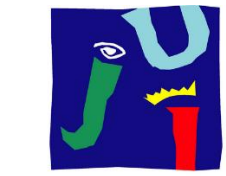

Creating an artistic design document for an original videogame

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Final Degree Work
Bachelor's Degree in
Video Game Design and Development
Universitat Jaume I
July 03, 2020

Supervised by: **Jose Miguel Sanchiz**

Acknowledgments

First of all, I would like to thank my Final Degree Work supervisor, **Jose Miguel Sanchiz**, for his orientations, suggestions and indications, throughout the development of the work, that have allowed me to reorganize and reorient it, at different times to give it a meaning that is more correct with the expected quality, and more coherent with the objectives I seek.

I also wanted to thank my parents and in general my entire family for their support in achieving this work and in general during the development of all my studies.

Abstract

This document reflects my final degree work, which is essentially divided into two halves: A mainly art oriented GDD that includes several instances of concept art and ideas for story narrative and game mechanics. And a short playable demo game that implements the main ideas introduced in this.

I have designed the concepts and described all the elements that make up the game including characters, settings, dynamics, controls, obstacles and tests to overcome, scoring, lives, etc.

The work includes the textual description of the development of the game and some fifty high-resolution files of the images, graphics and animations made.

My objective has been to design everything necessary to explain all the elements of the game. This excludes three elements: its programming, the audio design (music, sounds and possible voices), and a more detailed expansion of the arts, which, for the game I have designed, requires more time frames than those that are available for the execution of this work and that I describe as possible future work.

Additionally, I've created a small playable demo of the concept in Unity, to better show how this game would work.

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FIGURES

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CHAPTER 1

Introduction

Contents

This chapter reflect what is going to be done during the development of the work. Although the fundamental point is to state the objectives of the presented work.

1.1 Work Motivation

When deciding what to do for the project I considered mainly which where my strengths and what would be an enjoyable work to do. During our course, one of the subjects involved a project on making a document around a concept for a videogame, which I found really fun to do. My main interests and skills lay in art, so I decided to make something more related to that than to coding, since I feel I'd have better chances at making something good this way.

Indie games tend to have a fame of being mostly pixel art, but there is a big market for games in a more traditional style of drawing and animation. Many big games lately have stood out for their beautiful art, as well as the work and dedication it takes to draw each frame to make it look fluid and nice. Games like Skullgirls, Cuphead or Hollow Knight come to mind were known precisely for this, either their amazing hand drawn animations or their iconic art style.

Fig. 1 Skullgirls ©Reverge Labs

On trying to come up with the kind of game, I decided to take inspiration on the classic Contra, and other similar styled games like Megaman, or Cave Story. With a simple basic gameplay but with lots of room for making fun stages and enemies. The game would be a mix of platforming with shooting with those game, having access to items and powerups, adding in the punch attack for extra power and mobility.

Fig. 2 Contra. ©Konami

1.2 Objectives

My goal was to make a document that presents the concept for a videogame, illustrating several of the elements, explaining its gameplay mechanics and a summary of how the story is told, etc. so as to show what the game would be like.

My objective was to create concept art for the characters, npcs, items and some stages; example animations for some enemies, as a way to show how they would appear in game, some mockup scenes of what ingame levels may look like, a description of the gameplay mechanics and other elements related to how the game may work and be played, and some description of what the story is about.

In short, I'd like to make a document that covers most points needed for the reader to get a good idea of what the game described would be like.

To make this more complete, I've also programed a game demo, where the player can control the main character, implementing the main controls and moves the player would have in the game, so as to give a better idea of what the game would be like. The player would have to be able to move, shoot, punch and interact with the enemies for a good result, and in general, the game should properly display the main mechanics I described should be available in the design document I made for this project.

1.3 Environment and Initial State

I had a slightly delayed start to my project, catching on to the first deadlines barely in time since I didn't know when these would start, and having been focused on dealing with the internships search at the time, which would continue to take a big part of my attention and work time to share with this from then onward. Additionally, the current pandemic situation, though not majorly, did bring some slight loss of focus during the first stages.

At the supervisor's request, a second element was added to the objectives of the project, creating a playable demonstration of the game.

CHAPTER 2

Planning and resources evaluation

Contents

This chapter explains the technical part of the work, the initial planning and the resources needed.

2.1 Planning

The very first step of the project was to come up with a good enough concept for a game, something that would allow at least a decent amount of content to elaborate on.

After this, the work splits into the art side and the written concepts side.

Art for the characters and elements will be made, and then accompanied by a written explanation of what it's illustrating.

Starting with the main character and the major gameplay mechanics of the game.

Followed by minor enemies, general items and major bosses, as well as animations for these.

With a development of the overall story of the game through this, adding illustrations of the different stages of the game as this is written. Detailing appearance of some important ingame menus, HUD elements and items.

Additionally, some illustration that could work as a "cover" for the game should also be made, as well as some relevant npc characters.

Lastly, if time was available, including an additional part regarding extra cosmetic content or downloadable expansions for the game via DLC purchases.

On to the playable part of the project, the planning was divided into the different minimum elements that would be needed, following the established controls the game would be supposed to have.

Start by setting up a basic stage and the character, make her move and jump. Next implement the gun, make it shoot forward and in angles. Then program the punch, which should be able to charge to different levels and dash forward depending on the power. Work on the different animations, walking, shooting while walking with the different shooting angles, etc.

Add an enemy to interact with. Should be able to take damage from bullet shots and punches, die when its hp is depleted and grant Heat to the player.

Introduce other elements like a background, start menu, HUD elements. Code in the Heat mechanic when attacking, which should give a brief powerup to the player while its active.

Try to add special effects to make moves more impactful if possible.

2.1.1 Task and temporal Planning

February: (30 hours) - Initial Design of the game concept, history and characters. - Evaluating models and investigating references - Technical Proposal and gdd.
March: (60 horas) - Design and illustration of the cover art - Design and illustration of the protagonist, actions and dialog / emotion pictures. - Animation of the protagonist in action.
April: (75 hours) - Design and drawing of ingame stage screens. - Concept and design of unique mechanics for each stage. - Concept, development and redaction of the story and game progression. - Concept and design of game mechanics and controls. As well as main gameplay mechanics and general game progression. - Drawing of game HuD interface. - Drawing of shop and item inventory menu screens.
May: (70 hours) - Concept and design of the different enemies with their mechanics. - Concept and design of the different items, with their uses. - Boss design, with illustrations and explanations of their mechanics and animations of their moves. - Development of a document compiling work done.
June: (50 hours) - Analysis of future work. Cost and resources required for developing a game. - Development of de project report and presentation.
July - September: (50 hours) - Development and Implementation of a demo with a playable character in a small game level.

2.1.2 Gantt Diagram

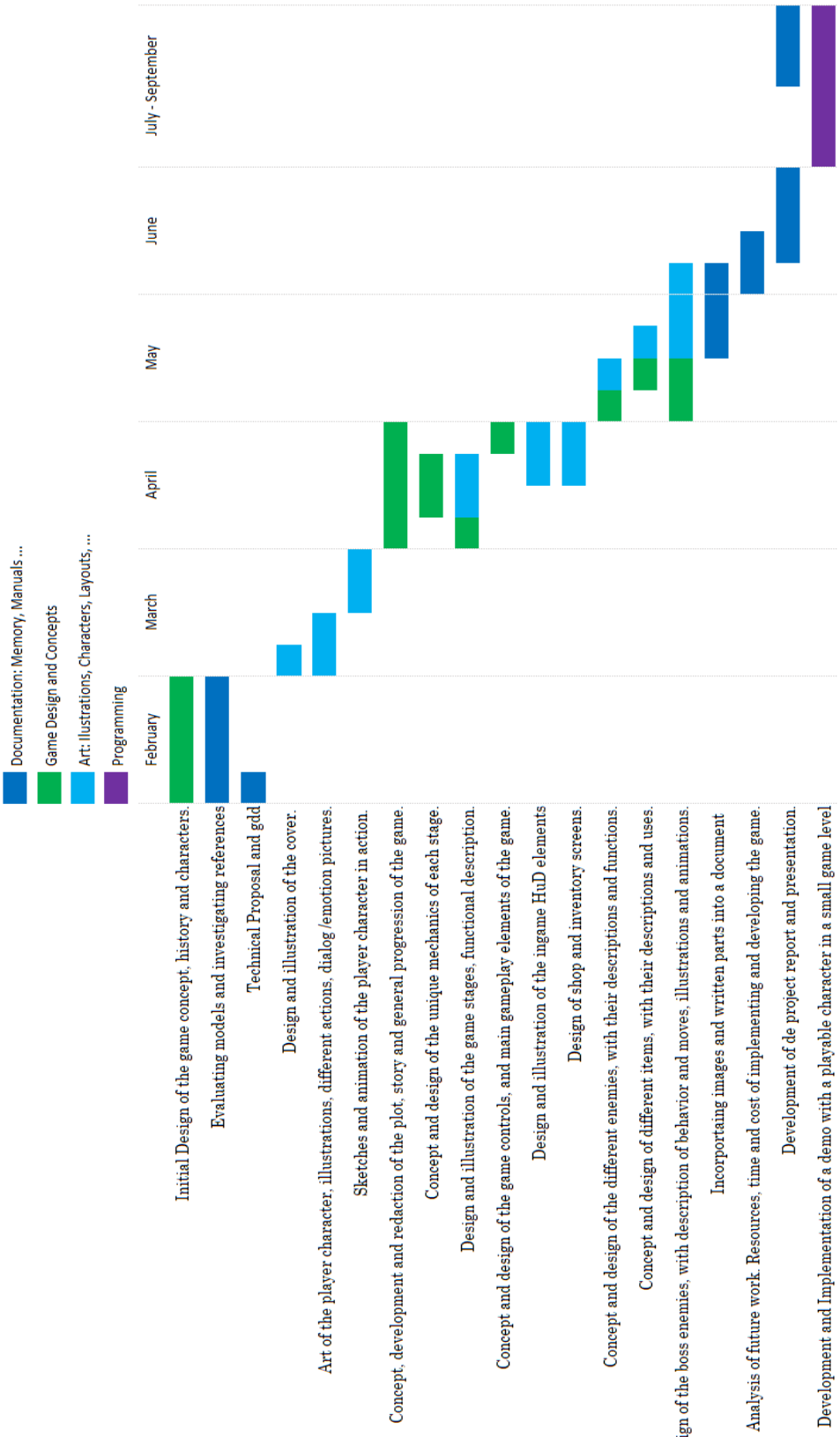


Fig. 3 Gantt Diagram

2.2 Resource Evaluation

Resources needed for this were minimal, only needing basic programs and tools already available. Digital drawing tools, in this case Paint Tool Sai was used and a Wacom digital tablet for drawing.

For writing the document I used Microsoft Word, and Microsoft Visio for creating tables.

For programming the game, I used Unity, a free game engine that has been used through the course and provides many tools to develop a multitude of different kinds of games, ranging from 3d to 2d genres.

Code for the scripts was written on Visual Studio Code.

2.3 Game Idea

The concept of the game is a 2D side scrolling, platformer, shoot and run style game. The game controls a mercenary, can jump and move through stages, fighting enemies with their gun, to shoot them at a distance but also use a powerful fist attack, to punch through them. Additionally, they'd have a Heat mechanic to reward a good performance by constantly hitting and defeating enemies to get power boosts.

