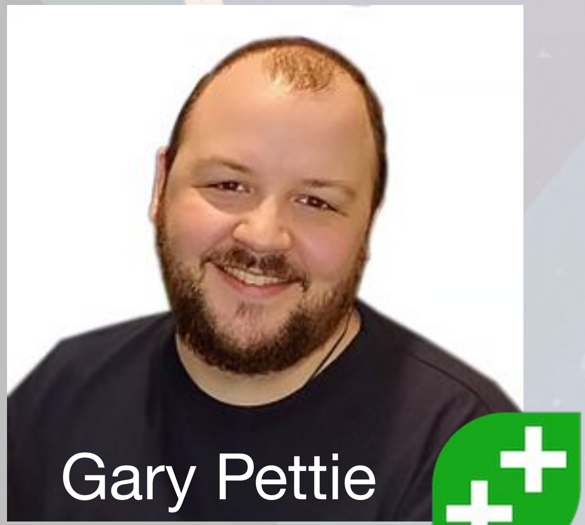
Scrolling Backgrounds



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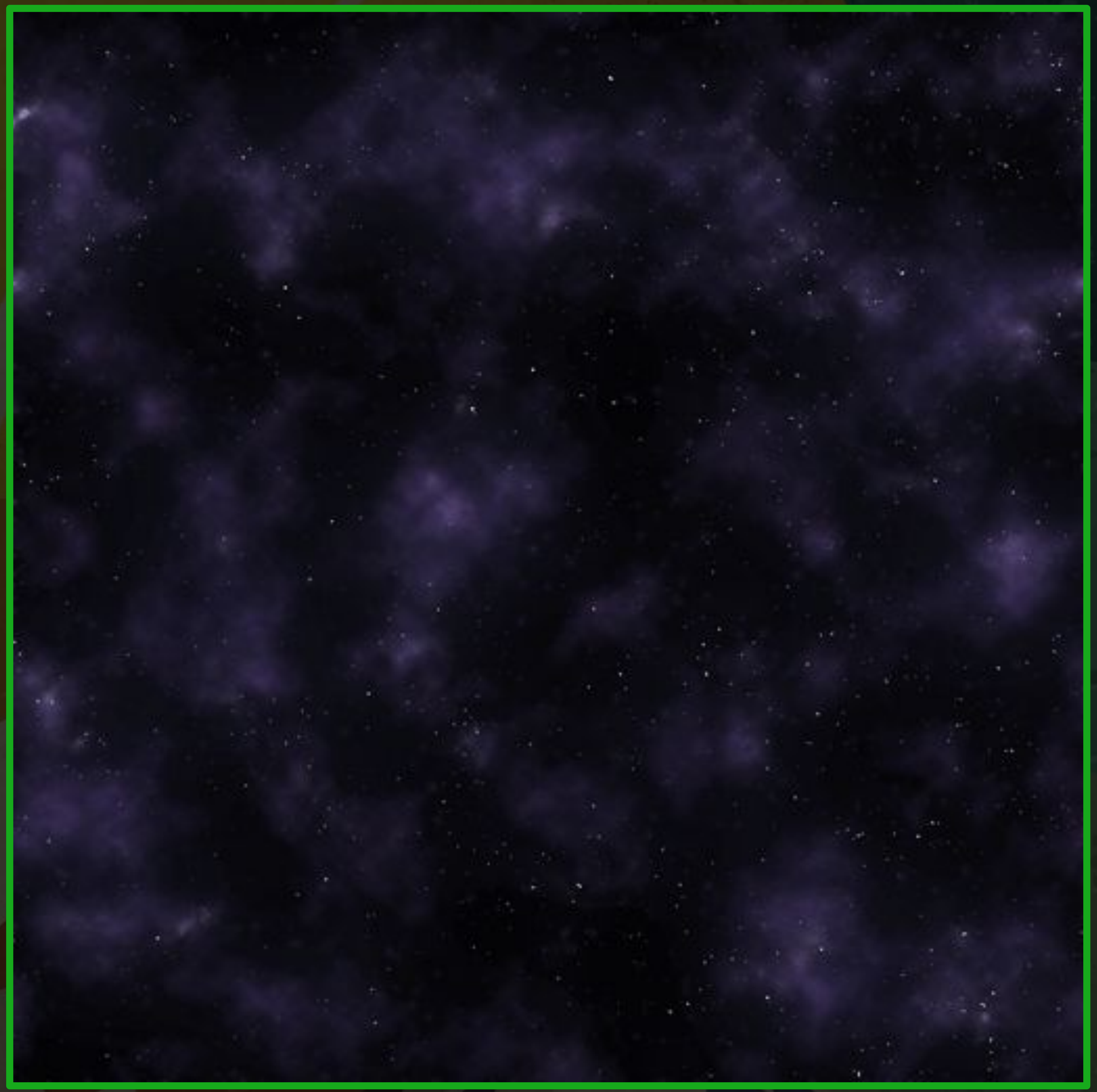
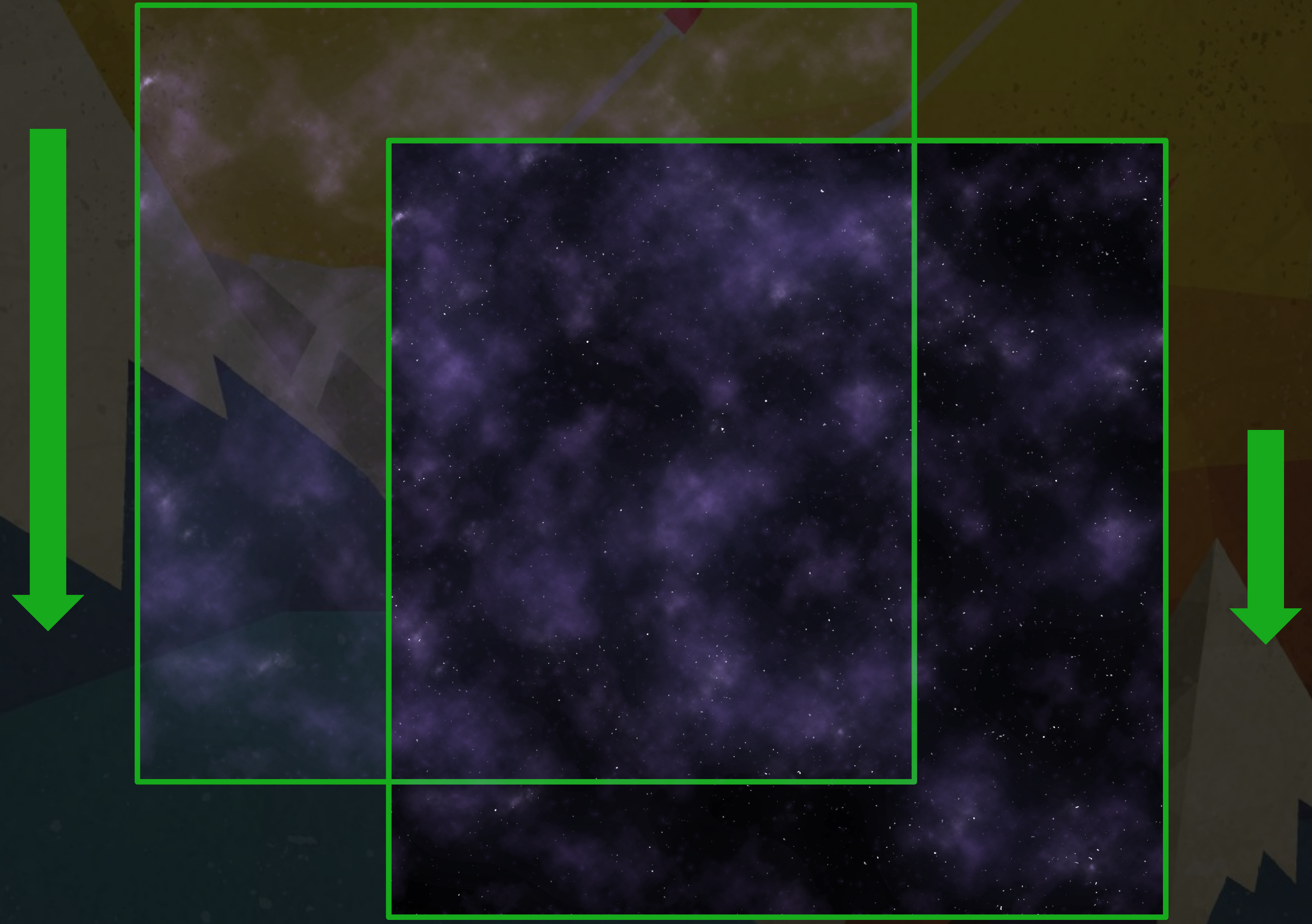
Parallax Scrolling

