Design Document for:

Wildfire Fighter

Fighting Fires And Saving Cities

“These levels are lit!”

INM375 Game Development Process

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Version # 1.20

Sunday, December 10, 2023

Table of Contents

Design History

Version 1.10

Version 1.10 includes some updated map designs.

1. Revised the trees to model tree assets for each map.
2. Added screenshots of prototype maps for California, Hawaii and Amazon maps.

Version 1.20

Version 1.20 contains the Objects Appendix and Developer Notes Index.

1. Objects Appendix contains all assets used and any still required for the completion of the game.
2. Developer Notes contains some notes from throughout the development of the concept and the initial prototype.

Game Overview

Philosophy

The game aims to visualize wildfires and the damage they cause. It aims be a gamified tool used alongside museum exhibits or educational courses, helping players gain a better understanding of what challenges are encountered when fighting wildfires and the devastating effects they can have on human civilization.

In classes or at museum exhibitions attendees are provided a lot of information and data which can be hard to fully grasp without any visual representation. This game is not intended to replace the images, videos or any other digital media used, but rather to provide a further alternative.

Gamification can pose as a very effective tool in education when done correctly, as it keeps players engaged and acts as a medium for communication. In this game players should be presented with information on wildfires based on their performance in game. This can be more general data or information specific to real-life historic events that ties in with the outcome of the players experience.

There are three main effects of wildfires the game aims to highlight: the displacement of wildlife (habitat destruction, e.g. amazon rainforest fires), the displacement of human life and health risks of air pollution caused by wildfires.

Common Questions

What is the game?

The game is a wildfire fighting game, where the aim to put out a forest fire before it reaches the city using a water carrying airplane. The game is to be a gamification tool used by museum exhibitors or educational staff to communicate the effects of wildfires.

Why create this game?

The game is inspired by the Canadian wildfires that took place throughout the summer of 2023. The smoke generated by these fires spread south, enveloping New York City in an orange haze and making it have the worst air quality in the world. Although I want to create a game world inspired by the breathtaking images taken during these events in New York City, I do not wish to portrait these events in a positive light. Instead, I wish to educate people about how these wildfires are yet another symptom of global warming and the detrimental damage they cause.

Where does the game take place?

The game will take place all over the world with every level being in a unique location that is subject to wildfires in real life. The following locations will be levels: California (USA), British Colombia (Canada), Maui (Hawaii, USA), Greece, Amazon Rainforest (Brazil) and Algeria. (I am aware that the fires in the Amazon are ignited by people for deforestation purposes, but it still falls under the general theme of the game.)

What do I control?

The player controls a plane which carries water collected from a body of water and releases it over fire. The plane's engine output can be increased and decreased affecting the flight velocity. To control the vehicle's movement, the aileron, rudder and elevator are adjusted according to the player's inputs, mimicking the control functionality of real-world planes.