CHAPTER 3

Game Design Document

Contents

3.1 Work Development

After a session considering different possible topics, genres and aesthetics and settling on one. Work on a concept for the main character started, after several designs, one was chosen and started working on preparing a few pictures needed to display the ingame moves.

The gameplay explanation went through without too much problem, having come up with a decent idea for it.

The story was written and rewritten a few times through the work of the project.

Otherwise the project mostly followed the list of objectives, adding in whatever was missing one by one, enemies, items, etc… Spending some more time making the animations for the bigger enemies, coming up with ideas for stages and elements to keep each one interesting.

Being unable to actually introduce the animations on the document itself, I put them on an image hosting website, adding links to it on the project where they were needed.

On to the playable part of the project. It was planned to be a brief demonstration of how the game that has been designed for the project would work. I coded the player character to be able to perform the basic moves planned for the game. Running, jumping, shooting and aiming and punching.

The player can jump and move. For the shooting, I set up the bullets and shooting function in a way that allows to modify their properties as each shot is fired, so their angle, direction and damage values can be easily changed depending on different conditions, for example for aiming up or down, or if the character were to get a powerup.

The punch attack was another important element to implement. The main requirements were that it had to be able to be charged to 3 levels, and would have a movement part to it.

Thus, there's two parts to it, first the charging while holding the key, which simply counts down for how long it's going on, adding up charge levels as countdowns are done until the max is reached. The character can't move while charging, but can change direction and jump in place. The second part is the release, the player executes the punching action, depending on how high the charge level is, it will be a longer punch with a longer forward movement. The punch has a collision area that will damage enemies and knock them back proportionally to the charge. Additionally, to make it easier for the player, I added flame graphics that light up as the fist charges, to show the level of charge.

I made different sprites and some animations for the different moves, running, punching, jumping, shooting in different angles, and combinations of shooting with running and jumping…

Also added a simple walking enemy to show the attack interactions against, giving it basic animations for moving and getting hit. When attacked the enemy loses health, and explodes when defeated.

I implemented the heat gauge in the HuD, which charges when hitting enemies and constantly drains down. When fully charged, leads into a brief Burning state, giving a powerup and movement speed buff.

Also made a basic title screen for the game before going into the test level itself.

Introduced platforms and started working on extending the level a bit to show player movement a bit better, jumping into different platforms or Punch-dashing over gaps.

I introduced a screen shake effect for charging the fist and defeating enemies, which makes the moves feel more potent.

3.1.1 Original and Scrapped ideas

This is just a brief part to mention initial concepts. Such as the story revolving around 2 girls fighting an alien invasion, this was soon changed into the current one, since I wanted to try and have at least some sort of mystery adventure introduced into the plot.

The second girl was also removed from being a co-protagonist and made into an enemy and later playable after finishing the game, as additional content, which is a common occurrence in many action videogames. This way the story could be more personal to the protagonist character.

Wanting to add a way to buy items and some sort of partner, the merchant character was introduced into the mix.

Fig. 4 First concept sketch of the main girls

3.2 Game Design Document

This section summarizes the design of the full game. Including concept art, narrative ideas for the story, explanation of its mechanics and designs for possible stages and battles that could take place, with illustrations and animations included.

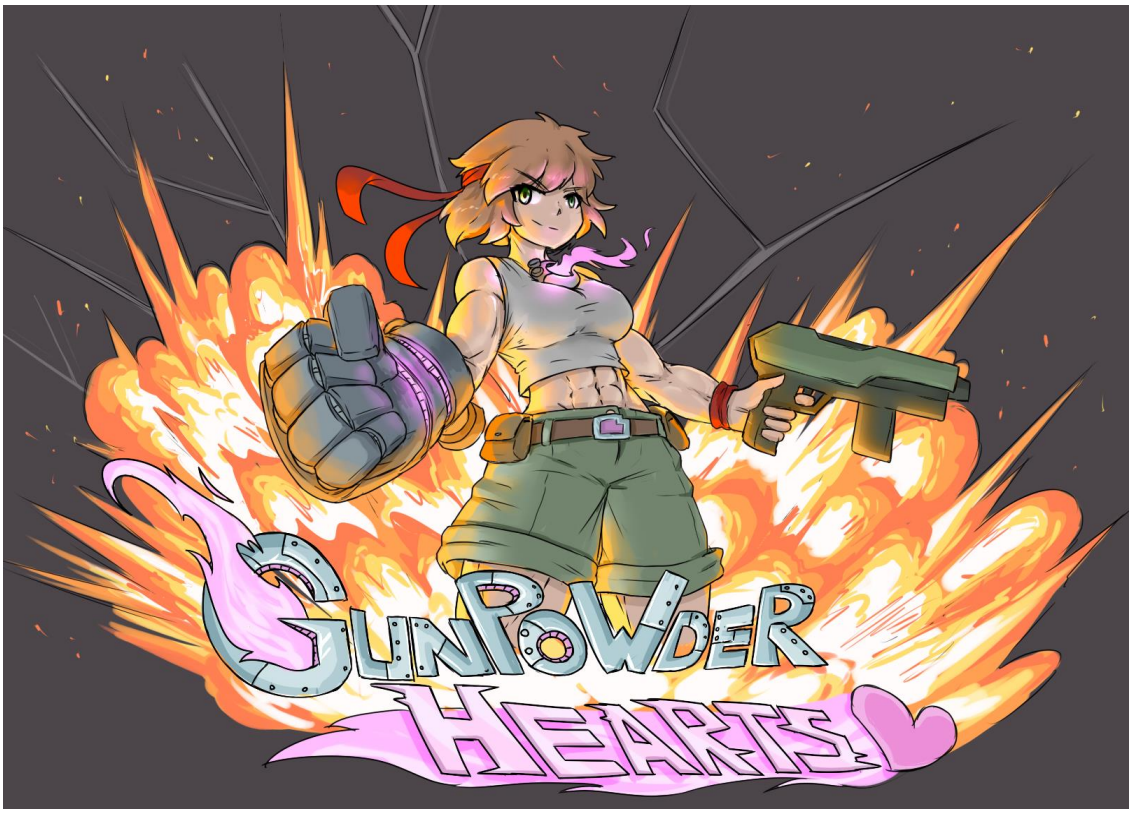


Fig. 5 Cover Art

GDD Structure

In the document there are links to an external website to access the animations, these are also included in the folders for easier access.

The contents it is divided into several parts, covering specific elements of the game. These are composed of a mix of written explanations and illustrations to help visualize them.

Summary

A summary of the basic concept of the game.

Controls

An explanation of how the game is played, the different actions of the player character. Includes art to show the different moves.

Gameplay

The main gameplay mechanics of the game. Objectives, game progression, etc. With art to illustrate some of the elements.

Story

Presents the plot that is to be developed through the game.

Characters

Illustrations and concept art for the main characters, with some brief introductions for each one.

Chapters

Mockup pictures of what some of the stages would look like, with a description of what the gameplay, mechanics and obstacles would be like in each one.

Boss fights

Art of the major enemies at the end of each stage, displaying their special attacks and mechanics, including small animations to show them in motion. Accompanied by a written explanation of each one.

Enemies

Pictures and descriptions of different enemies that would appear in the game.

Items and artifacts

A list of the consumable items and powerup artifacts the player would have access to through the game, with their uses.

Cosmetics and DLC

Additional content, paid expansions like additional characters, stages, alternative player designs, etc.

3.2.1 Summary

Gunpowder Hearts is a fast-paced side-scrolling platforming and shooting action game.

The player controls a mercenary facing hordes of robots and agents commanded by an evil organization through several stages as they try to learn about their plans and what happened before she lost her memory.

They'll be armed with a long-range quick firing gun and a powerful mechanical fist, having to decide, as well as several items and artifacts to choose from, having to adapt to different situations and learn how to deal with each enemy and obstacle.

By performing well and gaining Heat, they'll achieve better power and rewards to progress faster.

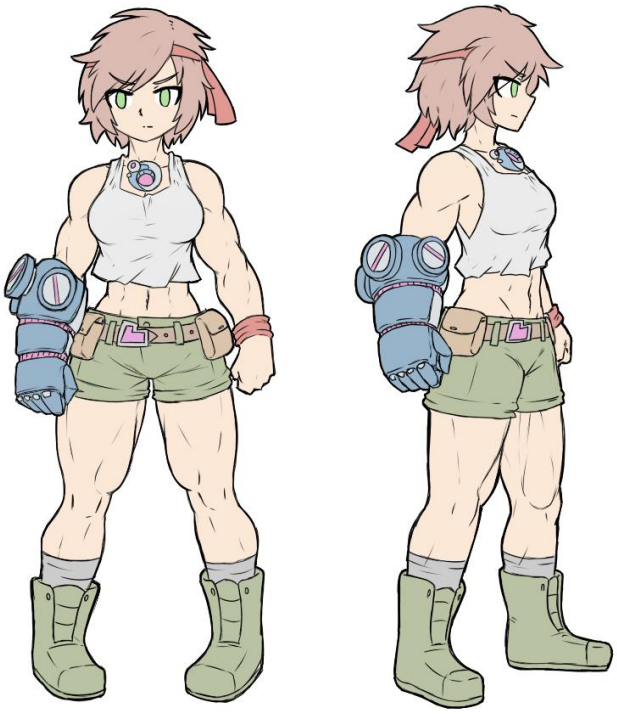


Fig. 6 Player design

3.2.2 Controls

Horizontal movement with left/right keys.

Tap twice to run faster.

Pressing tapping the jump key (z) executes a short hop, pressing it longer lengthens the jump.

It's possible to move sideways and attack in the air.

Used to move around obstacles, dodging hazards and reaching high places.

Press the shot key (x) to use the gun, it will keep firing shots for as long as the key is held. It can be used while moving and jumping, shots can be aimed by looking up or down. This attack will deal rapid light damage to enemies and some breakable obstacles.

Press the strong attack key (c) to launch a powerful punch with the mechanical fist. This is a strong short-range attack that sends the character slightly forward and can greatly damage enemies and obstacles, and can damage usually unbreakable obstacles, as well as be used for things like knocking back or pushing certain objects. Holding the key will charge the punch and launch it once it's held, the more it's held down the stronger it gets until it reaches full power, increasing the damage and giving it a powerful knockback effect, as well as increasing the distance advanced during the punch. The player can't move while charging the fist, but takes reduced damage for a brief moment.

There're two keys assigned to consumable items, which will be used and execute their effects, losing a unit from the amount possessed.

3.2.3 Gameplay

Fig. 7 Player's moves

Animation 1. Players punch Attack: https://imgur.com/a/i4u9qHL

Health

A health bar is displayed that shows the amount of health available, it will be consumed when taking damage, different sources of damage may deal different amounts, if it's emptied the character will die and will have to start from the last save point or from the beginning of the level. It can be restored with certain items.

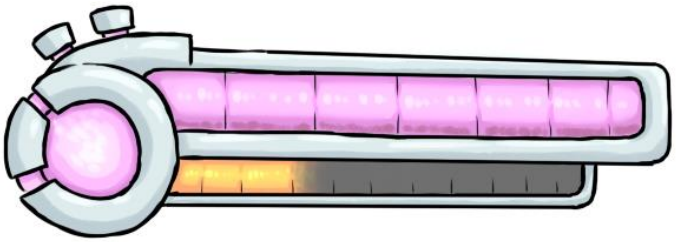


Fig. 8 HuD

Hud, health bar and heat gauge bellow it.

