

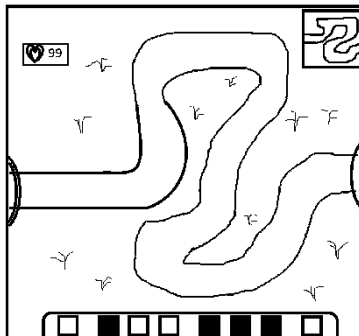
Earth Defense

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12/03/23



1. Introduction

This document specifies a design for the gameplay of a game with the proposed title “Earth Defense”. It is based on an article published by Earth.org [1]. The five biggest environmental issues in Canada, i.e.: mining, oil sand pollution, depletion of aquatic populations, wildfires, and pollution will be represented in the game as mobs. The inspiration for this project comes from the game “Bloons TD 5”.

2. Overview

Tower defense games usually have a story behind the whole defending structure. The aim of “Earth Defense” is to create a fun, addictive and strategic game which uses pixel art. The game is tower-defense-based. The player defends against mobs and tries to save Earth. It will have various levels of increasing complexity and difficulty which creates a challenge but gratification in the player’s attempt to save the world on their device.

3. Design Details

3.1 Story

The game is based on current events of what is happening around the world. The world is being destroyed by the factors highlighted in the Earth.org article and the goal of the game is to protect planet Earth at any cost. The player is the guarding angel of the Earth and has to defend against mobs trying to destroy the Earth.

3.2 Setting

The environment is set in a pathway layout in which detrimental mobs spawn on the left side of the screen and move through the path to reach Planet Earth which is at the end of the pathway.

3.3 Core Mechanic

Players are given a few basic protective turrets to place on the field to protect against the detrimental mobs. Each mob has a certain number of live points, and the turret will be used to shoot and destroy these mobs. Earth has also a health count and as mobs successfully pass through the defending towers, the health score decreases. If the health count reaches

0, Planet Earth is destroyed and the player loses. To win the game, the player must place the turret strategically on the ground (*see figure.2*) to combat the mob waves.

To progress to the next level, the player must defeat three waves of mobs. The first wave permits the purchase of only one turret from the available selection. Following the conclusion of the first wave, the second turret is unlocked and available for purchase. During the final wave, all turrets are accessible, allowing the player to choose the best combination to overcome and defeat the final boss. Each turret has its unique specifications, and they all shoot different types of bullets.



Figure.1: Selection of Turrets

In order to reduce the possibility of an imbalanced game, adjustments are made to each turret according to its cost, coverage range, firing rate, and damage potential against Earth-destroying mobs. The unlocked turrets aid in battling the stronger mobs that appear in the subsequent waves. The game starts with an easy tutorial wave which serves as an introduction to the game, allowing the player to become familiar with its mechanics, while the first, second, and third waves feature increasingly challenging mob spawns.

3.5 Mobs

The description of the main causes of the Earth's destruction served as the inspiration for the creation of every mob in the game. To attack the planet Earth, every mob must travel from their spawn location all the way to the end. The following highlights a description of what the mobs are based on and a table showing the mob sprite and their specification:

1) Mining

Mining is linked to the destruction of forests, tainted freshwater resources, and the impoverishment and eviction of communities. (*Mob Name: Crystally*)

2) Oil sand pollution

The extraction of oil contributes to water pollution because it makes enormous ponds of toxic waste in addition to discharging toxic pollutants into freshwater resources. (*Mob Name: The Oiler*)

3) Depleted aquatic populations



Due to overfishing, damming rivers for hydroelectric power, irrigation, and flood control, aquatic species are left with no habitat. The species' migratory movements, from reproducing, are blocked or hampered by the development of dams and culverts. (*Mob Name: Fisherman*)




4) Waste Pollution

Waste pollution is the term used to describe environmental contamination brought by improper waste disposal. Undisposed waste has negative effects on the environment, it is one of the major causes of greenhouse gas emissions and soil and water contamination, all of which contribute to climate change. (*Mob Name: Rolly Stinky*)

5) Wildfires

As global warming wreak havoc, Earth has dryer weather and has more susceptible to forest fires. Forest fires cause a loss in plant diversity and displacement of animals. (*Mob Name: Fire Hazard*)

Mob Name	Sprite	Specifications
Crystally		Easy to break, Higher fire rate turrets are very effective against it
The Oiler		Very dense and viscous, is hard to destroy but a normal bullet can do good damage on it

Rolly Stinky		Rolls to the end. Very smelly but easy to kill.
Fire Hazard		Very strong but walks slowly to the end. Can be destroyed with higher-range turrets
Fisherman		Strong but walks moderately slowly. When shot, gets confused and waits for a few seconds then resumes walking.