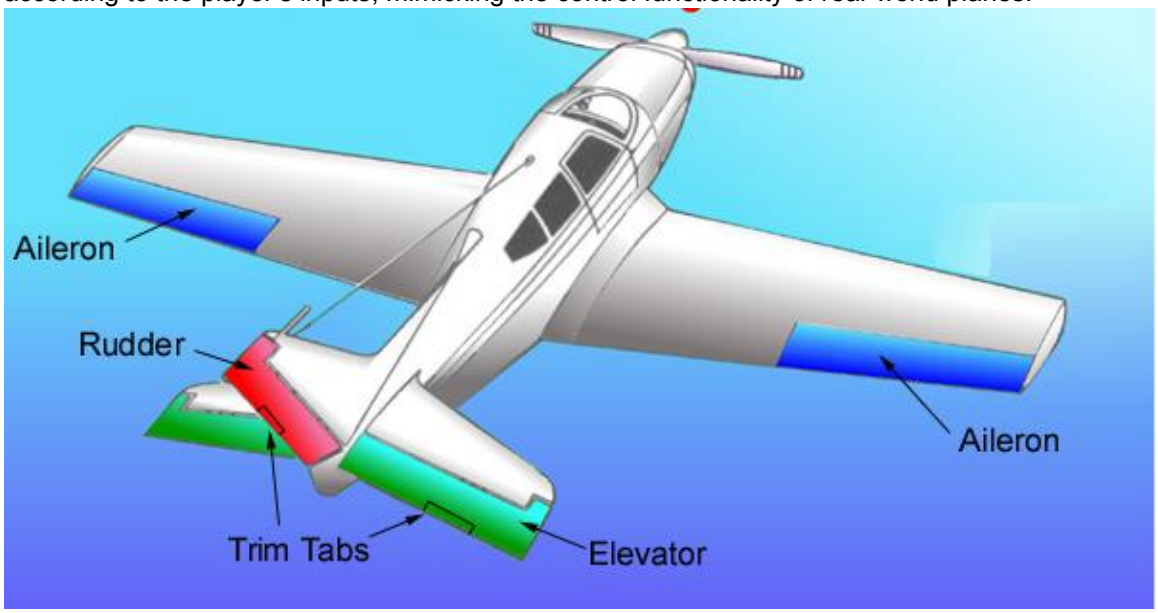

Figure 1 Airplane Controls

What is the main focus?

The aim of the game is to extinguish the wildfire as quickly as possible without allowing it to reach human housing and achieving a high score in doing so. The player's score is negatively affected by the amount of forest that burns down and the amount of smoke generated by the fires.

What's different?

There are three main competitors that I identified, namely Stormworks: Build and Rescue, Firejumpers Inferno and WILDLAND: Initial Attack. Stormworks: Build and Rescue is a game where you build your vehicles and use them in natural disaster rescue missions. FireJumpers Inferno focuses explicitly on fighting wildfires, however, allows the player to control an entire fleet of vehicles simultaneously and better resembles a real-time strategy game. Lastly, WILDLAND: Initial Attack (not yet released) prioritizes a multiplayer experience in a sandbox environment.

Unlike the aforementioned titles, Wildfire Fighter intends to educate the player about wildfires and their devastating effects on both nature and human civilization.

Who is the game for?

As the game is intended to be used as an educational tool used in classes or museum exhibitions the age and digital literacy of player will vary. Whilst classes would take place in educational institutions, e.g. high schools, universities, etc., and cover ages in the ballpark range of 14-24, museums do not cater to a specific demographic and may hence include elderly visitors whose digital literacy may be inferior to that of younger generations. Whilst it can be assumed that players will be able to use and understand how to use a gamepad or keyboard and mouse for controls (exact control mapping is to be communicated within the game), it is important that the game's gameplay and control complexity reflects the varied abilities of the player base. Hence, the game's entry barrier should be very low, but without taking away form the quality of gameplay, enjoyment and immersion.

Feature Set

General Features

- Real world location and event inspired levels
- Unique to each level fire related characteristics
- Educational facts relevant to experience presented
- Grid based fire spread
- Low poly art style

Gameplay

- Flying a plane.
- Dropping water on wildfires.
- Stopping fire from spreading.
- Refilling water tank by flying close to a water source.
- Defending human settlements/cities from fire.
- Minimizing smoke generated.
- Generated smoke impacts visibility.
- Player's score is based on how much land burns down, how quickly they complete the level and how much smoke is generated.
- Data and information on real life events that inspired the level are shown upon completion.
- Data and information shown is affected by a player's performance.
- Grid based fire spread logic.
- Levels with unique impact on fire behavior.
- Levels inspired by real life locations and events.
- Hawaii: Strong winds accelerate fire spread in the direction of the wind.
- Amazon: Fires randomly ignite in locations unrelated to existing fire.
- British Colombia: Fire cannot spread of mountain ridges.

- Algeria: Large patches of grass lands which burn and spread fire much quicker than forests.

The Game World (Level Layouts)

Overview

The core gameplay loop of extinguishing wildfires will take place in levels inspired by real-world locations that are susceptible to such fires. Upon launching the game, players will be presented with a world map containing pins placed according to the location of each level. The pins on this screen at like a level select, i.e. to start a level the player will need to click on the associated pin.

Each level will contain a body of water (this is where the player refills their plane's water tanks) and land on which there is a clearly identifiable human settlement and a forest spreading much of the landmass. Levels may have multiple instances of each element to allow each level to provide a unique experience and not feel too similar to other levels, e.g. the level "Greece" contains two islands each with their own towns the player must protect simultaneously. Levels should also aim to introduce specialized fire behavior appropriate to the location.