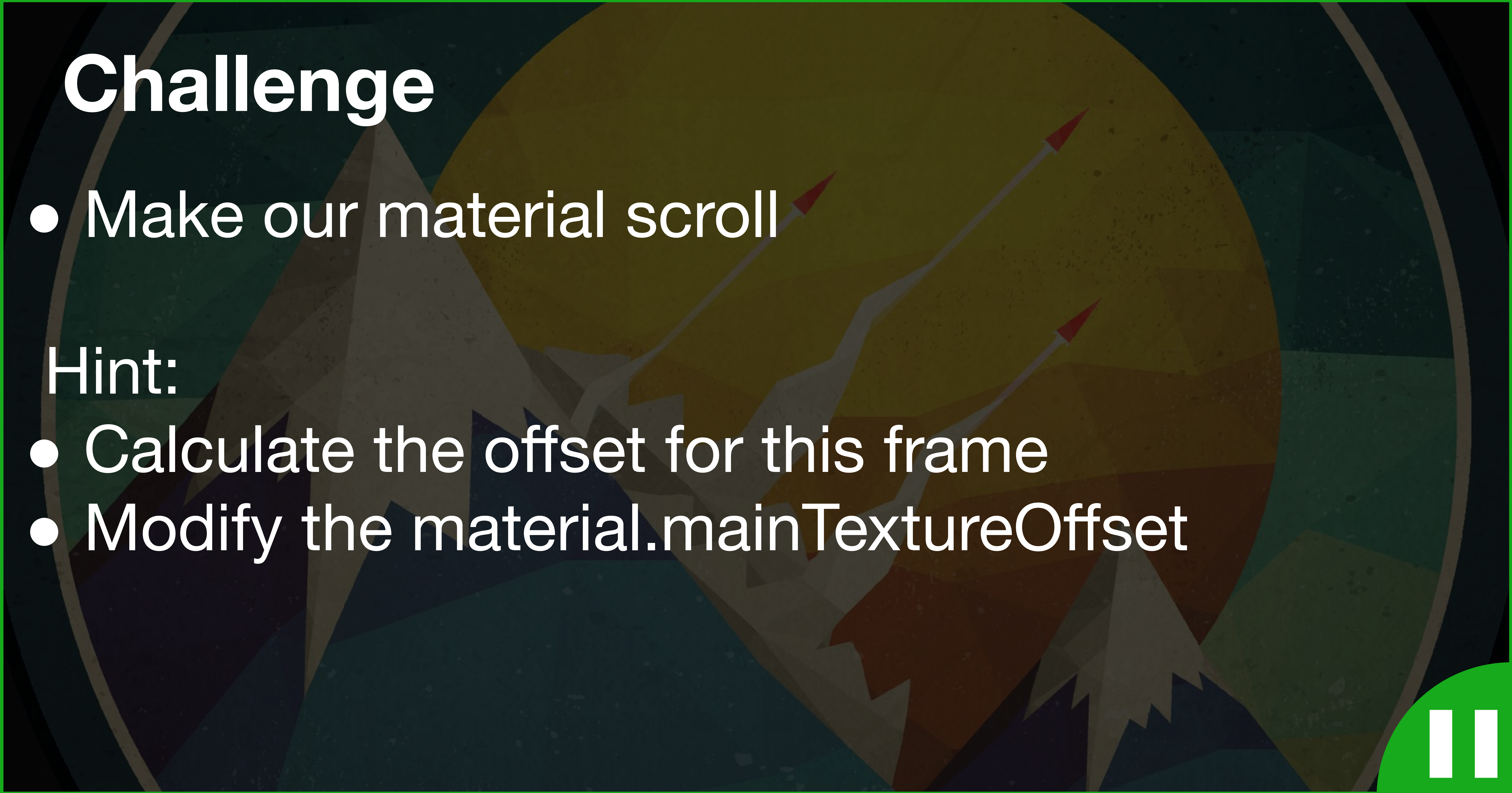
- Multiple image layers scrolling at different speeds
- Gives an artificial sense of depth
- More layers give more depth



Parallax Scrolling



Challenge



- Make our material scroll

Hint:

- Calculate the offset for this frame
- Modify the material.mainTextureOffset

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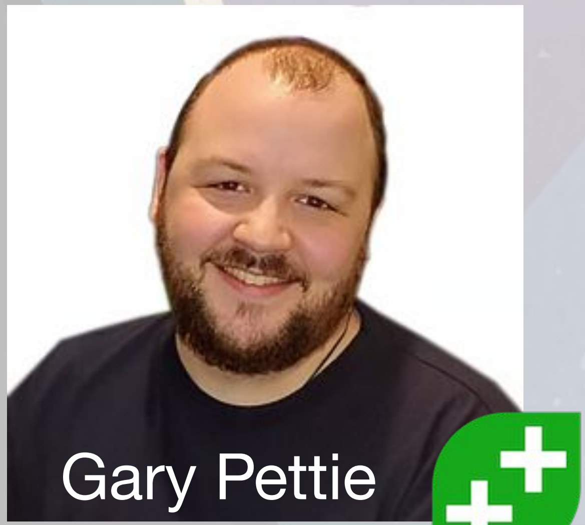
Sound Effects