Heat

A meter that charges as the player damages enemies, it will start slowly diminishing after some time without charging passes. When it becomes full, the Burning mode starts, increasing movement speed, damage dealt, Heat gain and other boosts (Punch will move the player forward further and will charge much faster). Burning mode has a limited duration, when it starts the Heat meter will reset and may be charged again, allowing to chain another activation of Burning mode. The Heat meter and Burning time will be lowered when the player takes damage.

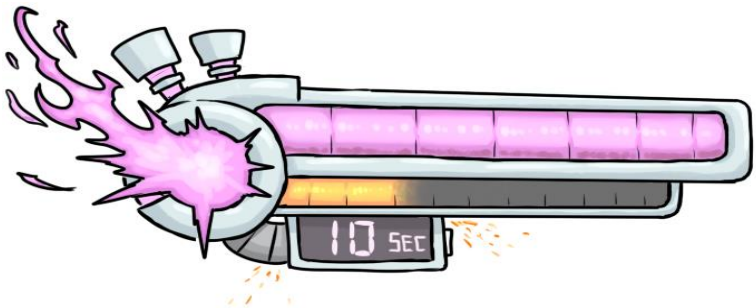


Fig. 9 HuD (Burning)

Animation 2. HuD during Burning mode: https://imgur.com/a/bwSJXpr

Hud during Burning Mode, sparkling and shaking as the timer counts down

Score

After a stage is completed the player will be rewarded for their performance, depending on how long it took to complete the level, how many enemies were defeated, damage taken and time in Burning mode. These points will be translated into currency that can be spent at the shop to buy items and upgrades.

Items and artifacts

The player can carry 2 consumable items with them into stages, these can be bought at the store using score coins. Additionally, they can carry a single artifact that will offer unique advantages.

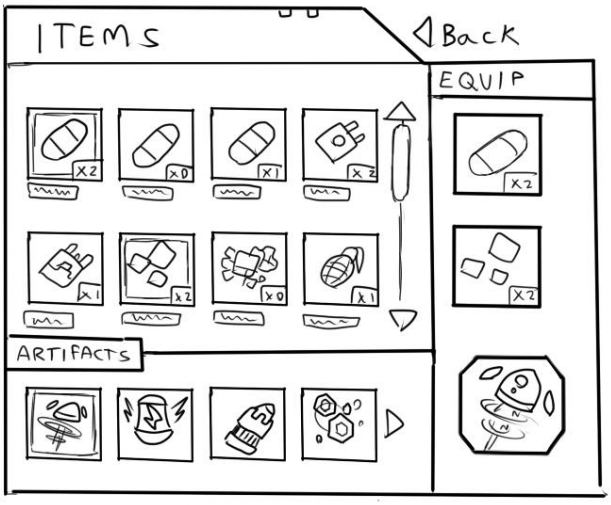


Fig. 10 Items Menu

Game Progression

The game is divided into a series of chapters, each chapter is divided into smaller stages and a boss fight at the end. Between each stage the player may go back to the shop to get new supplies and change their artifact before going to the next one. Once a chapter is completed the player can choose to play it again starting from any of its stages at any time by selecting it from the chapter selection screen.

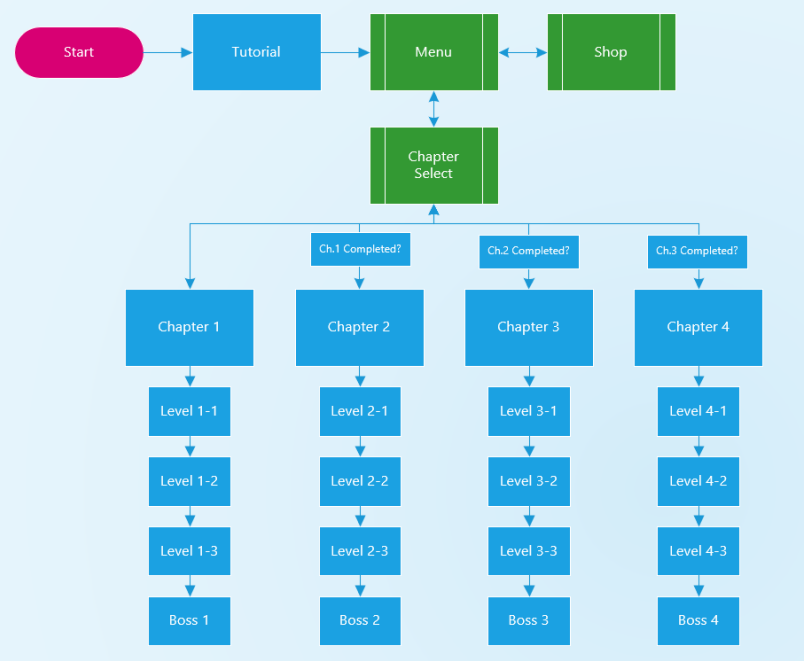


Fig. 11 Gameplay Flowchart

As the player progresses small scenes with dialogue will happen, developing the story as characters show up and interact.

Fig. 12 Shop Screen

In between each level, the player can access the merchant's shop, to spend their score points and buy useful consumable items and unlock artifacts to improve their abilities.

3.2.4 Characters

The hero

A mercenary soldier, tough, brash and brave, always ready for action. A strong and well-trained young woman. She lost her memories during her last mission; only knows she has a job to finish and that someone did something to her. Rather muscular, wears comfortable light clothing and a red headband. Her left arm is covered in a huge mechanical gauntlet, with a pink inner part and large pistons that give it extra power when punching. The device implanted on her chest releases small flames when she pushes herself.

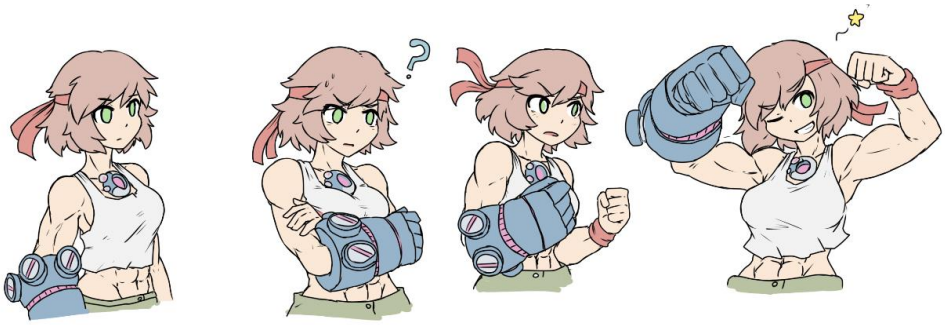


Fig. 13 Protagonist pictures

The merchant

A mysterious woman in charge of a little shop in a van that offered to assist the protagonist. She doesn't talk much about herself but seems to be well informed and always know what's going on, she's really good at tinkering with machines. Usually acts rather smug and coy, but seems to be genuinely want to help.

Fig. 14 Merchant pictures

The evil organization

A group planning on world domination through their advanced weaponry and war machines. The protagonist vaguely remembers being on a mission to stop them.

Among their troops there's many different models of robots, and soldiers augmented with especial technology.

The doctor

A woman working for the organization and their head scientist. Developed a method for augmenting humans through cybernetic implants, tried to modify the protagonist after she was captured on her last mission, but something went wrong.

The leader

A mysterious figure at the head of the organization, commanding from a hideout. His features are hidden and wears an intimidating outfit with a militaristic style. Confident and proud, enjoys gloating a bit too much. His secret weapon, a massive robot is designed similarly to his outfit, a giant skeleton-like robot, with several energy cores over its armor.

Fig. 15 The villain and his war machine

The agent

A soldier girl from an unknown corporation, sent on a mission to track down the protagonist. She's quiet and mature, very efficient and focused on her job, doesn't really express her emotions. Dresses in a warm uniform. Carries a long-range sniper riffle and is supported by a floating claw drone.

3.2.5 Story

A girl wakes up, a mercenary, lost in the middle of nowhere and with foggy memory. She notices a heavy mechanical gauntlet attached to her arm and a warm pulsating engine in her chest, before she can react, she's surrounded by violent attackers, she picks up her gun and gets ready to look for answers.

After dealing with some threats she meets with a woman in a van. She simply identifies herself as a traveling merchant and tells her she spotted some suspicious people setting up a camp nearby. After explaining her situation, she offers to help in exchange for business.

The protagonist goes into the depth of the jungle and finds the campsite, and a giant steel wall blocking her path, with a massive mounted turret machine on it, which she promptly destroys after which the cockpit window breaks and a shadowy figure escapes opening a gate on the wall.

Meeting back with the merchant, she comments that she saw those people driving a few trucks away, and she could take her where they were going if she'd like, mentioning that she's interested in the odd gadgets they are all carrying around and could make some money from them.

They follow their tracks through the desert, finding a hidden underground base, there the protagonist is stopped by a scientist woman, she seems to recognize her, but before she can get any answers the woman dons a robotic suit and fights her. After the battle she confirms that she was the one that modified her after capturing her the last time she went into their base. The protagonist tries to push further but the woman opens an escape route and manages to get away. Checking the computers, some coordinates to a secret tunnel into a facility in the ocean show up, pointing to the next objective.

On their way to locate the base, the merchant tries to get the protagonist to talk a bit about herself, why she was there, who she used to work with, but she doesn't seem to have any memories of that. Meanwhile, she does notice a familiar gun among the items in the merchant's van, but the woman writes it off as just junk she found near where they met.

The subterranean path into the facility is heavily guarded and defended with advanced security systems, being finally stopped by a huge machine protecting the computer room. After dispatching it, she manages to access the computers, finding blueprints about some sort of source of power for a new weapon, after saving it to discuss it, she notices some logs about a past confrontation with an armed group against the organization, there were files with information on several identified soldiers, recognizing her own face among them, and some test logs linked to it, regarding the experiments done and the circumstances of her capture. Apparently, she was part of a small armed group that attempted to infiltrate the organization, they were promptly fought off, and most of the group made an escape leaving her

behind as she was captured. The rest of the information seems to be encrypted, when told about this, the merchant explains she'll try to decipher it, in the meantime, with the data found they discover the location of the organization leader's hideout.

After this, a special option will be unlocked at the shop, a chip with secret locked info, the player will need to achieve high scores on each chapter to be able to unlock it, opening a different ending at the end of the final chapter.

The protagonist reaches the evil organizations headquarters, set under a massive mansion, the place is extremely tricky to traverse and skilled guards and powerful machines patrol the halls. As she fights her way through, she'll rise up floor by floor, facing more powerful opposition, having to face previous major enemies again, another turret cannon, a soldier equipped with the emerald armor, and another guardian droid. Finally reaching the leaders room at the last floor.

The villain will show his surprise at seeing her again, and praise her perseverance in making it all the way to him again. Both start a back and forth, the leader of the organization warns her that their army can't be stopped and it's better to give up and he'll allow her to join his side. Refusing let her quest end now she'll face him in battle, as he summons a massive robotic armor, his secret weapon. After an intense duel that destroys part of the building, the machine and the villain fall defeated, on his last words, he comments that although he did experiment on her, she had already been tampered with when they captured her. The hero leaves with a slightly bittersweet victory, the threat and her mission solved, she goes back to rest and think on her next objective.