3.6 Features

As the core mechanic is put to play, the game experience is based on how the player spends their coins. Coins are gained as a reward after a mob is destroyed. The coins collected can be used to purchase more turrets. The rewards underwent testing to ensure that the player receives the appropriate amount necessary to successfully complete the level.

On top of the overall health score of Planet Earth decreasing when a mob hits Earth, the game deducts a percentage of the currently owned coins by the player. This leads to the second objective; the player must decide whether they are willing to jeopardize Earth's security in order to earn more money to buy expensive and superior turrets to combat the coming and more challenging waves.

3.7 Level Design

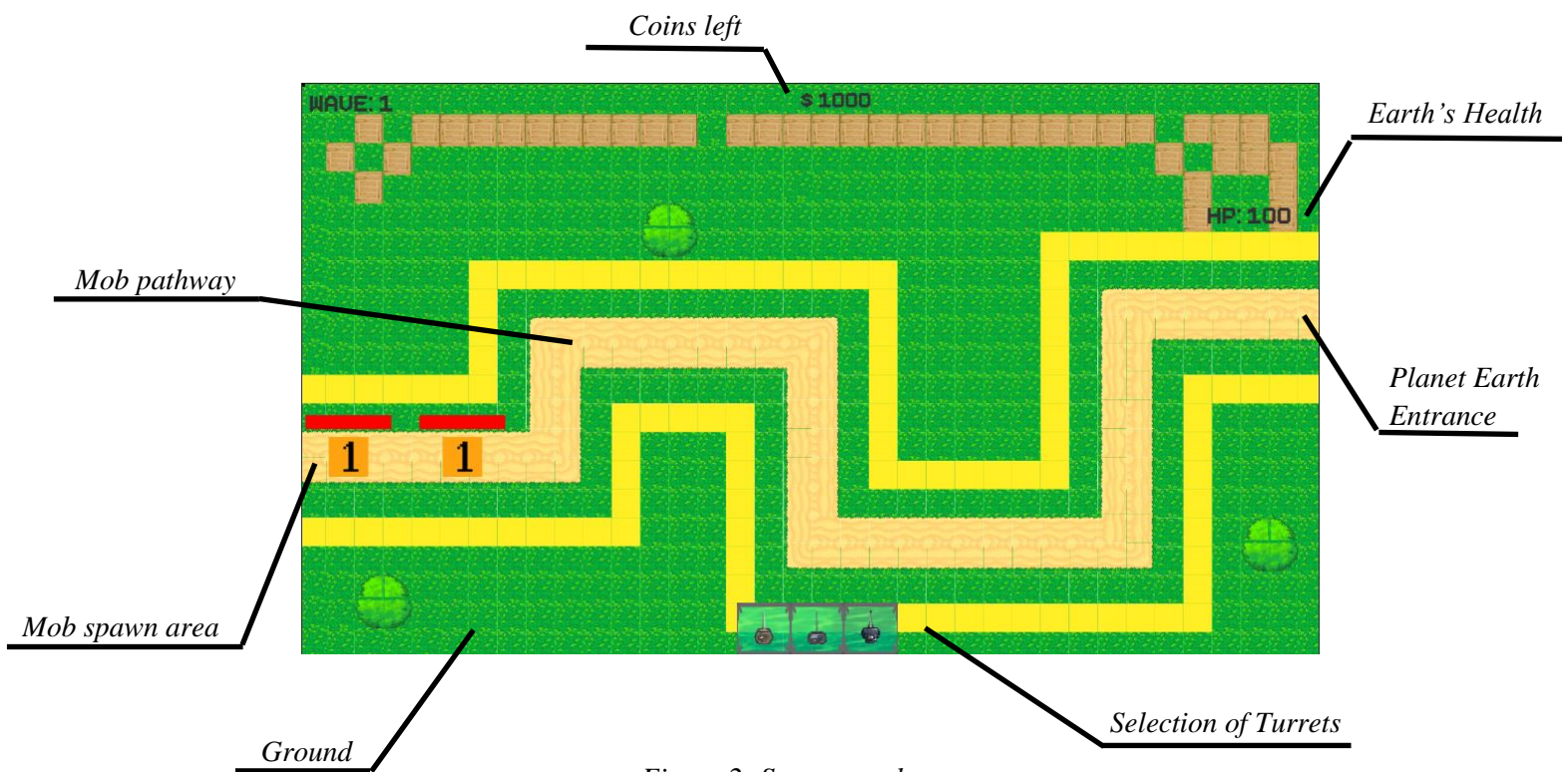


Figure.2: Screen mockup

Figure.2 shows a concept overlook of how the game will look like. Levels are going to have different paths and each theme will be different. The ground tile will change dependent on what level the user pick. The interface displays the player's coin count, the health count, and the timer until the next wave.



Figure.3: Waves and Time

Figure.3 shows the timer being displayed once the wave is over. The timer text only appears between waves and counts down to zero. It indicates when the next wave begins.