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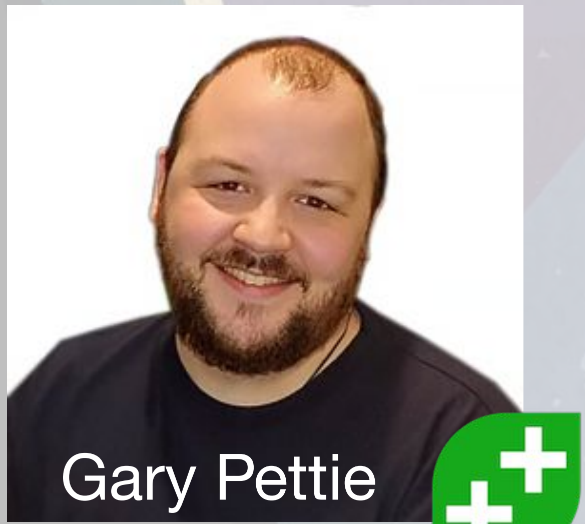
Challenge

- Extend our AudioPlayer to play an audio clip when damage is taken.

Hint:

- Similar process to playing our firing audio clip.
- Think about where damage is processed.

Music



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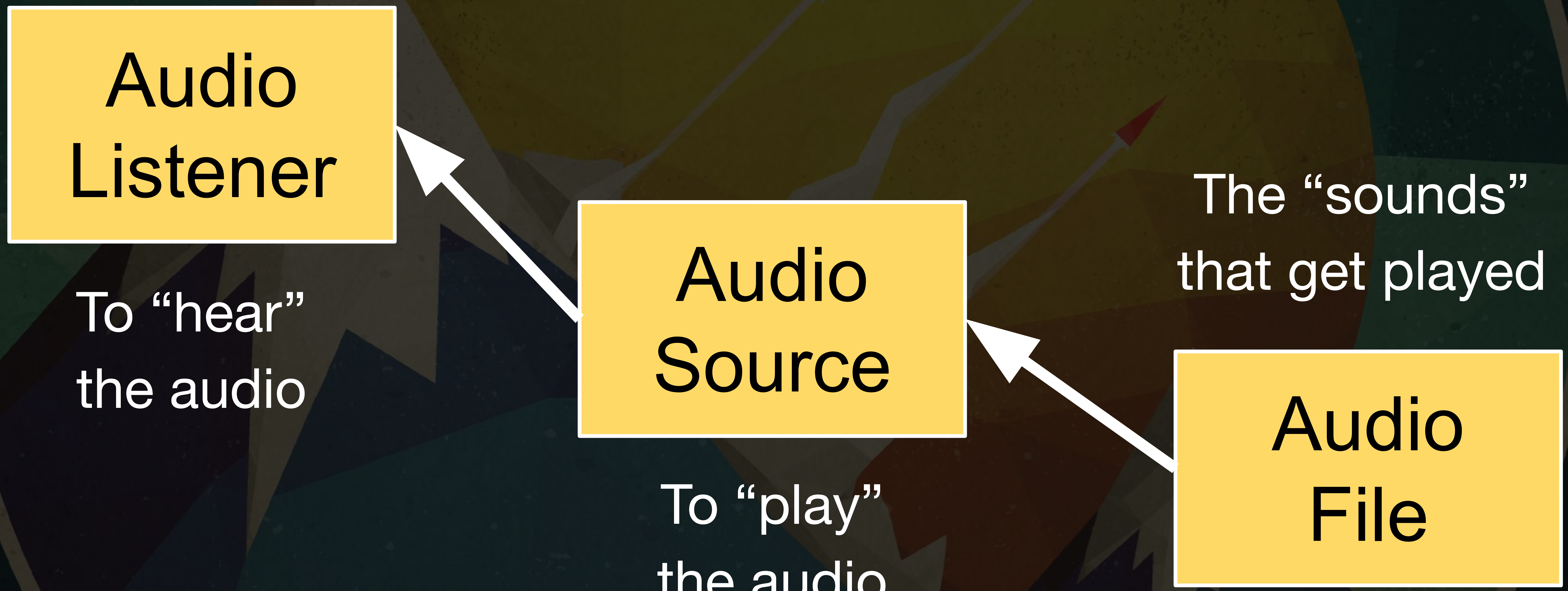
Audio in Three Parts