If the chip conditions are fulfilled, a cutscene will play before reaching the villain, the merchant explains her findings from the chip. The engine on the hero's chest had been planted before, by the organization that used to lead her, and had apparently sent her on a suicide mission to swiftly deal with the villains, when things went south they abandoned her, and the engine wiped her memories as she was captured…

Conflicted with this new information, she goes to face the villain, but upon reaching him and as he begins his evil speech, he is shot by a sniper and falls to the floor. An agent enters through the window. She's been tracking her, and upon discovering she had found out the truth she was entrusted with finishing the mission and taking her out. A duel ensues between the two, the agent is a skilled and fast gunner, employing many different tricks and traps. Once she's defeated the agent praises the hero on her skill and determination and thanks her for her excellent work, but warns her that their organization won't want to leave loose ends, and others may come. With that, she leaves with her last bits of strength.

The ending is similar, but this time the protagonist leaves more fulfilled and focused, now understanding the situation, and ready to take on what's to come.

...

3.2.6 Chapters

Here I include concept ideas for the different stages, with brief descriptions of the mechanics for each one. Including concept art mockups of what each one may look like and possible layouts that may work as examples or guidelines of how each one would be built.

Chapter 0: Tutorial, Outer jungle

This is a short stage in which the player will be able to get used to the controls, they will be faced with small holes to jump over, breakable wooden walls to shoot through and harder stone walls to punch through, there will also be some weak enemies to defeat. Its set near a jungle.

Chapter 1: Deep jungle

A dark jungle, where a strange organization has been setting up a camp and smuggling strange technology. There's some basic enemy soldiers and floating drones that will shoot at the player, as well as some smaller robots and upgraded versions of these that can attack with a powerful cannon. There're also simple obstacles like breakable barricades, spike traps and holes that need to be avoided.

The stages will start easy but will become more challenging approaching the last ones, when the player reaches a fortified campsite, where they'll have to face many more enemies.

The boss of this chapter is The Turret.

Fig. 16 Jungle Stage

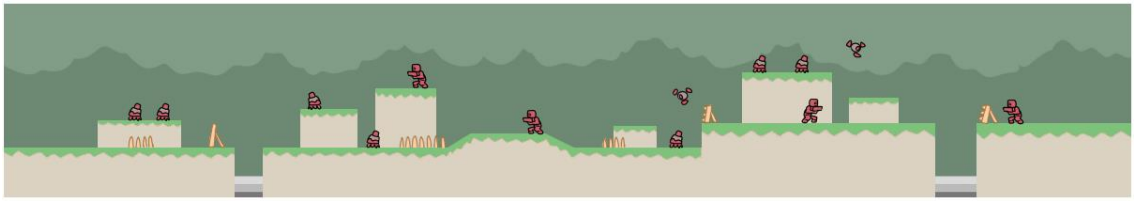


Fig. 17 Jungle Layout

Chapter 2: Desert route

A large desert near the jungle, the terrain is irregular, with slippery slopes and pitfalls, there's several splitting paths, with hills and caves going under them, at times it will be necessary to traverse one and backtrack to open the path through the other, activating mechanisms to open gates. The caves and underground parts have a more technological appearance, with modern defense systems guarding them.

Enemies will pop out of the sand for surprise attacks, and big hordes of small weak enemies are common. There will be many environmental hazards, like stone spikes or rolling rocks. Near the end of the level, going into a cave, the player will find a hidden lab with several screens and computers in the last room. The boss of this chapter is Doctor Emerald.

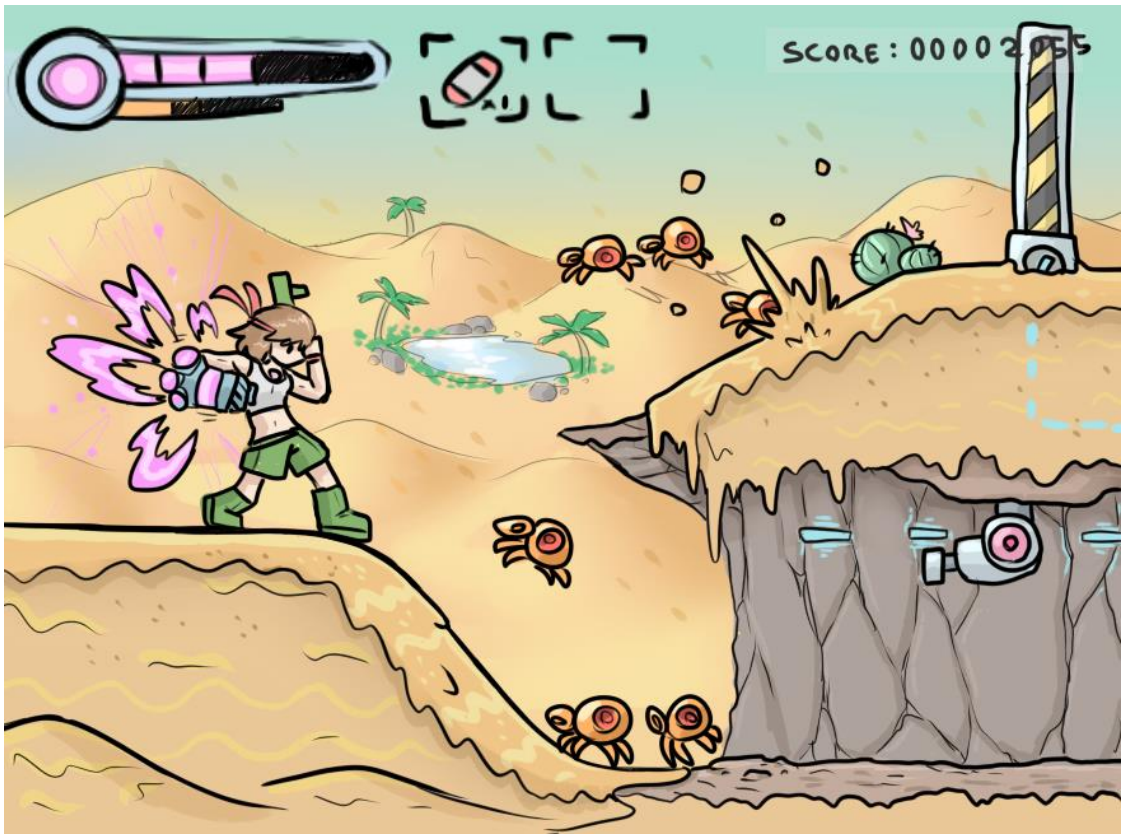


Fig. 18 Desert Stage

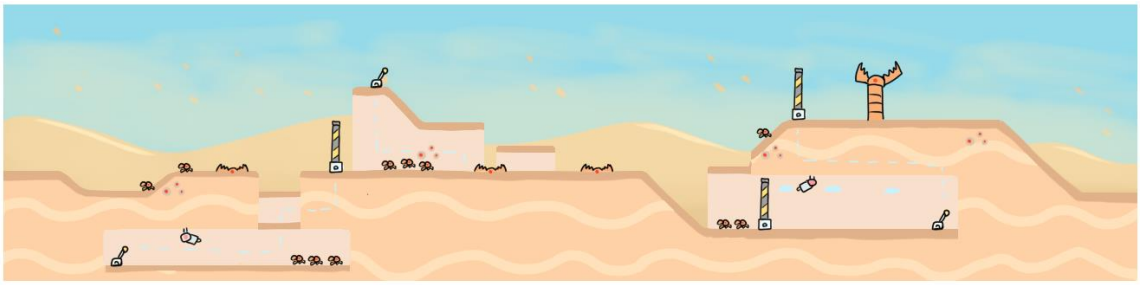


Fig. 19 Desert Layout

Chapter 3: Ocean facility

A modern underground tunnel that leads into a facility hidden under the ocean, the stages will take place traversing passageways leading into the base, with the deep ocean visible through the windows. There will be mechanics dealing with pushing blocks using the fist attack to make progress, water spouts that will launch the player up and may be used to reach higher places or maneuvered around to not get displaced, gaps that will require the player to dash with the fist to get through…

These puzzles will be slowly introduced in the first stages, and made more complex in the later ones, introducing more threats into them. Enemies will use shields to stop bullets from the front, but may be dealt with from behind or with the fist.

Others will use homing attacks that explode on contact and have to be shot, while others will launch themselves as projectiles and may be redirected with a punch to deal with obstacles and enemies, or to hit out of reach buttons.

For example, the player may need to redirect a comet drone so that it hits a far away button, to activate a water spout that will propel them in the air, and then use their punch attack to dash forward to reach a high and far away platform.

The boss of this chapter is the Guardian Droid.

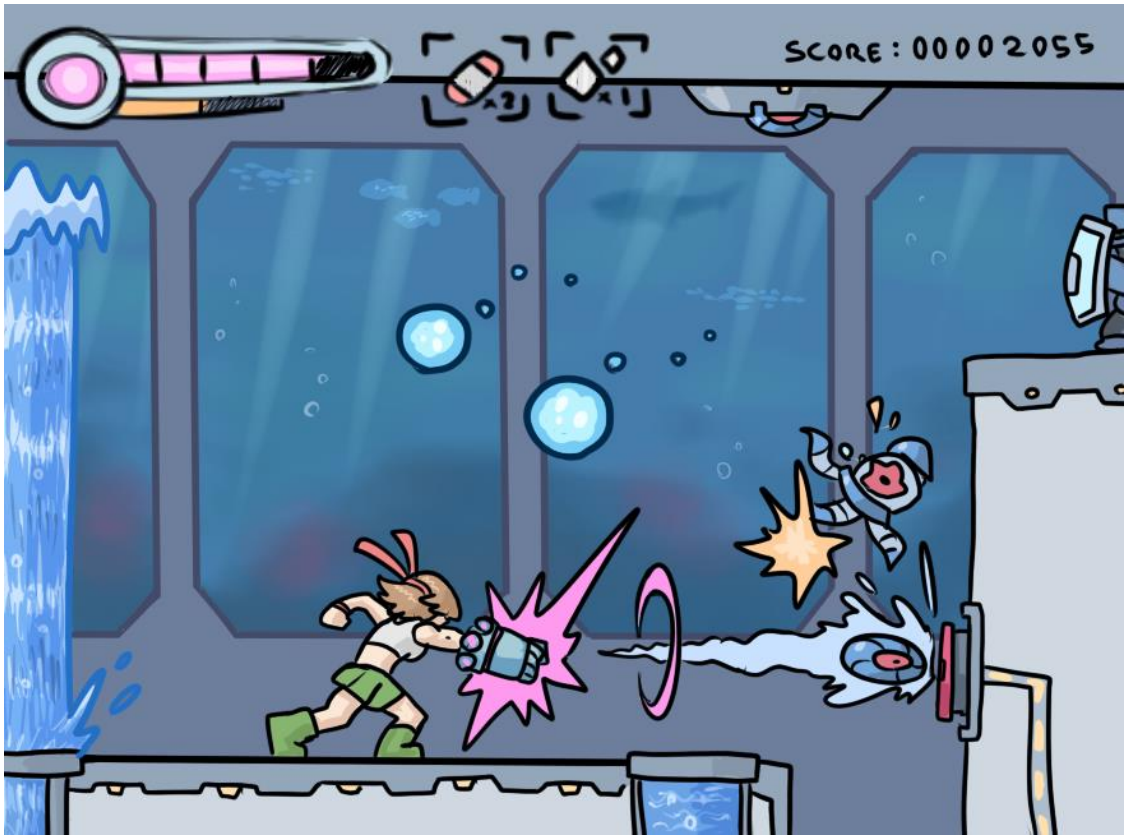


Fig. 20 Facility Stage

Fig. 21 Facility Layout

3.2.7 Boss fights

At the end of a chapter, the last stage will consist of one powerful enemy battle, they'll use different attacks that the player will have to learn how to deal with, usually involving the environment or needing quick reflexes.