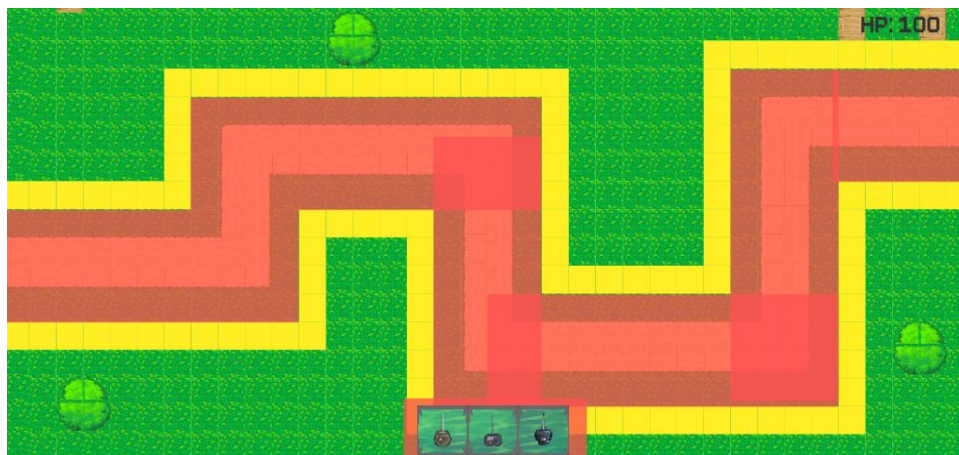


Figure.4: Unclickable Region

Figure.4 illustrates the hidden tile layer where the player is unable to click. This design is important since we want to limit the region where the player can place the turrets around the tile map. During QA testing, some testers were able to place the turrets on the mob's pathway and even behind the turret selection UI buttons. Adding this extra layer improves the game mechanic.

3.8 Development tools

Unity is the main game engine that will be used for development. Various sprites are subjected to be made to set up a basic theme and know how the game will look like. The Sprite Editor of choice is PixilArt. The assets that will be used for this game will mainly be from the Unity asset store.

References

1. Igini, M. (2023, February 17). 5 pressing environmental issues in Canada in 2023. Earth.Org. Retrieved March 12, 2023, from <https://earth.org/environmental-issues-in-canada/>
2. osn2019. (2021, March 16). Even small acts can have a ripple effect: Tackling plastic pollution. National Environmental Treasure. Retrieved March 12, 2023, from https://www.oursafetynet.org/2020/01/06/even-small-acts-can-have-a-ripple-effect/?gclid=Cj0KCQiAjbagBhD3ARIsANRqEuyL5l1N3cDwPmqfVeDENotPUfeTr-sftJDkQelenBcZwbuuqxGzeMaAgPaEALw_wcB