Audio Listener

To “hear” the audio

Audio Source

To “play” the audio

Audio File

The “sounds” that get played

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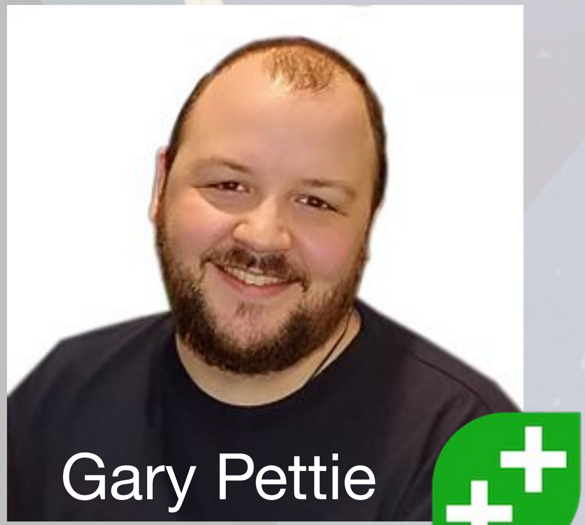
ScoreKeeper



Gary Pettie

Challenge

- Write a public getter to return the health from Health.cs

- Write the ScoreKeeper script
  - Private variable to store the current score
  - Public getter method to return the current score
  - Public method to modify the score
  - Public method to reset the score

- Increase the score whenever an enemy is destroyed

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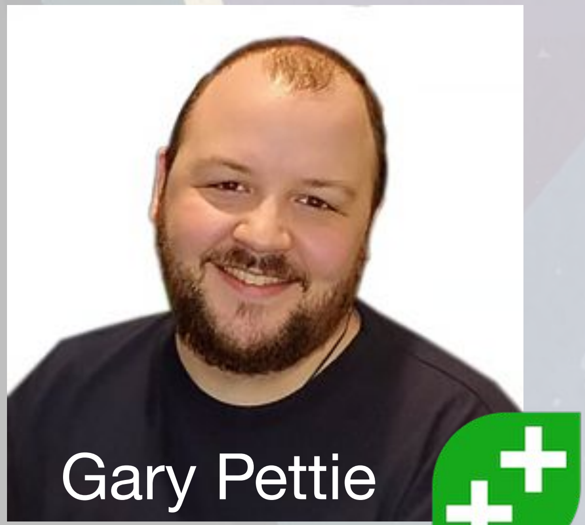
Game UI - Part 1



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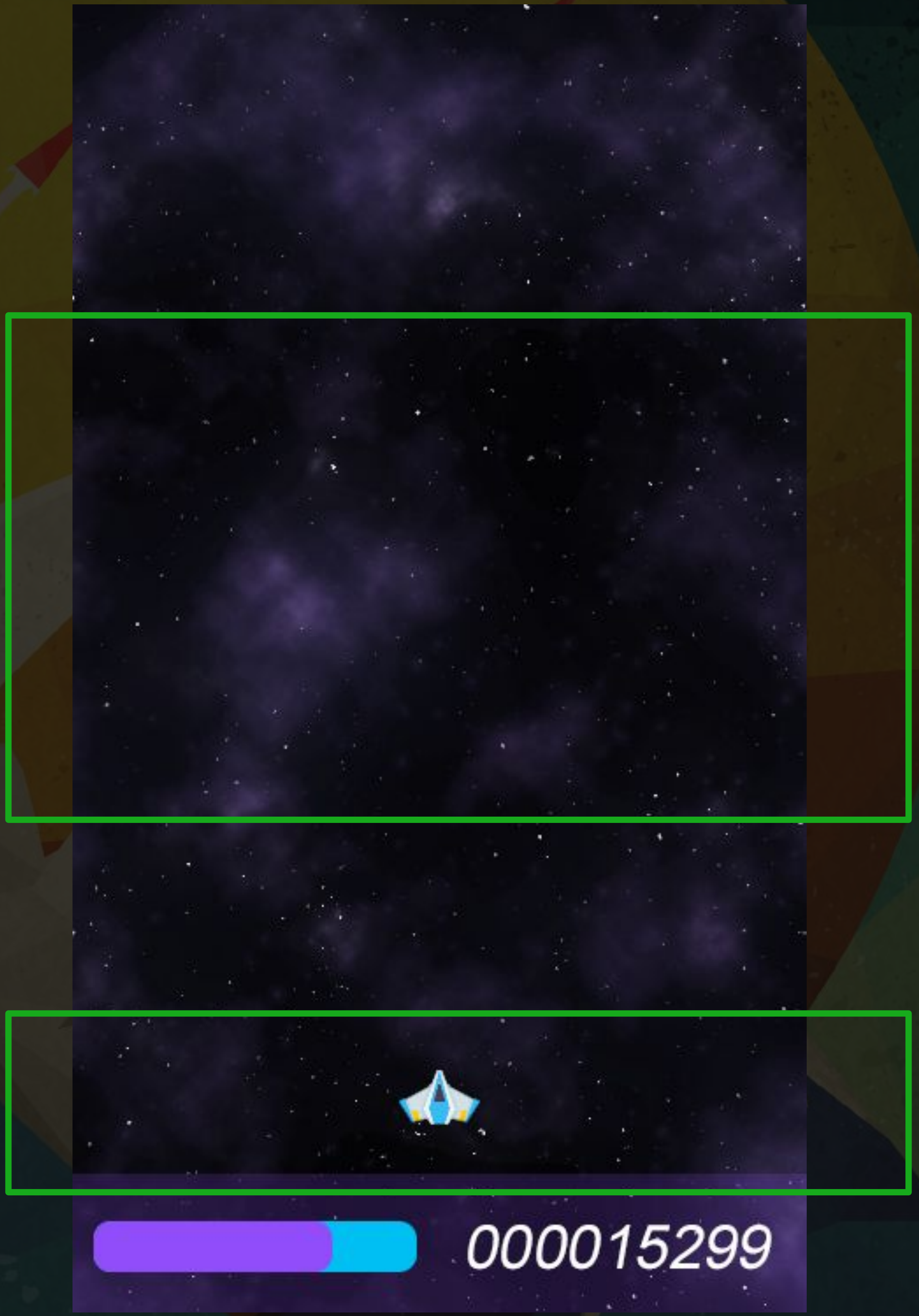
Game UI