At the end of a level, upon successful completion, information is shown to the player. This information is slightly altered depending on how the player has performed. if a player completed the game very fast, the game is to prioritize information based on how long the real-life fire associated with the level has lasted. If a player allows for a lot of smoke to generate then this is prioritized and the effects of bad air quality is focused on. And if a player allows for a lot of burnable area to burn down, then area affected and its effects on humans and wildlife of the real-life associated event will be spotlighted.

Tree models may be substituted with willows to use as place holder assets during early builds until the models not available in the Synty asset packs are made (see Objects Appendix).

California

This level has no additional fire behavior pattern as it is supposed to act as a default level. It has a set of mountains which hide the corner in which the fire starts in from the player. The body of water runs along one edge and is to represent a lake among mountains. To better show this, the map is to be surrounded by a skybox depicting mountains in the distance. The vegetation in this level is to consist of various pine trees found in available Synty asset packs.

Upon completing this level, general statistical data about the near yearly wildfires that occur in California should be presented. Information about human casualties, human displacement and wildlife impact should be prioritized.

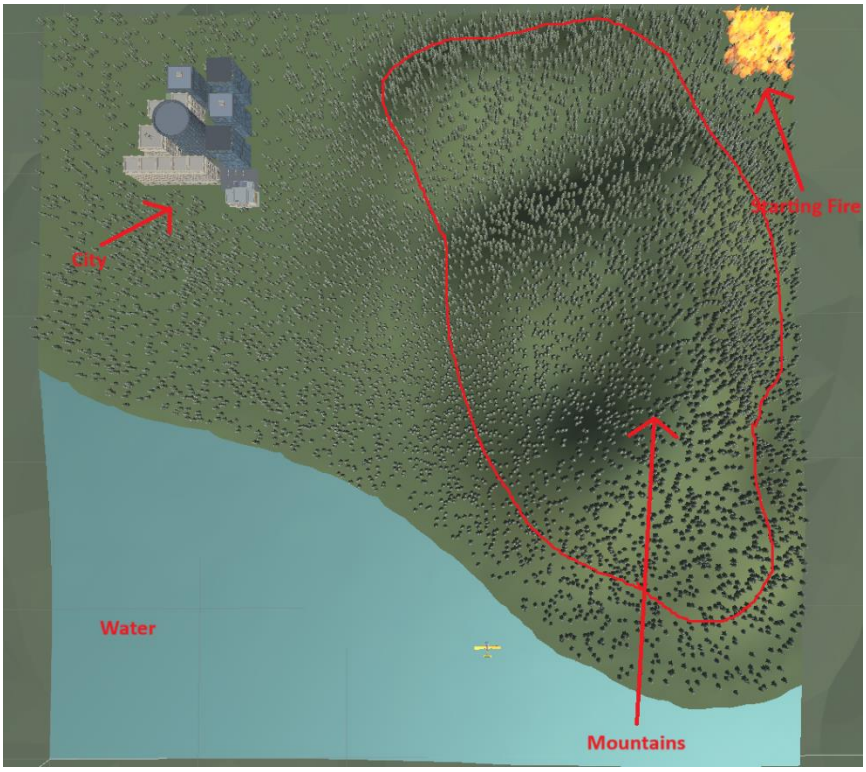

Figure 2 California Map Layout

Hawaii

This level contains an island which has a tall mountain in the center and is fully surrounded by water. The fire starts on the northern side of the Island. The city is located on a protruding lip on the southwest of the Island. A powerful wind is to be visualized in this level using particle effects of grey lines moving from north to the south. This wind is to affect the behavior of the fire, accelerating its southward spread.

Tree models used for this map should be based on the Hala tree, coconut palms and the Cibotium menziesii.

Information provided upon completion of the level should refer to the fires that occurred between the 8th and the 11th of August 2023. These fires were especially devastating due to strong gusts that accelerated their spread.