Boss 1: The Turret

The area is a flat zone with some higher platforms in the middle, to the right there's the giant wall with the turret. The boss will move vertically along the wall to aim at the player, it has 3 different moves. It will stop it's movement and start charging its laser, signaling an horizontal area in front of it before firing a large and powerful beam that should be avoided. It may periodically shoot 3 small bullets. It may also have its cockpit glow red, before releasing a shockwave that will push the player away and form an energy wall that will protect the turret while it continues attacking, this wall can be broken with fist attacks.

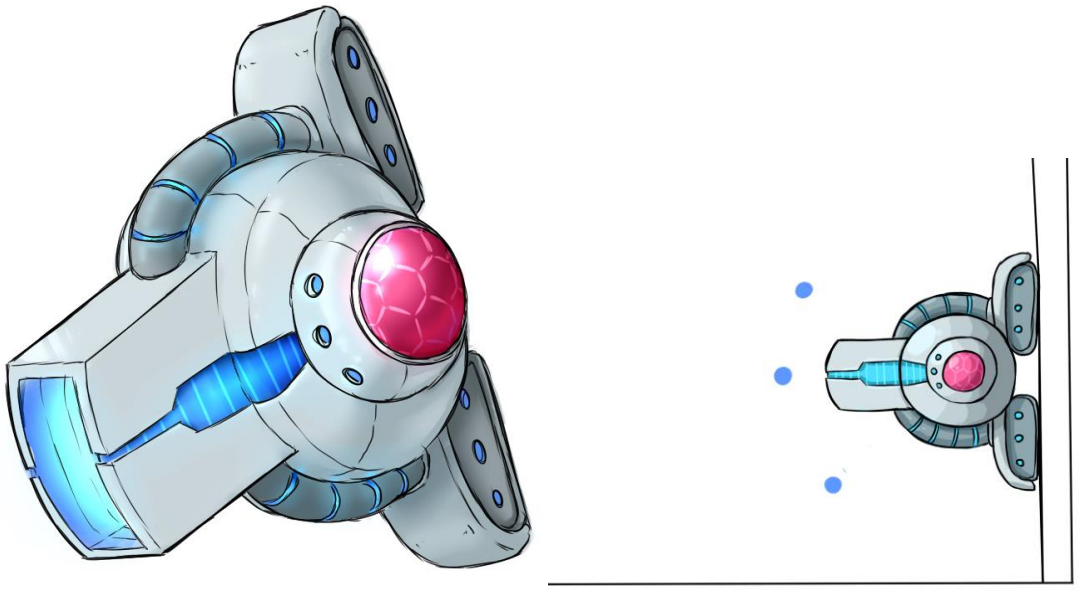
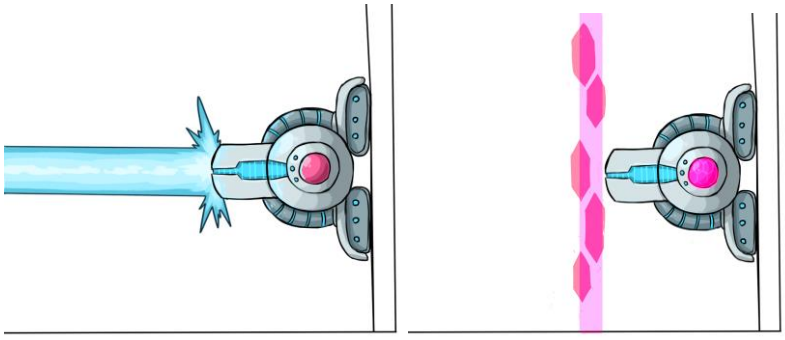


Fig. 22 Turret Boss - illustration and attacks

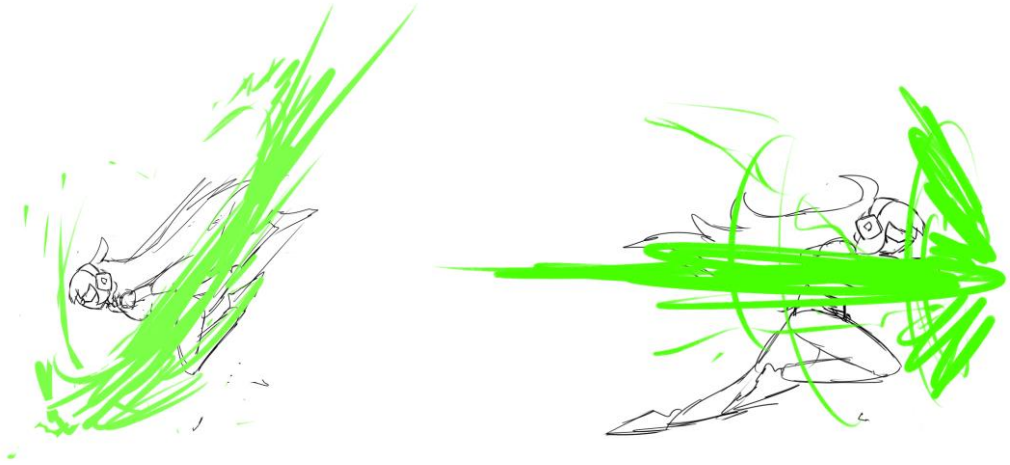


Animation 3. Turret Boss attack: https://imgur.com/a/1akdxT1

Boss 2: Doctor Emerald

The area is simple, a square locked room, the doctor is very agile and will try to catch the player and slash them with her energy blades. At times she'll signal a patch around the room, before dashing at high speed. She can execute attacks in big areas by extending a long blade before dashing or attacking, the player will need to reposition accordingly. She will often teleport before attacking quickly, keeping the player on their toes. At points she'll charge a powerful attack that can't be avoided, dashing towards the player with her blades, a well-timed punch can counter this. She'll signal this attack by preparing a similar charge to the player's fist attack.

Fig. 23 Doctor Boss - Transformation and attacks



Animation 4. Doctor Boss attacks: https://imgur.com/a/WG7WbZv

Boss 3: Guardian Droid

This area has several switches on the walls, which will make the ground platform rise or lower when hit, which should be used to avoid the machine's attacks or to reach it.

The giant droid will move around the room, launching powerful wide laser attacks that at times will require the platform to be moved to avoid them.

The droid will spawn little satellites through the fight that will float around it, taking hits for it and shooting at the player, dealing with them before there are too many will make the fight easier. The droid may also launch a bomb that will explode into a cross shape, it is possible to push it with the fist so that the explosion hits the droid, knocking it done and leaving it open for a lot of damage.

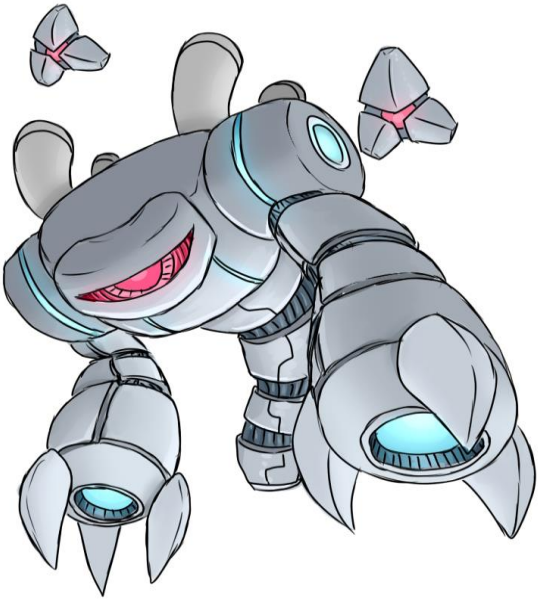
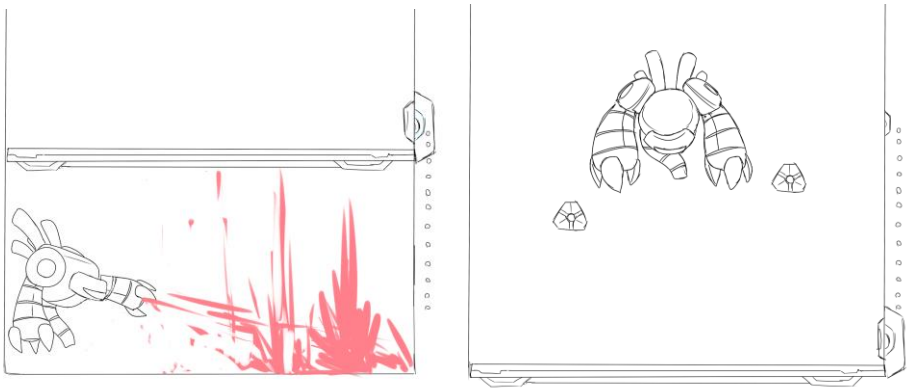


Fig. 24 Droid Boss – Illustration and attacks



Animation 5. Droid Boss attacks: https://imgur.com/a/wg0W7k3

3.2.8 Enemies

The stages that the player will have to traverse will be filled with smaller adversaries, each chapter with different kinds of them, getting stronger and trickier to deal with as the game progresses. While they'll start out simple, later on they'll employ ambush tactics or powerful defenses and abilities to block their progress.

Walker

Weak sentry robot that simply walks around slowly and aimlessly. May alert nearby enemies to come closer or call for reinforcements if approached.

Fig. 25 Walker

Hired Soldier

Grunt agents from an evil organization, armed and ready, but not very skilled. Will shoot on sight, but their weapons and armor aren't too strong.

Fig. 26 Hired Soldier

Drone

Flying robots that will try to shoot from above, tricky to shoot, but not too fast, very fragile.

Fig. 27 Drone

Tank Walker

Walker with a mounted gun, slightly stronger, can shoot from a distance for high damage.

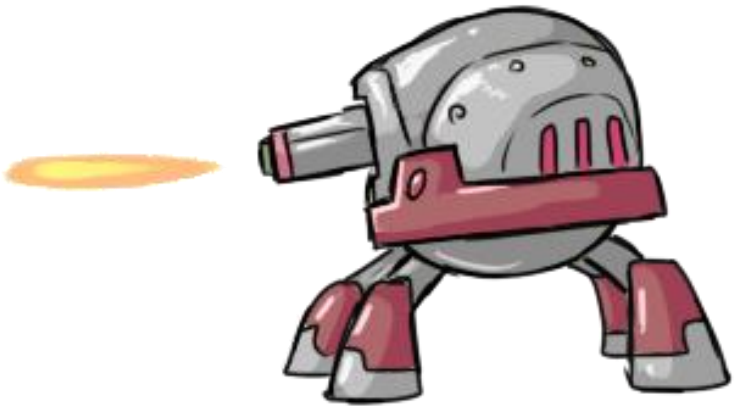


Fig. 28 Tank Walker

Sandworm

Huge worm-like machine that hides underground, ready to attack when someone approaches. Its huge maws can be seen on the surface.