- Health
  - Slider
  - Heart containers
  - Text
  - Change player sprite

- Score
  - Text

- Other stuff
  - Current wave
  - Active powerups
  - Playtime



Challenge

- Improve the look of your UI
  - Think about color scheme
  - Find a nicer font
-

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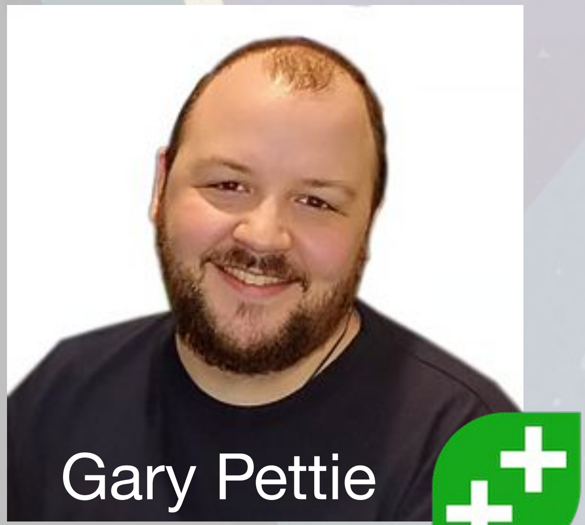
Game UI - Part 2



Gary Pettie

Challenge

- Write a new script called UIDisplay.cs
- Attach this script to the Canvas

- This script should update our UI elements
  - Health.cs contains the players current health
  - ScoreKeeper.cs contains the current score

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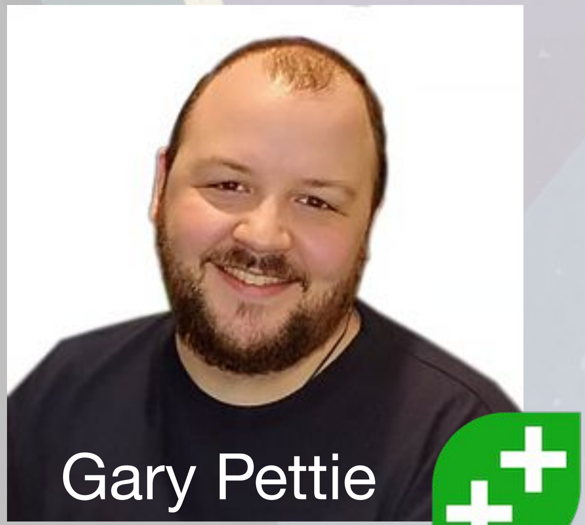
Adding Scenes