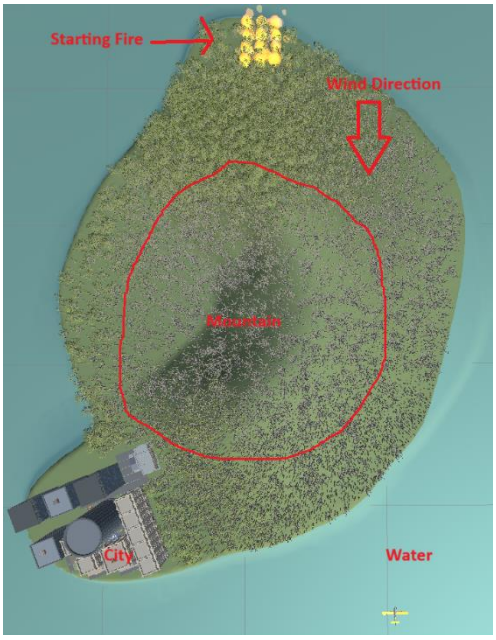

Figure 3 Hawaii Map Layout

British Colombia

This level takes the Canadian Rocky Mountains as inspiration. Two parallel mountain ranges are to run through the map creating a valley in between. These mountains extend above the tree line and hence no fire can spread over them, however, when the player's plane is carrying water, the load should be considered too heavy and hence the plane should not be able to elevate to an altitude high enough to cross the mountain ridges.

Two lakes will be located in opposite corners of the map and a fire starting near each. The city will be in the center of the map in the valley. Should the player be able to fully extinguish one of the fires early on, the other fire spreading, as well as the traversal limitations of both the fire and the player should provide enough of a challenge and extend playtime to the desired amount of 5 to 10 minutes per level. Trees to be used in this map are various pine tree assets found in the available Synty asset packs.

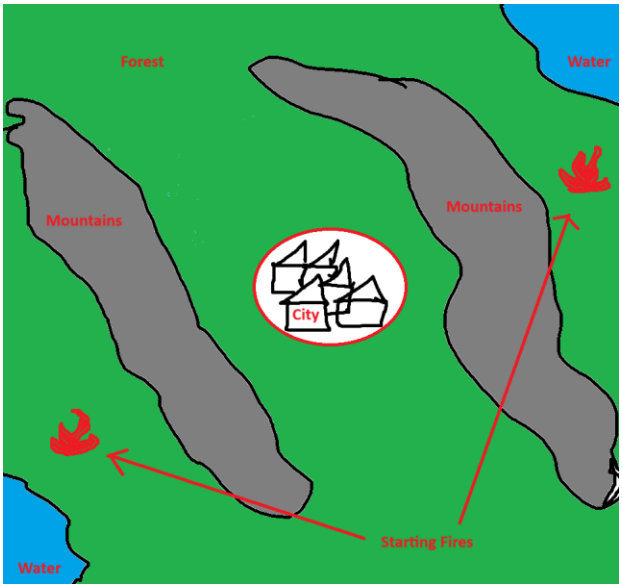

Figure 4 British Colombia Map Layout

The information and data displayed to the players upon completion should relate to the yearly increase in size of wildfires in British Colombia. The size of 2023's McDougall Creek wildfire should be compared to sizes of wildfires in previous years. Potential impact of exponential rise in size of wildfires in the area on humans, wildlife and nature should be made very clear to the player.

Greece

This level consists of two islands in an endless body of water representing the Mediterranean Sea. Each island will have its own town located on opposite ends and each along the coast. The remainder of islands' surface will be covered by trees making up forest. Tree assets are to be modeled after wild olive trees, mastic trees and kermes oaks as these are commonly found on Greek islands.

In this level there will be two wildfires, one on each island. The fires will start on the side of their islands opposite the towns. The speed at which fire spreads, areas burn and areas dry up may need to deviate for the game's standard to accompany the smaller areas and provide an appropriate challenge. This is to be tested and decided upon during development.