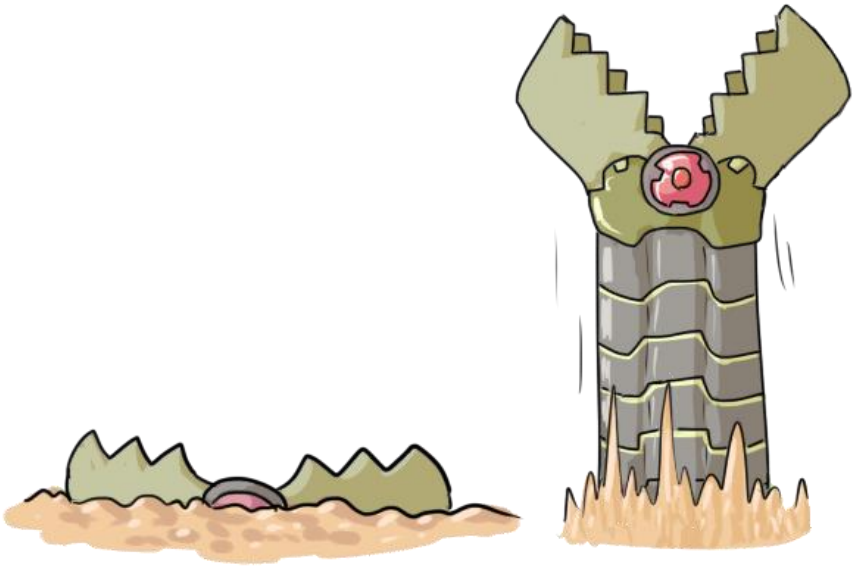


Fig. 29 Sandworm

Swarmers

Tiny robots that use ambush tactics to attack, they'll pop from underground in great numbers, and jump around to attack. Because of their size, straight shots will go over them when they are on the ground.

Fig. 30 Swarmers

Shielded Soldier

Mercenary equipped with advanced armor and defensive technology, very slow but won't take any damage from normal weapons and may attempt to use their shield to deal damage. Vulnerable to powerful attacks or from behind.

Fig. 31 Shielded Soldier

Squid drone

Floating drone in the shape of a squid, can generate energy bubbles that slowly move towards its target, these will soak any shots they take, shrinking slightly when they do until they disappear, they deal high damage on contact and explode if hit with a punch attack.

Fig. 32 Squid Drone

Comet drone

Orb-shaped drone that will float in place until a target comes into range, it will then wind-up and shoot itself like a cannonball. Can be redirected with a well-timed punch to hit enemies or destroy objectives, often needed to solve certain puzzles, like hitting unreachable buttons or breaking special walls. Very durable, usually comes with a respawner machine if one is destroyed.

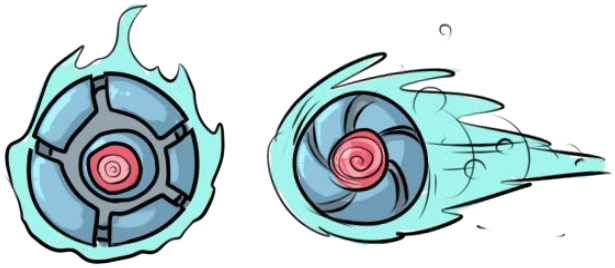


Fig. 33 Comet Drone

3.2.9 Items

To help them deal with these and other obstacles, the player will be able to buy different items at the shop. Healing items, defense boosters, energy increase, etc. As well as unique artifacts that will offer special abilities and advantages, slightly changing the basic gameplay.

Consumables

These items can be bought at the shop before entering a stage using the coins gained from the score. And used in stages for various uses, when one is activated it's used up and lost. The player can take 2 different items with them, and can carry several units of each one. The items are shown on one 2 boxes on top of the screen, by their health bar.

Health Vial

Restores 20% health.

Fig. 34 Health Vial

Concentrated Vial

Restores 50% health, slightly more expensive.

Fig. 35 Concentrated Vial

Ionized Vial

Restores health over time, 10%/s for 10 seconds.

Fig. 36 Ionized Vial

Small Battery

Charges 20% Heat.

Fig. 37 Small Battery

Plasma Battery

Charges 60% Heat.

Fig. 38 Plasma Battery

Light insulator

Prevents heat loss and stops the Burning mode duration timer for 5 seconds.

Fig. 39 Plasma insulator

Reforged insulator

Prevents heat loss and stops the Burning mode duration timer for 15 seconds.

Fig. 40 Reforged insulator

Basic grenade

Thrown a short distance, causes a small explosion on impact that deals decent damage to enemies and obstacles.

Fig. 41 Basic grenade

When used, the player can hold the item button to charge the throw up to 3 levels, increasing the distance and height. The grenade will be thrown in an arc and explode once it hits ground, an obstacle or an enemy.

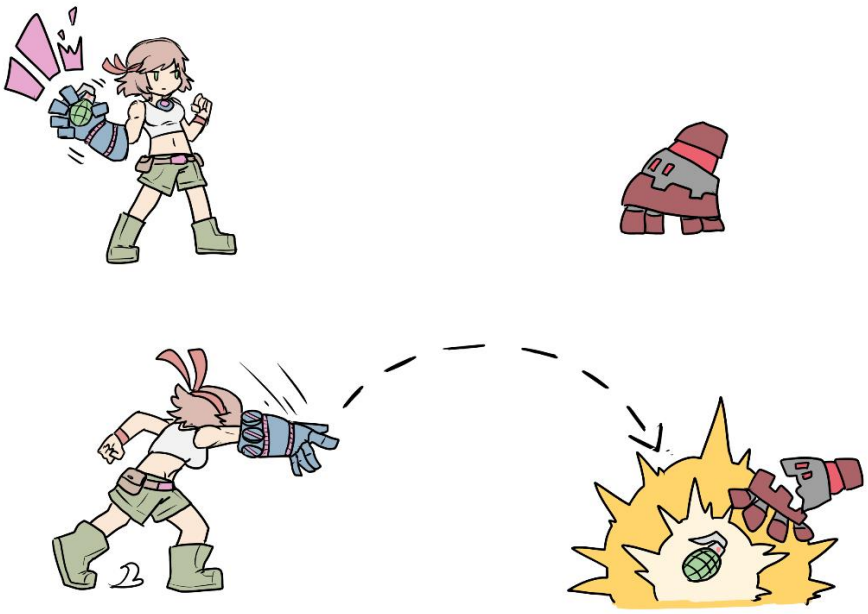


Fig. 42 Grenade throwing example

Volatile grenade

Thrown a longer distance, causes a much bigger explosion and shoots damaging particles on impact, deals huge damage.

Fig. 43 Volatile grenade explosion

Energized capsule

Increases movement speed for 5 seconds.

Fig. 44 Energized capsule

Explosive ammo

For 5 seconds, gunshots create a small explosion on impact that deals extra damage.

Fig. 45 Explosive ammo

3.2.10 Artifacts

These are special items that provide a passive upgrade, which allows for specific advantages, allowing for different strategies and playstyles, only one can be taken into a level. They can be unlocked by purchasing them at the shop at a high price.

Propulsion system

Increases movement speed slightly and allows a much slower fall if the jump button is held in the air.

Fig. 46 Artifact – Propulsion System

Experimental reactor

Randomly, every few seconds, creates a small radiation area around the player that deals damage to enemies and grants a small amount of heat.

Fig. 47 Artifact - Experimental reactor

Ballistic amplifier

Increases gun damage and allows shots to go through enemies.

Fig. 48 Artifact – Ballistic amplifier

Luminic barrier

Reduces damage taken slightly and prevents heat from being lost from it.

Fig. 49 Artifact – Luminic barrier

Prototype core

Increases damage taken considerably, doubles heat gain and score rewards.

Fig. 50 Artifact – Prototype core

3.2.11 Cosmetics and DLC

Past the basic content, there'd also be additional things to unlock, either through an achievement system (like completing the game under a certain amount of time), ingame purchases at the shop or through paid dlc transactions and expansion packs. These would include simple cosmetic changes like recolors for the player on the easier to acquire side. And more detailed skins that change the player's outfit and aesthetic, which may be obtained through micro transactions.

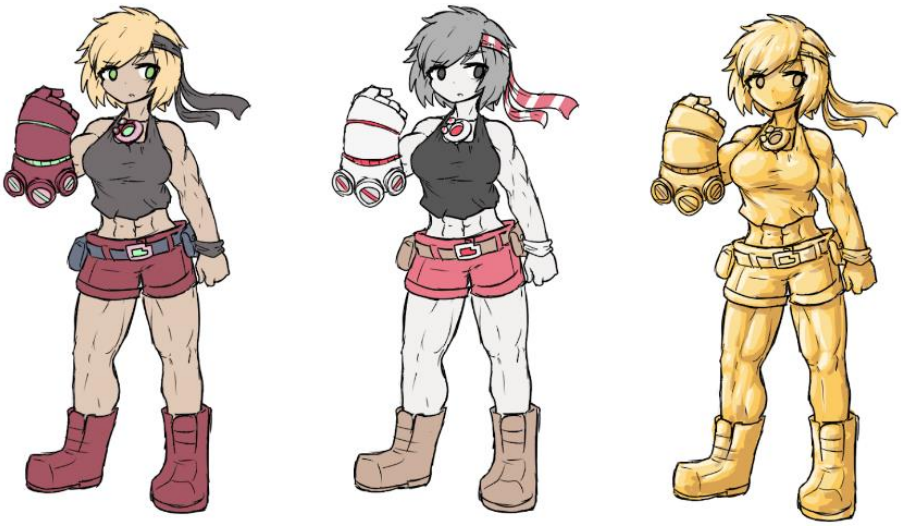


Fig. 51 Basic recolor Concepts

Fig. 52 Halloween Skin Concept

Fig. 53 Halloween Skin Attack

There could also eventually be expansion packs, which could be bought to add a new playable character to the game, with her own short side story and quest. This character, the agent, would have similar controls to the original protagonist but play slightly differently. This one would aim for a more measured and tactical approach to her playstyle instead of just "punching through", she'd take powerful long-range shots and quickly attack nearby enemies with her sentry drone as a last resort.

As the true final battle during the main storyline, her side of the game would take her through the last stage of the game on an alternate path adapted to her gameplay, ending on a fight with the pervious protagonist as a boss.

Fig. 54 The agent's moves

Fig. 55 The Agent

3.3 Results

Although some elements couldn't be delved into as in depth as I may have liked, I believe all the main elements and objectives have been dealt with. There's illustrations and written explanations for all the elements that were planned to be included. Concept art, interface elements, some animations, ingame mockups and examples, explanations of gameplay mechanics and controls, an overview of the story, etc.

CHAPTER 4

Game Analysis and Design

Contents

In this chapter I will go over the design and implementation of the game I coded for this project. Going over the different requirements and goals set for it and how the different functions work.

4.1 Requirement Analysis

The requirements of this work include developing a game that fits that which was described in the GDD part of the project as much as possible, it should be playable and properly illustrate the main mechanics.

These tables summarize the different parts that would be required for the main elements of the project.