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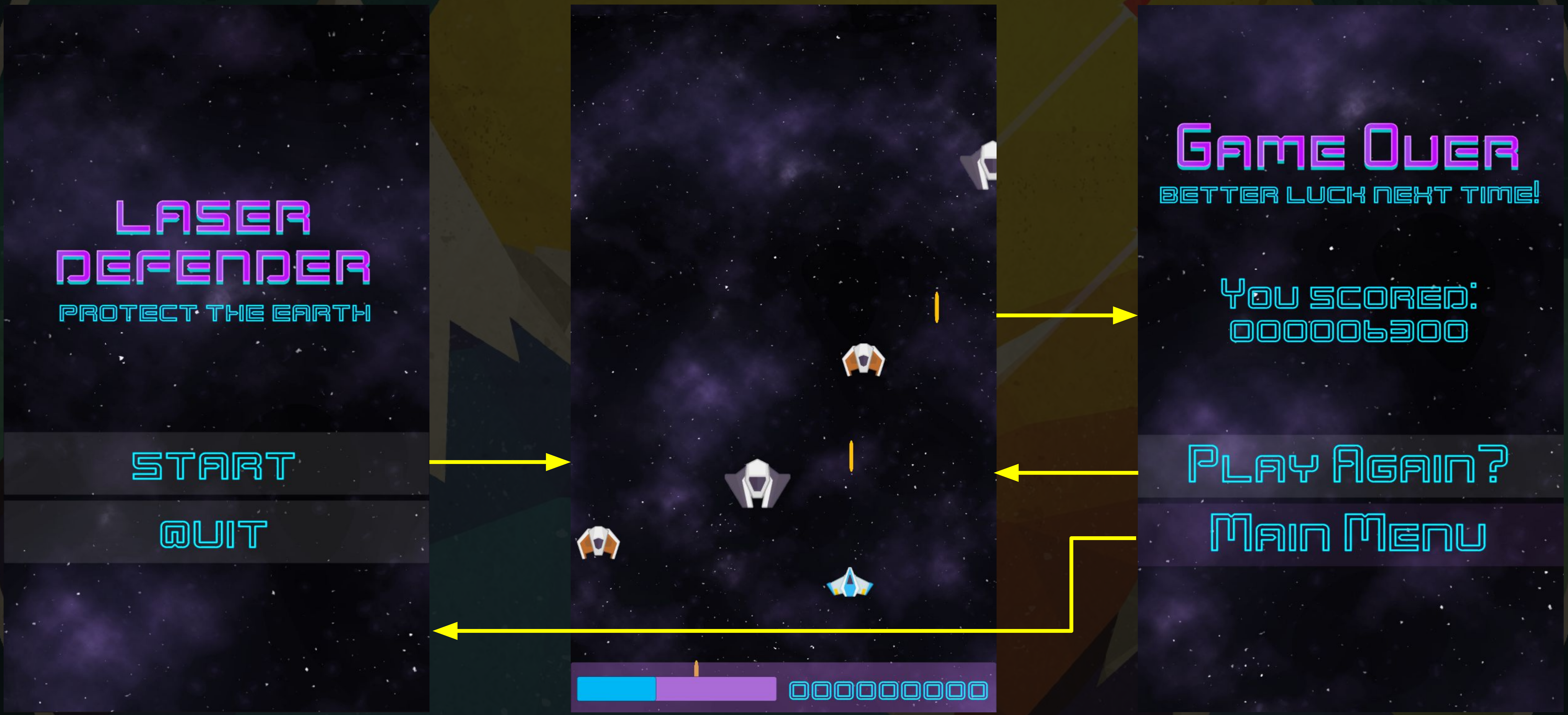
Game Overview



LASER DEFENDER

PROTECT THE EARTH

START

QUIT

0000000000

GAME OVER

BETTER LUCK NEXT TIME!

YOU SCORED:

0000006300

PLAY AGAIN?

MAIN MENU

Main Menu

Game

Game Over

Challenge

- Create a new “Main Menu” scene
- Design the UI for the main menu

- Create a new “Game Over” scene
- Design the UI for the game over menu

Hints:

- Create new font assets for different styles
- Don’t be afraid to duplicate scenes!

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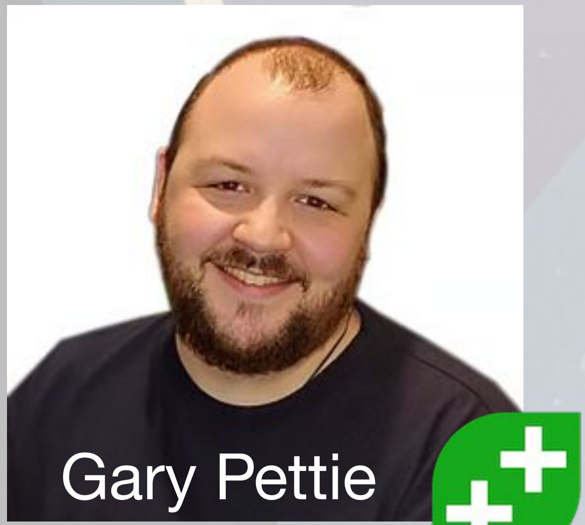
Level Manager



Gary Pettie

Challenge

- Write the public methods for;
  - LoadMainMenu()
  - LoadGameOver()

Challenge

- Connect the menu buttons in the GameOver scene.