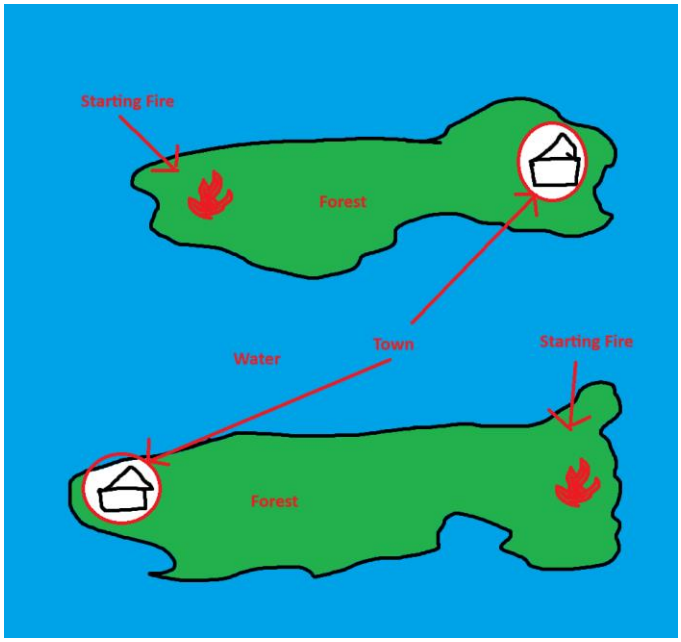

Figure 5 Greece Map Layout

Information and data presented to the player upon finishing the level should be regarding the wildfires throughout the summer of 2023, especially the fires in the north-east of Greece near Alexandroupoli in August and fires on the island of Rhodes in July.

Algeria

This level will contain large patches of grass land which burns and spreads significantly faster than a forest, whilst also producing less smoke. On one edge of the map is a coastline and the city is located in one corner along the coast. The rest of the map is hilly and covered in forest.

Vegetation in this level should be modelled after Saharan cypress trees, argan trees and fig trees.

The information provided upon completing the level should be regarding the wildfires in northern Algeria during July 2023. It should be noted that this region is already subject to very hot temperatures and any potential increase in or acceleration of desertification of the greater region as an aftermath of wildfires should take center stage.

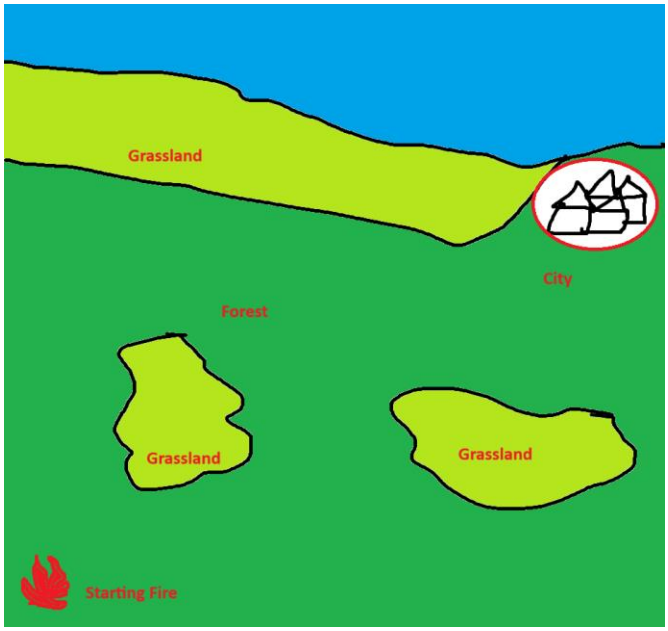

Figure 6 Algeria Map Layout

Amazon Rainforest (Brazil)

The Amazon Rainforest is naturally not subject to wildfires. The fires starting in the Amazon are all manmade. This level will have random areas ignite in interval to replicate this. A twisting river will be found at the center of the map and the fire will start in the corner on the same side as the city, however, on the other end of the map.

The forest on this map just consists of assets modeled after the Kapok Tree, Rubber Tree and Xate covering the ground along the edges to give the illusion of a dense rainforest.

Information provided upon completion of the level should cover the man-made fires in the Amazon. The motivation for this deforestation should be presented, followed by the affects of these fires on wildlife and especially on endangered animal species. It should be emphasized that 11.8 million acres of land have been burned down since the start of 2023 and how this has led to unprecedented droughts uncharacteristic to the region.