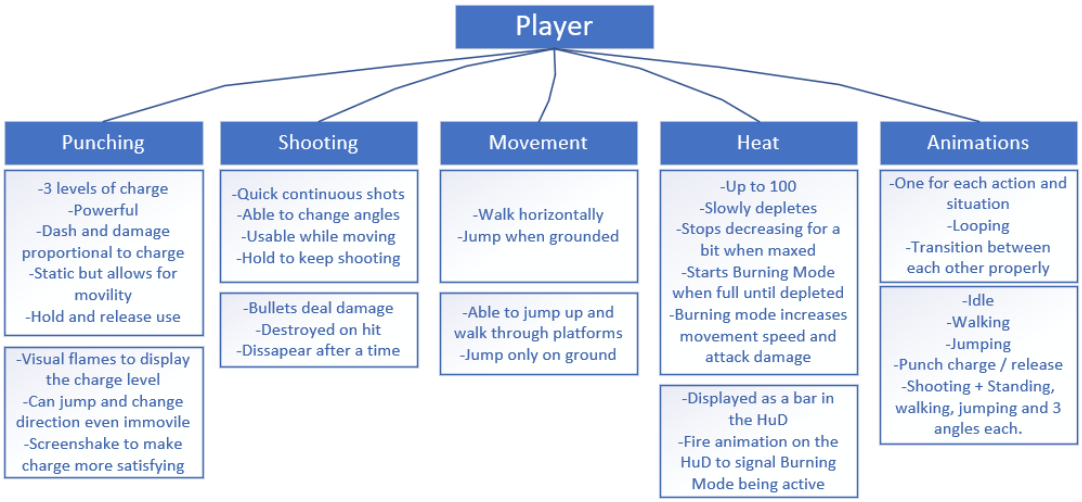


Fig. 56 Player Requirements Table

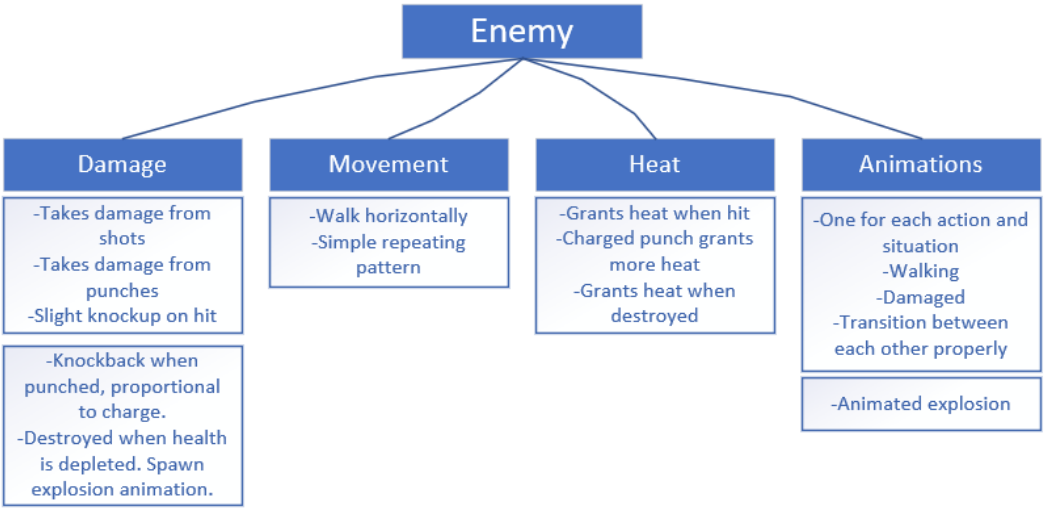


Fig. 57 Enemy Requirements Table

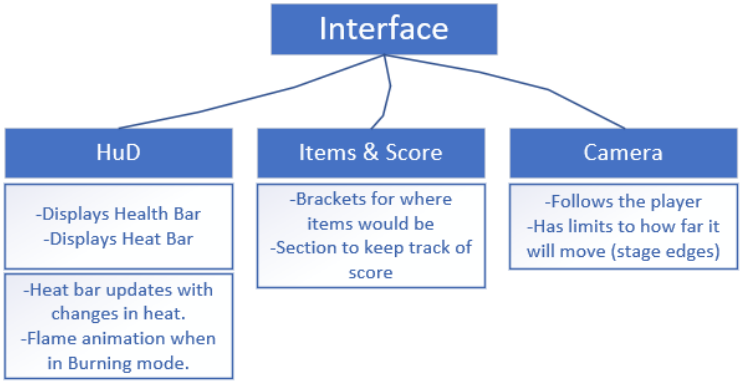


Fig. 58 Interface Requirements Table

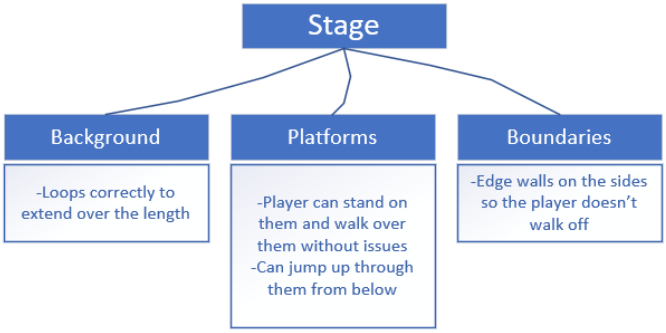


Fig. 59 Stage Requirements Table

4.1.1 Functional requirements and Implementation

The game needs to be able to play as an executable on any computer. The key inputs have to properly execute the related moves without mixing up or interrupting each other, animations should happen accordingly to the related action. In general, should be able to perform the mechanics explained in the concept document.

The player needs to be able to move sideways with the directional keys. When the opposite direction is inputted, the player sprite is flipped into the opposite direction.

Pressing z should make the player jump and then fall due to gravity, landing on the floor again, should be able to jump into platforms. When touching the floor, a "grounded" variable is checked, allowing to change the animations for standing and jumping, and allowing or disallowing the jump at all. Jumping can only be done from the ground.

Fig. 60 Ingame Player Movement

Animation 6. Movement animation: https://imgur.com/a/qaKIkkr

The x key has to execute the shooting action, shooting bullets quickly with a brief pause between each as long as the key is pressed. Holding up and down has to change the shooting angle accordingly. The character's sprite should reflect these different aiming positions, as well as when the character is also moving or jumping. While the key is held, a bullet is instantiated and given a series of attributes regarding its angle, power and speed. For as long as the key is held bullets keep being spawned, with a brief cooldown in between them. Also, when changing angles, the change is done progressively from the current one to the new one, making bullets shoot in an arc until the angle is reached.

Fig. 61 Ingame Player Shooting

Animation 7. Shooting animation: https://imgur.com/a/SRI2LWJ

The player needs to be able to punch, holding the c key to charge, having some visual way of knowing how much charge has been accumulated, and then throw the punch by releasing it, moving forward a proportional distance to the charge.

Punching is divided into 2 parts: First, while the key is held, the player enters the charging state, starting a countdown, when its completed, a level of charge is gained and the countdown starts again. This repeats up to 3 levels of charge. Every time a level is gained, a flame visual is shown to better display the charge accumulated. I added a slight camera shake that increases which the charge level to make this more dynamic looking. While charging, the player can't move or shoot, but can jump and change direction.

Then, when the key is released, the player enters a punching state, this starts a brief cooldown timer in which they can't punch again, with a duration proportional to the duration of the punch. The punch is executed, instantiating a damaging collider object, (which is created by modifying the normal shot code), this punch is assigned power according to the charge level, along this, the player dashes forward in the direction they are facing, a proportional distance to the charge level, after this is completed, the instantiated damage collider object disappears, and the charge is reset.

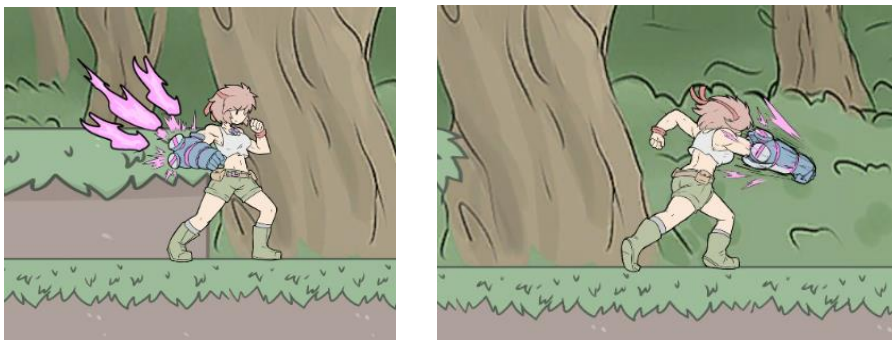


Fig. 62 Ingame Player Punch

Animation 8. Punching animation: https://imgur.com/a/QLrfqts

There should at least be some enemy to test interactions for shooting and punching, with damage animations, and reactions to being hit, damaged animation, being knocked back, dying after enough damage.

The enemy moves around side to side, with a walking animation. When hit by a damaging attack, either a shot or a punch, it takes the damage set on the attack, (bullets disappear on impact) and does a brief hurt animation. It also gets slightly knocked up with each attack, to give it more of an impact feel. Punches will knock it back according to the power of the punch, from no distance to off the screen at max power. When its health is depleted, it instantiates an explosion animation and disappears.

Fig. 63 Ingame Enemy Walker

Animation 9. Punching enemies animation: https://imgur.com/a/ONr4ekX

When dealing damage to an enemy or defeating one, the player has to charge a Heat Gauge, which slowly depletes. When it's filled, it will activate Burning mode, displaying an animation on the Hud to show this, and giving the player more shot damage and movement speed as long as the heat gauge doesn't deplete completely.

Every bullet shot on an enemy gives a small amount of heat, and punches give heat according to the charge, defeating an enemy gives a large amount of additional heat. An orange bar on the Hud extends or shrinks depending on the heat charge. Whenever its above 0, it slowly depletes down. When it fills at 100 heat, it starts the Burning mode state on the player. The Hud gets a flaming animation to illustrate this, and the player gains increased movement speed and their bullets deal higher damage. When burning mode starts, a brief cooldown timer begins, during which the heat gauge won't go down, after its over, it will start depleting faster than normal, but can still be kept up by attacking enemies. Once it finally depletes completely the Burning state will end.

Fig. 64 Ingame Hud and Burning Hud

Animation 10. Heat and Burning animation: https://imgur.com/a/quVXnxa

As the player moves through the stage, a camera has to follow them properly. The camera is set to follow the player, and a set of horizontal and vertical boundaries are stablished, so that if a limit is reached, the camera will stop moving further, getting too close to the side ends of the stage or going too high up. Also included a function which allows for camera shakes effects of different intensities and durations when called, which are used mostly during the punch charge and punch launch actions for the player.

The player interface is implemented through a canvas overlay over the screen, currently most of it is only decorative as most of its functions haven't been implemented, but it works as a visual mockup of what it should look like. The heat bar works as I described, and the Hud animates when burning mode becomes active.

As a last detail, I added a title screen that leads into the game itself.

4.2 Function's Codes

Here I will add some brief screenshots of examples of the code used to implement some of the functions for the work, with explanations of the processes. In particular the shooting and punching functions.