Hint:

- Don’t worry about the LevelManager for now!

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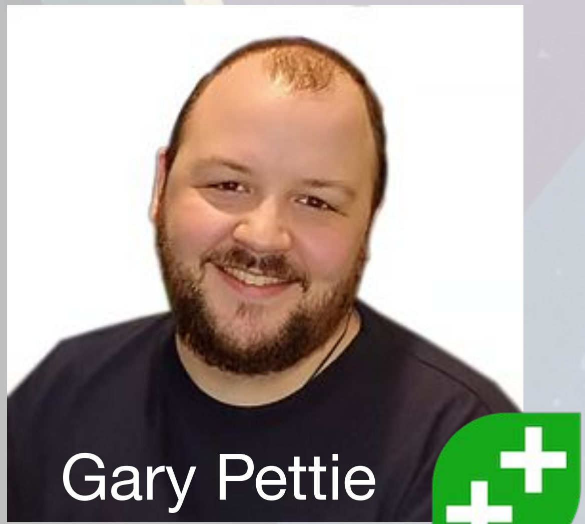
Singleton Pattern



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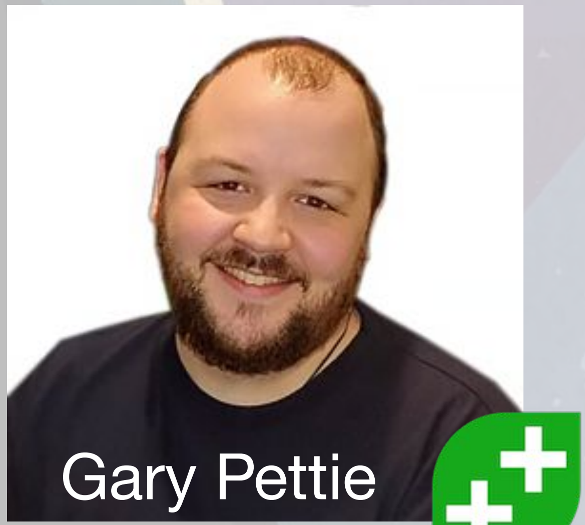
Singleton ScoreKeeper



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Challenge

- Turn the ScoreKeeper into a singleton

Hint:
Look at the the AudioPlayer for reference

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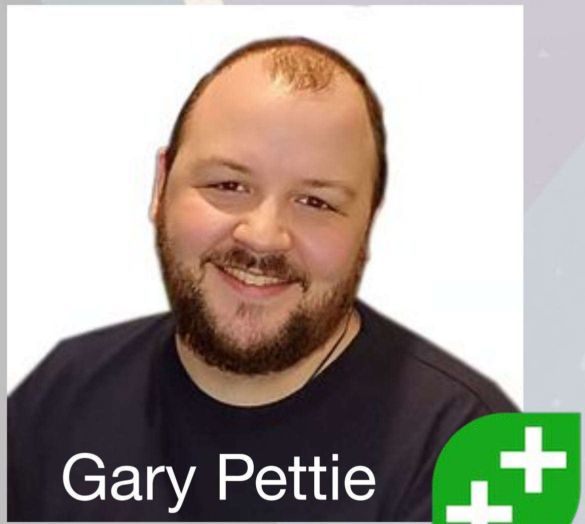
Balance and Build



Gary Pettie

Challenge

- Add more content
- Balance your game
- Share your game with the community
- Ask the community for feedback
- Pay it forward by reviewing someone else’s game!

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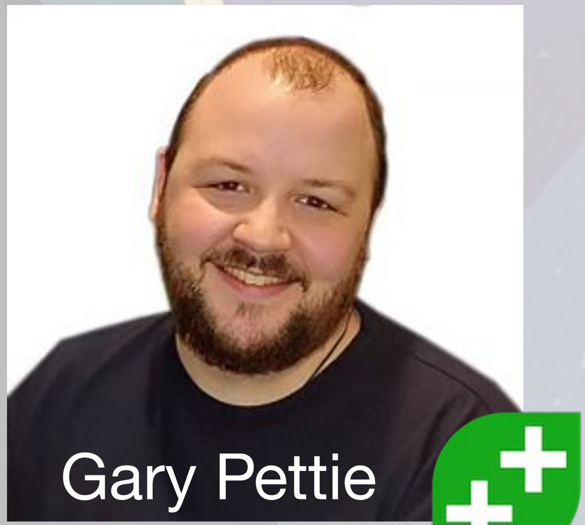
Wrap Up - Laser Defender



Gary Pettie