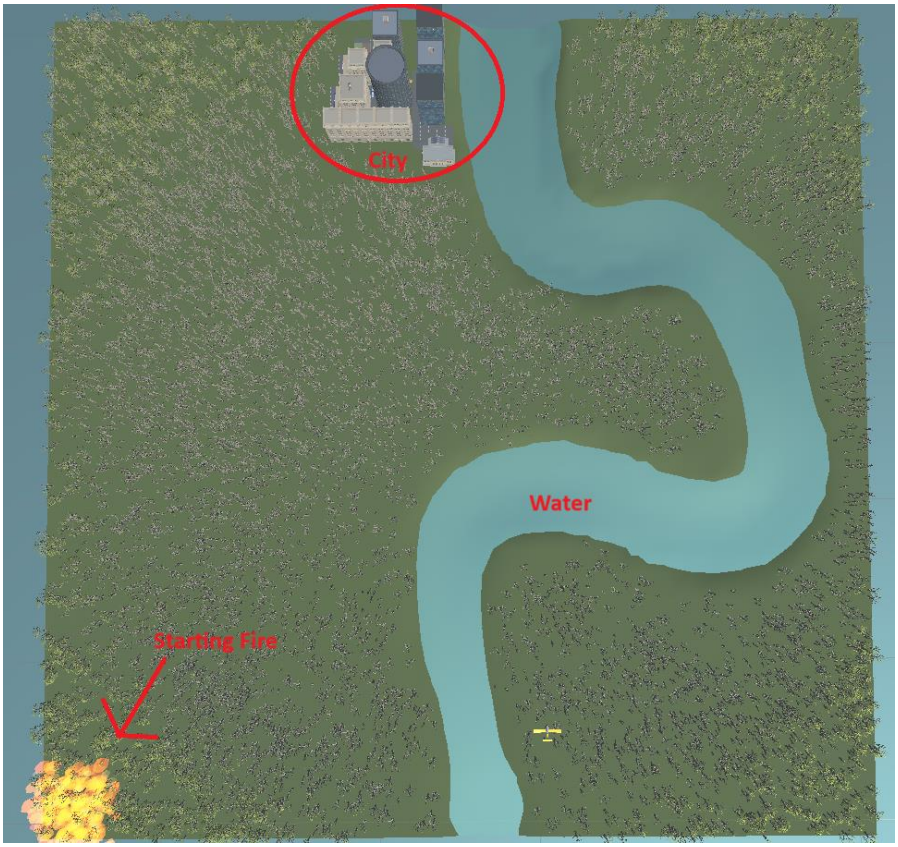

Figure 7 Amazon Map Layout

Camera

The game's camera will follow the player's plane, located behind and slightly above the vehicle looking slightly ahead of it. By using either the mouse or the right stick on a controller, the camera can be rotated to get a better view of the surrounding area. Once the player stops actively moving the camera, it will slowly recenter to its original position.

Game Engine

The engine used for this game is Unity. The main reasons behind this decision is my existing experience with the engine, as well as its intuitive particle system. Other benefits are that Unity has an easy-to-use collision system as well an intuitive UI system.

Lighting Models

Every level will take place during daytime. To achieve this a simple directional light will suffice. Fire effects should emit their own light.

Game Characters

The player controls a plane which carries water used to the release over the fire and extinguish it. The plane rotates around its z-axis (runs along the length of the plane) and y-axis (vertical axis) when turning and along the x-axis (runs side-to-side of the plane) when increasing or decreasing elevation. Upon completing the turn, the plane will rotate back to its upright neutral position along the z-axis. When turning, the plane's aileron, elevator and rudder should also move accordingly and the propeller should always be rotating. The player can also increase and decrease the movement speed of the plane to aid with traversing the environment, however, there should be a minimum and maximum speed defined which cannot be exceeded.

The plane has a water tank which empties as water is being released. To refill the tank, the player must fly close to the surface of the water source and press the same button used for releasing water.

Controls

10-Keyless Keyboard

Figure 8 Keyboard Controls Layout

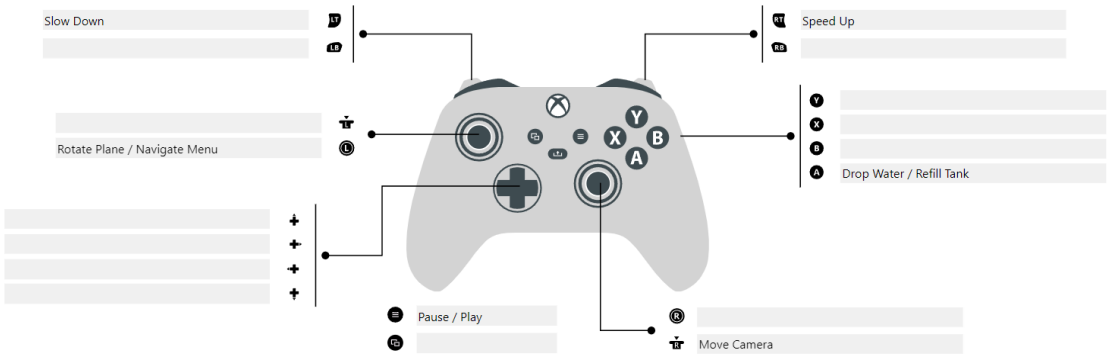

Figure 9 Controller Controls Layout

User Interface

This game does not require very a complicated UI as not much information needs to be communicated. The UI during the level select will differ from that during a level.