4.2.1 The Shooting Function

A part of the shooting function, bullets are coded so that their different attributes, direction, speed, starting position, power, etc. can be easily modified through conditions.

```
if(Input.GetKey(KeyCode.X) && !FistCharging){
    animator.SetBool("Shooting",true);
    if(shotReady){

        shotReady=false;
        shotTime=shotTimeSet/10;

        var Bullet = Instantiate(bullet,transform.position, Quaternion.identity);

        if(Input.GetKey(KeyCode.UpArrow)){
            animator.SetInteger("ShootState",1);
            if(shotAngle<25){
                shotAngle+=6;
                shotHeight+=0.3f;
                if(shotAngle>=25){
                    shotAngle=25;
                    shotHeight=2f;
                }
            }

        }
        else if(Input.GetKey(KeyCode.DownArrow)){
            animator.SetInteger("ShootState",2);
            if(shotAngle>-25){
                shotAngle-=6;
                shotHeight-=0.3f;
                if(shotAngle<=-25){
                    shotAngle=-25;
                    shotHeight=-0.14f;
                }
            }
        }
        else{
            animator.SetInteger("ShootState",0);
            if(shotAngle>0){
                shotAngle-=6;
                shotHeight-=0.3f;
                if(shotAngle<=0){
```

```
            if(shotAngle>0){
                shotAngle-=6;
                shotHeight-=0.3f;
                if(shotAngle<=0){
                    shotAngle=0;
                    shotHeight=0.95f;
                }
            }
            else
            if(shotAngle<0){
                shotAngle+=6;
                shotHeight+=0.3f;
                if(shotAngle>=0){
                    shotAngle=0;
                    shotHeight=0.95f;
                }
            }
            else{
                shotHeight=0.95f;
                shotAngle=0;
            }
        }
        Bullet.transform.position += transform.up*shotHeight;
        if(facingRight)
        Bullet.transform.position += transform.right*2f;
        else
        Bullet.transform.position -= transform.right*2f;

        Bullet.GetComponent<ShotScript>().angle=shotAngle;
        Bullet.GetComponent<ShotScript>().speed=shotSpeed;
        Bullet.GetComponent<ShotScript>().time=1;
        Bullet.GetComponent<ShotScript>().facingRight=facingRight;
        Bullet.GetComponent<ShotScript>().damage=shotDamage;
    }
}
else{
```

Fig. 65 Shooting function code

4.2.2 The Punching Function

When the player holds down the key, a timer starts, to build up the different levels of charge. When the key is released, a collider for the punch is instantiated, and it's given attributes similarly to the bullets of the gun, using the same script. The two are differentiated through tags in the objects, so that enemies and obstacles can react differently to each one, while making coding them fairly simple.

The punch is given a force depending on the level, which will increase the damage it deals as well as the knockback it inflicts on the enemy hit. While the punch is charging, a camera shake function is called to the main camera, which grows in intensity as the punch force increases. After the punch is released, there is a very brief cooldown, matching the time needed to actually execute the punch and forward movement that goes with it.

```
if(Input.GetKey(KeyCode.C) && !punchout){

    if(FistCharge<3){
        chargeTime-=Time.deltaTime;

        if(chargeTime<=0){
            FistCharge+=1;
            chargeTime=chargeTimeTop;

        }
    }
    GameObject.FindGameObjectWithTag("MainCamera").GetComponent<CameraScript>().TriggerShake(0.1f, 0.01f*(FistCharge+0.001f));
    animator.SetBool("PunchCharging",true);
    FistCharging=true;
}
if(Input.GetKeyUp(KeyCode.C)){
        PunchAOE = Instantiate(PunchAoe,transform.position, Quaternion.identity);
        PunchAOE.transform.parent = gameObject.transform;
        if(facingRight)
            PunchAOE.transform.position += transform.right*2f;
        else
            PunchAOE.transform.position -= transform.right*2f;
        PunchAOE.GetComponent<ShotScript>().damage = 20*FistCharge+20;
        PunchAOE.GetComponent<ShotScript>().force = FistCharge;
        PunchAOE.GetComponent<ShotScript>().facingRight = facingRight;
        FistCharging=false;

        animator.SetBool("PunchCharging",false);
        animator.SetBool("PunchLaunch",true);
        punchpause=0.2f+0.02f*FistCharge;
        punchout=true;
}
```

```
if(punchout){
    punchpause-=Time.deltaTime;
    if(facingRight)
    rb.MovePosition(transform.position + transform.right * Time.fixedDeltaTime*FistCharge*9);
    else
    rb.MovePosition(transform.position - transform.right * Time.fixedDeltaTime*FistCharge*9);
    if(punchpause<=0){
        Destroy(PunchAOE);
        animator.SetBool("PunchLaunch",false);
        FistCharge=0;
        punchout=false;
    }
```

Fig. 66 Punching function code

4.3 Interface Design

The HUD interface is located on the upper part of the screen.

At the top left there's a graphic that displays the player's health and heat gauge, and will animate when the player reaches full heat.

To the right of it, two boxes hold the consumable items that may be used if any are available. And at the top right the score is shown.

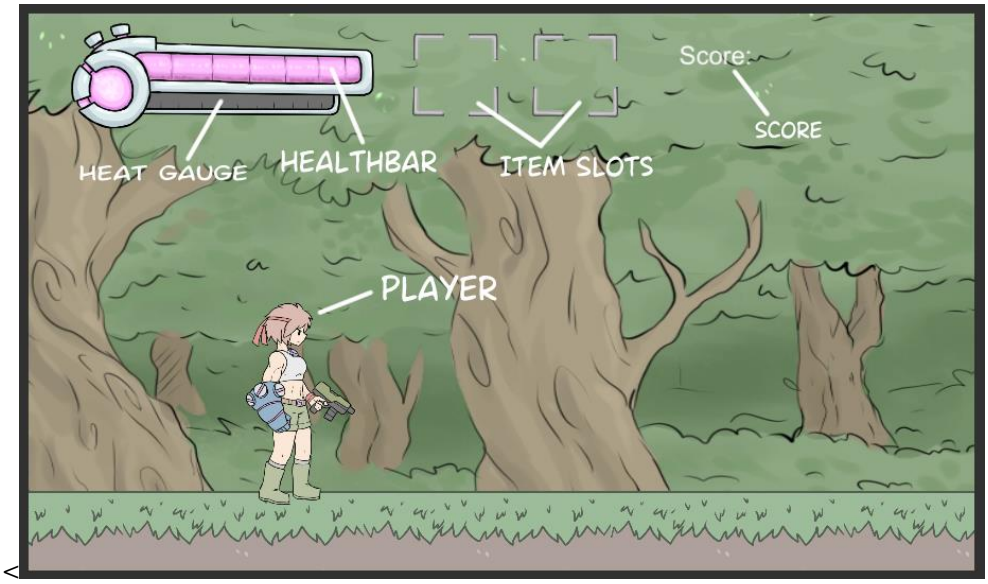


Fig. 67 Interface Design

4.4 Results

I believe it has been rather successful regarding the initial goals.

The game performs properly, the character controls as expected and can do all the basic actions that were required.

Shooting works and looks and feels nice and natural, all the steps of the punching attack execute as they should and feel satisfying, from the weak hit to the powerful fully charged attack, launching the character forward and knocking enemies away, as well as allowing for aerial movement to cross gaps between platforms. Platforming

works fine, the player can jump through platforms and doesn't get blocked or move in strange ways. The heat mechanic works properly as expected, hits charge it up, Burning mode triggers as it should and goes away when it's supposed to.

There's some mechanics I could have added like the scoring system, which would simply increase the counter for each enemy defeated. Or some consumable item, which would show up on the brackets and be used with another key.

I also didn't get to implement damage to the player, but implementing it would be much the same as how the heat bar was implemented.

The level itself is merely a small area to play around and show off the gameplay mechanics, not so much a proper stage, but I feel like it serves its purpose for this work.

There don't seem to be any bugs and from this base it's in a state from which I believe it could be extended into a larger project.

CHAPTER 5

Conclusions and Future Work

Contents

In this chapter, the conclusions of the work, as well as its future extensions are shown.

5.1 Conclusions

The development of this project has been possible for me based on the knowledge and experience that I have acquired during training in this degree.

With this work, I have acquired the feeling of being able to work in professional environments, mainly in the artistic and narrative field, where I think I can better develop my abilities.

Being able to put my programming knowledge into practice and seeing the results work properly has been really exciting and fun.

In summary, this project has given me experience and security, being of course aware of everything I have left to learn, but with the peace of mind of having a good base.

5.2 Future work

After having worked on this project for some time, I would like to take everything I've learned and the ideas I've implemented and put them all together into actually developing a full game, either using the concepts already stablished or adapting them slightly into different ideas.

5.2.1 Resources

To complete the execution of the entire project, it will take around a full year of work including the time already spent in obtaining the objectives of the current project presented in this document.

An estimated schedule of about 4 months will be necessary for programming and the generation of art in more detail than the current one, may require up to 5 additional months to those already employed. Additionally, time would have to be allocated to procure sound effects and music.

It will also require tools for its development, in this case, Unity seems like the best choice.

It would be convenient and would accelerate the process to get together with a small team of people specialized in the different tasks to be performed to help with programming, sound assets and scriptwriting, etc.

5.2.2 Future work Gantt

The following charts show a possible Gantt schedule based on an analysis of the tasks performed and those that left to complete the work.

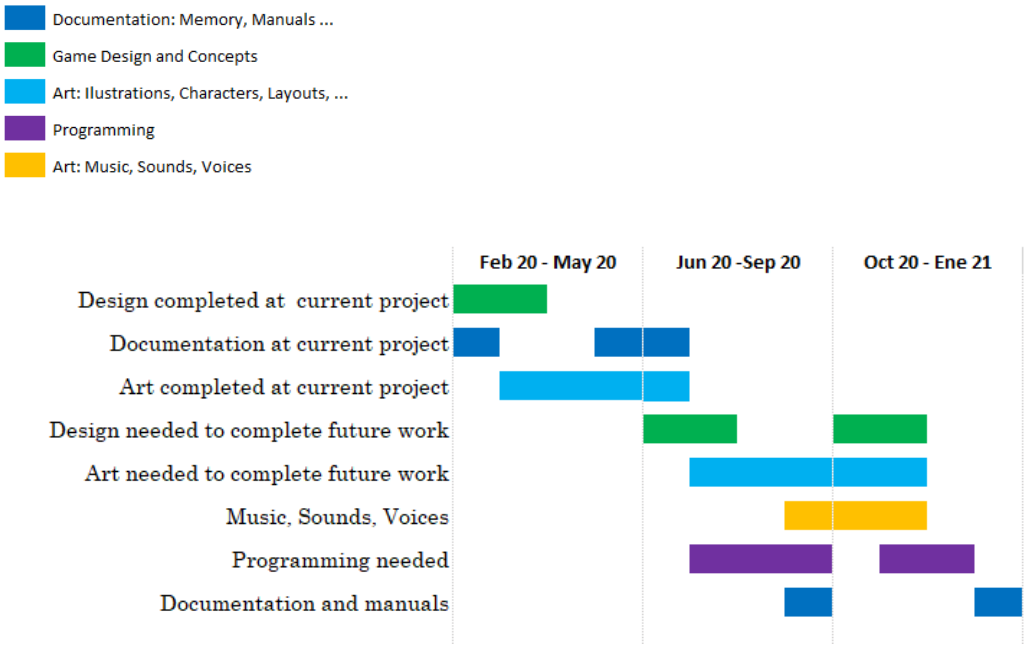


Fig. 68 Future Work Gantt