Level Select

Upon starting the game, the player will enter a level select. This screen consists of a world map with pins at locations representing each level. When clicked upon, a menu appears which shows some information on the level like name and location, leaderboards and some characteristics about the region that play into the gameplay, e.g. how the tall Rocky Mountains in British Colombia can be tough to traverse for low flying planes.

In the top left hand corner a question mark can be found. When pressed, this toggles the game menu, displaying the controls for the active controller type (if a controller is detected, it displays the controller layout, otherwise it displays keyboard controls) and an option to change the volume, see credits and exit the game.

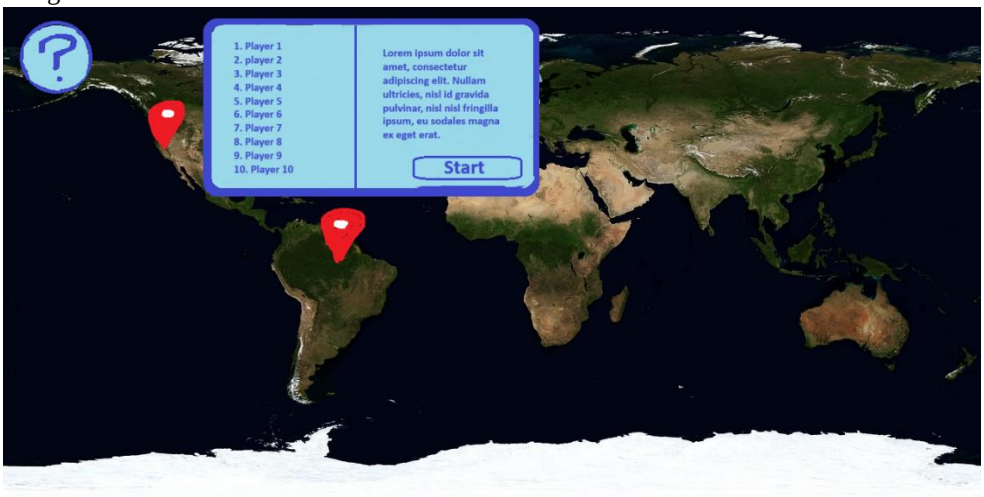

Figure 10 Level Select Screen Concept

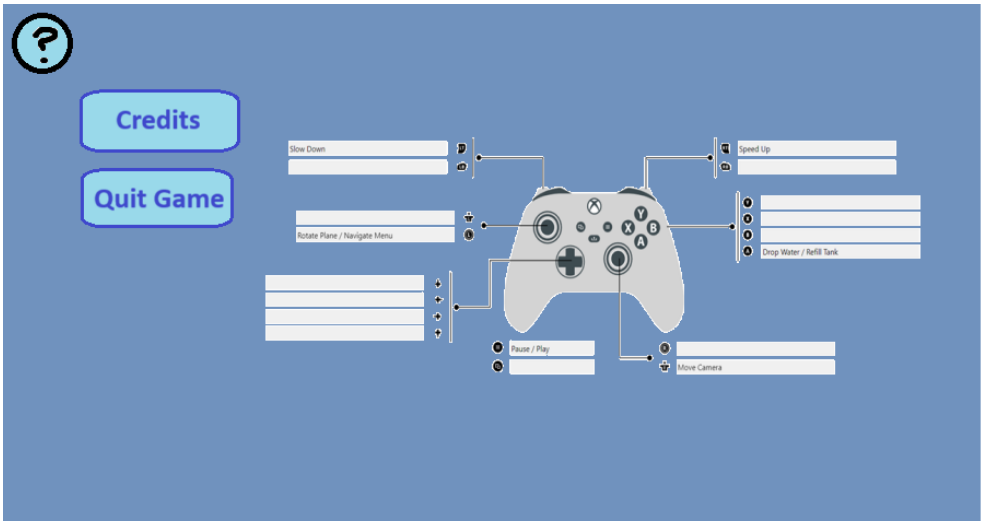

Figure 11 Level Select Menu Screen

Level Gameplay

During Level:

Whilst a player is a level, only two things are communicated with the player. Firstly, the current air quality which is displayed using the Air Quality Index (AQI) in the top right-hand corner of the screen. And secondly, below the AQI a depiction of the water tank, visually displaying how full the tank is, but also a numerical percentage is displayed below it.

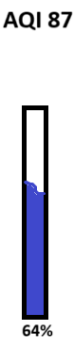

Figure 12 Water Tank UI

Pause Menu

The pause menu is identical to that during the level select, however with an “Exit Level” button between the “Credits” and “Exit Game” buttons.

Level completion screen

Once the level is completed the player is prompted by a popup to enter a username (is not unique but is filtered for inappropriate language) which the score is then stored under. Once this is complete, a screen appears displaying the player’s score, the level’s final AQI, the area that burnt down, the time it took for the player to finish the level, a leaderboard and information on the real-life event the level is associated with.

Figure 13 Level Complete Screen

Musical Scores and Sound Effects

Sound Design

The game does not require many audio elements. However, the following should be implemented:

- A continuous engine sound, which plays at a higher pitch the faster the plane moves.
- Fire crackling sounds that get louder as the player approaches the fire.
- General city noise which gets louder as the player approaches the city.
- A simple, slow, short melody that plays on repeat during level select and fades out once a level is started.

“Objects Appendix”

Four Synty asset packs are to be used for the project, namely:

- Polygon City
- Polygon Nature
- Polygon Particle FX
- Polygon Stunt Plane

From these, the following assets are to be used:

- Polygon City:
  - SM_Env_Road_03
  - SM_Bld_Apartment_Stack_03
  - SM_Bld_OfficeOld_Large_01
  - SM_Bld_OfficeOld_Small_01
  - SM_Bld_OfficeSquare_01
  - SM_Bld_OfficeSquare_03
  - SM_Bld_OfficeSquare_Roof_01
  - SM_Bld_Apartment_Corner_02
  - SM_Bld_Apartment_Door_Corner_01
  - SM_Bld_Shop_Corner_01
  - SM_Bld_Shop_04
  - SM_Bld_OfficeRound_03
  - SM_Bld_OfficeRound_Base_01
  - SM_Bld_OfficeRound_Roof_01
  - SM_Veh_Car_Police_01
  - SM_Veh_Car_Muscle_01
  - SM_Veh_Car_Taxi_01
  - SM_Veh_Car_Small_01
  - SM_Bld_Apartment_Stack_02
  - SM_Veh_Car_Van_01
  - SM_Veh_Car_Medium_01
  - SM_Veh_Car_Ambo_01
  - SM_Veh_Car_Sedan_01
  - SM_Bld_OfficeSquare_Base_01
  - SM_Bld_Roof_Access_01
  - SM_Prop_Water_Tower_01
  - SM_Bld_CityHall_01
- Polygon Nature:
  - SM_Tree_Pine_Large_01
  - SM_Tree_Pine_Small_01
  - SM_Tree_Pine_Small_02
  - SM_Tree_Pine_01
  - SM_Tree_Willow_Large_01 (use as temporary substitute for unfinished assets)
  - SM_Tree_Willow_Medium_01 (use as temporary substitute for unfinished assets)
- Polygon Particle FX
  - FX_Fire_Big_02
- Polygon Stunt Plane
  - SM_Veh_Plane_Stunt_01

The following assets are required to finish the game:

- Hala tree
- Coconut palm
- Cibotium menziesii
- Olive trees
- Mastic trees
- Kermes oaks
- Cypress trees
- Argan tree
- Fig tree
- Kapok tree
- Rubber tree
- Xate tree

“Developer Notes Appendix”

Original game idea found in game_idea.txt:

“Game Idea:

- Forrest Fires
- Plane putting out fires
    - get water from the lake first
    - drop of fire
- fire can spread if not put out in time
- can spread to cities -> defend at all costs
- lake can have a random oil spill -> when oil is dropped on fire, fire increases
- 2.5D
- fire can spread back into areas where water was dropped as it dries out, but maybe some firefighting tactics to better fight the fire can be implemented.”

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